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REFERENCES ON THE PHYSICAL GROWTH AND DEVELOPMENT OF THE NORMAL CHILD



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U. S. DEPARTMENT OF LABOR
JAMES J. DAVIS, Secretary
CHILDREN'S BUREAU
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REFERENCES ON THE PHYSICAL GROWTH AND DEVELOPMENT OF THE NORMAL CHILD

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FOREWORD

In the present day not only the pediatrician and the parent but lso the teacher, the social worker, the health officer, and even the orrectional officer, are vitally interested in the question of the physi- al fitness of children. No single factor is of greater importance n dealing with the health of nations. Although almost every nodern school and institution recognizes this fact and makes some ort of attempt to evaluate the physical condition of its charges, oo often the examinations made are either valueless or actually letrimental in effect, owing to faulty methods or improper appli- ation. It is becoming of daily increasing importance that prac- ical and uniform standards for making these examinations be de- eloped for the everyday use of the great mass of workers.

An enormous amount of research in this field is being carried n by various agencies and independent investigators, with very aluable results. It has long been obvious to many of these workers hat their progress would be very markedly advanced if some means ould be found of coordinating all these various pieces of work. Every student of the literature on any scientific subject is impressed y the waste and delay involved in duplication and overlapping of esearch where the whole field is so inadequately covered. Variations n methods of work or in instruments used, and failure to take full dvantage of the previous findings of others also contribute to this esult.

With the idea of promoting cooperation among the students of the roblem of physical fitness the Children's Bureau called a conference f leading experts in this and related fields which met at the bureau n October 11, 1922. The members of the conference were as fol- ows: Dr. C. R. Bardeen, Dean of the Medical School, University f Wisconsin, Madison, Wis.; Dr. Franz Boas, Columbia University, New York City; Dr. Richard A. Bolt, Baltimore, Md.; Dr. Howard Childs Carpenter, Philadelphia, Pa.; Dr. Taliaferro Clark, United States Public Health Service, Washington, D. C.; Dr. John Foote, Washington, D. C.; John C. Gebhart, Association for Improving he Condition of the Poor, New York City; Dr. Clifford G. Grulee, Chicago, Ill.; Dr. Samuel McClintock Hamill, Philadelphia, Pa.; Dr. Milo Hellman, New York City; Dr. Henry F. Helmholz, Sec- ion of Pediatrics, Mayo Clinic, Rochester, Minn.; Dr. Buford John- on, Psychological Laboratory, Johns Hopkins University, Balti- nore, Md.; Dr. Vernon Kellogg, National Research Council, Wash- ngton, D. C.; Dr. J. H. Mason Knox, jr., Chief, Bureau of Child Hygiene, Department of Health, Baltimore, Md.; W. M. Gilbert, Carnegie Institution of Washington, Washington, D. C.; Dr. Henry L. K. Shaw, Albany, N. Y.; Dr. Richard Smith, Boston, Mass.; Dr. Edgar Sydenstricker, United States Public Health Service, Wash-

ington, D. C.; Harriet Wedgwood, American Child Health Association, New York City; and Dr. Jesse Feiring Williams, Columbia University, New York City. The conference was attended by the following members of the Children's Bureau staff: Grace Abbott, Chief of the Children's Bureau; Dr. Ella Oppenheimer, director, and Dr. Edith E. Nicholls, of the child-hygiene division; Dr. Anna E. Rude, director, and Dr. Ethel M. Watters, associate director, of the maternity and infant-hygiene division; and Dr. Robert Morse Woodbury, director of the statistical division of the bureau.

The conference discussed plans for systematizing and correlating the numerous investigations which had already been made and for initiating researches needed to round out the study of the problems of physical fitness. As a result of the recommendations of the conference several important investigations and studies were undertaken by the Children's Bureau, including studies of rickets in Washington, D. C., and in New Haven, Conn., and a posture demonstration among school children in Chelsea, Mass.[1]

The conference considered that one of the first steps to be taken was a thorough review of all the work that has been done along these lines in the past. Approximately 10,000 books and articles dealing with the various phases of physical fitness in children have been examined with care, and much has been found to be of little or no value. This bibliography, therefore, does not include all this material, but it indicates the contents of about 2,500 articles in such a way that future investigators can find for themselves with the least possible delay whatever material in the work of their predecessors will be of assistance to them. In general, only articles reporting original research have been annotated. The articles included were those available up to July 1, 1926.

In the section on growth in weight and height one is impressed by the necessity for uniform and better standards of measurement which this compilation brings out. Immense effort has been devoted to these studies, but owing to faulty methods of one kind or another a large proportion of the work is almost valueless. The need for consideration of standards in the problems of physical fitness is obvious. This bibliography should be an aid in the promotion of this end.

The bibliography was planned by Dr. Ella Oppenheimer, director of the child-hygiene division of the bureau; the reading of the literature was done by the following members of the bureau staff: Dr. Isabel Perry, Dr. Edith Nichols, Mrs. Helen Pope, Evangeline Kendall, Anna Kalet, and Dora Hansen; the medical editing by Dr. Kate Karpeles; and the classification and arrangement by Doctor Karpeles and Helen W. Ford.

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[1] In connection with the posture demonstration reports have been issued on Posture Clinics and Posture Exercises (U. S. Children's Bureau Publications Nos. 164 and 165, Washington, 1926).

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ABBREVIATIONS OF MAGAZINE TITLES

J. A. M. A.	Journal of American Medical Association.
Arch. Pediat.	Archives of Pediatrics.
Brit. M. J.	British Medical Journal.
Am. J. Dis. Child.	American Journal of Diseases of Children.
Am. J. Obst.	American Journal of Obstetrics.
Bost. M. & S. J.	Boston Medical and Surgical Journal.
New York M. J.	New York Medical Journal.
Am. J. Physiol.	American Journal of Physiology.
Ztschr. f. Kinderh.	Zeitschrift für Kinderheilkunde.
Jahrb. f. Kinderh.	Jahrbuch für Kinderheilkunde und Physische Erziehung.
Arch. f. Kinderh.	Archiv für Kinderheilkunde.
Monatschr. f. Kinderh.	Monatsschrift für Kinderheilkunde.
Deutsche Med. Wchnschr.	Deutsche Medizinische Wochenschrift.
Virchow's Archiv.	Virchow's Archiv für Pathologische Anatomie und Physiologie und für Klinische Medicin.

REFERENCES ON THE PHYSICAL GROWTH AND DEVELOPMENT OF THE NORMAL CHILD

SECTION I. GENERAL GROWTH IN WEIGHT AND HEIGHT

1 **Adams, Samuel S.:** "The systematic weighing of infants, a guide to normal growth." *Am. J. Obst.* [New York], vol. 54 (1906), pp. 832–842.

An article on the necessity of systematic weighing of infants, illustrated by eight charts on infant growth from the author's practice at the Washington Hospital for Foundlings.

2 **Adsersen, H.:** "Meddelelser om nyfødte Børns Vaegt og Laengde" [Communications in regard to newborn children's weight and length]. *Bibliotek for Laeger* [Copenhagen], ser. 8, vol. 5 (1904), pp. 248–260.

The probabilities of seasonal and geographical influences on birth weight and length are discussed with a view to stimulating interest in the problem. Five graphs and two tables, made up from material obtained from Danish and German lying-in hospitals, show seasonal and geographical variations in the size of the newborn. It is pointed out that there is a seasonal difference which varies with sex and with geographical location of place of birth.

3 **Affleck, G. B.:** "A minimum set of tentative physical standards for children of school age." *Pedagogical Seminary* [Worcester], vol. 27 (1920), pp. 324–353.

A study of the literature on physical standards, with a collection of tables from various investigators (Hastings, Pyle, Emerson, Woodrow, Smedley, and Crampton) to be used by parents, teachers, school nurses and physicians, and by investigators as a basis for further work. Bibliography.

4 **Ahlfeld, F.:** Über Ernährung des Säuglings an der Mutterbrust [Nutrition of the Breast-fed Infant]. Leipzig, 1878. 45 pp.

Investigation of progress of weight of one child from the fourth to the twenty-sixth week of life and of the quantity of breast milk taken by the child during that time. Comparisons are made with a few other writers on the same subject.

5 **Aitken, William:** On the Growth of the Recruit and Young Soldier. Macmillan & Co., London, 1887. 238 pp.

A treatise by a professor in the British Army Medical School designed to give recruiting officers scientific information by which the fitness of boys and men for military service may be determined. The subject of the military fitness of boys under 20 years of age is given particular attention in chapters on the development of the bones and internal organs, and emphasis is laid on the necessity for carefully established standards of height, weight, and chest girth at the various ages. Appendixes give schedules of measurements, and Army regulations.

6 **Albitzki, I. A.:** "O vliyanii shkoli na fizicheskoyie razvitie" [On the effect of school on physical development]. *Vrach* [St. Petersburg], vol. 11 (1890), pp. 695–698; 726–728; 744–747.

Account of 4,145 measurements of 1,462 school boys, aged 8 to 23 years, to ascertain effect of school on physical development. Height, chest circumference, weight, lung capacity, and muscular force were obtained, usually at the beginning and end of the academic year. Most of the boys were measured two or more times. Findings are discussed and compared with those of other writers. Several tables and diagrams are presented.

7 **Allaria, G. B.:** "Ricerche antropometriche sulla crescenza delle fanciulle povere" [Anthropometrical studies of the growth of poor girls]. *Il Ramazzini* [Florence], vol. 6 (1912), pp. 60–86.

The author studied 652 girls employed in urban industrial establishments, 420 in cotton factories in a rural district, and 158 girls of well-to-do families. Their ages varied from 12 to 21 years. He gives for each of these groups and for each year of age the height, weight, lung capacity, hemoglobin content of the blood, muscular force, longitudinal and transversal diameters of the skull, cephalic index, and bisacromial diameter. All these measurements were higher for the well-to-do girls than for the poor girls. This superior physical development of the well to do the author attributes to their more favorable social and domestic environment and the fact that they are free from the bad conditions of industrial work.

8 **Allix, Émile:** Étude sur la physiologie de la première enfance [A Study of the Physiology of Early Childhood]. Paris, no. 31, 1867. 255 pp.

Thesis for medical degree (University of Paris). On pages 205 to 209 the author reports the results of his own observation of 34 infants, 3 days to 4 years of age, to determine the relations which exist between the temperature, the circulation, and the respiration when the child is awake and when he is asleep. The rest of the thesis is a general treatise on physiology, based on the work of other investigators. References.

9 **Altherr, H.:** Über regelmässige tägliche Wägungen der Neugeborenen [On Regular Daily Weighing of Newly Born Infants]. Basel, 1874. 48 pp.

Account of weighing by author of 480 newborn infants at a Basel hospital. All the children were weighed immediately after birth, and in most cases the weighing was continued daily for two weeks. The report consists chiefly of statistical data obtained by author and deals with the initial weight, physiological decrease, subsequent gain, effect of sex and of method of feeding. Seventeen conclusions are stated. The report contains seven charts. References.

10 **Amherst College:** Anthropometric Work of Amherst College. 2 pp. (No publisher, no date.)

A study, continued for six years at Amherst College, of the physical measurements of 1,258 students of average development and 57 college athletes, to show the difference, if any, between the athlete and the average man. Each examination included about 35 body measurements and several tests of strength. The athletes exceeded the average by 6.92 per cent in weight and 10.24 per cent in tests of strength. In other measurements the differences were small.

11 ———, Physical Education Department: "On some relations of human stature to muscular strength." Publications of the American Statistical Association [Boston], vol. 3 (1892–93), pp. 347–349.

Test measurements of the tallest 20 men and the shortest 20 men in the classes of 1889, 1890, 1891, and 1892 at Amherst College to determine whether greater muscular strength is a correlative of lesser bodily height, other conditions being equal. Results of the measurements are tabulated. The study shows that the correlation mentioned apparently does not exist.

12 **Anderson, W. G.:** "Students in gymnasium." *The Adelphian* [Brooklyn], vol. 5, (1885), pp. 10–11.

A brief article by an instructor in physical training giving comparison in weight, height, and lung capacity of students in the gymnasium classes of Adelphi Academy with standards established by Bowditch, Roberts, and others. Technique of measurements is not given.

13 **Anonymous:** "Étude sur les variations de poids observées chez des enfants envoyés à la montagne" [Study of weight variations in children sent to the mountains]. *Bulletin médical* [Paris], 1903, 17th year, pp. 849–851.

Changes in weight of 519 boys and 395 girls from 3 to 14 years of age are shown by graphs. Special attention is paid to the apparent effect of mountain air on weight improvement with relation to sex, age, etc.

14 **Anonymous:** "Measurements of the Chinese." *Nature* [London], vol. 78 (1908), p. 607.

Average measurements of 669 Chinese boys from 10 to 24 years of age, as to weight, height, chest (normal), chest (expanded), neck (circumference), wrist (circumference), and hips (circumference), with comparison of English boys in weight, height, and normal chest measurements, the last obtained from the British Association averages. The Chinese figures were submitted to the magazine by A. H. Crook, Queen's College, Hong Kong. No technique is given.

15 **Anonymous:** "Über die Abhängigkeit des Körpergewichtes der Frucht von dem der Mutter" [Dependence of fetal weight on the weight of the mother]. *Wiener Medizinische Wochenschrift*, 12th year, no. 33 (1862), p. 519.

From material collected from 320 cases of pregnant women, by Dr. V. K. Gassner, formerly at the Lying-in Hospital of Munich, the author derives a law of the dependence of the mass of the fetus on the mass of the mother's body. The woman increases in weight during last three months of pregnancy in exact relation to whole weight. A first-born child weighs less than other children.

16 **Anthropometric Committee of the British Association for the Advancement of Science:** Reports.

In 1875 the British Association for the Advancement of Science appointed an anthropometric committee to collect observations on the systematic examination of the heights, weights, and other physical characters of the inhabitants of the British Isles. This committee, with various changes in personnel, functioned until 1912, when the work was discontinued. Its reports appear

16 **Anthropometric Committee of the British Association for the Advancement of Science**—Continued.

in the Report of the British Association for the Advancement of Science, as follows:

1875. Appointment of committee.

1876. Preparatory work.

1877. Published London, 1878, pp. 231–232: Measures taken to insure uniformity in methods and instruments.

1878. Published London, 1879, pp. 152–156: Abstract of tables of measurements of boys at Westminster School and letter sorters at the General Post Office, ages 13 to 18, about 2,000 in all, showing average height in inches, average weight in pounds, average strength of arm in pounds, ratios between height and weight and height and strength.

1879. Published London, 1879, pp. 175–209: Committee reported being in possession of nearly 12,000 original measurements, in addition to 50,000 collected by Mr. Roberts. Tables show average height and weight of persons in various occupations, ages from 12 years up; tables of the height without shoes, weight, and chest girth of boys in the school of Christ's Hospital at each month, quarter, and year from 9 to 15 with various tables of correlations; tables of comparison of stature and weight of British, Americans, and Belgians, prepared by Mr. Charles Roberts, with remarks on the establishment of a standard of stature and weight. Summary of the progress of anthropometric research in other countries.

1880. Published London, 1880, pp. 120–159: New observations nearly equal in number to all those previously collected were added during the year A standard class was established by collection of as large a number of cases as possible enjoying the most favorable conditions in respect to fresh air, exercise, and food, and a table shows the decrease in stature of boys aged 11 and 12 as social conditions are further and further removed from the standards. Tables also show the actual, average, and mean height, weight, chest girth, and strength of boys and men from 10 to 50 years of age, in the standard class, and their correlations, and the mean annual growth expressed in percentages from ages 11 to 23. Observations are reported of color of hair and eyes, in standard class. An investigation was made as to town or country origin, and results tabulated. Bowditch's observations on 12 boys and 13 girls, from birth to 22 years of age, reprinted, with comment on the increased comparative growth of girls from about 12 to 14, and a table reprinted from Roberts' Paper on Factory Children illustrating this increase. Tables from 1,850 observations made during several years on boys in Marlborough College, including head girth, arm girth, and leg girth. Table of age, weight, chest circumference, and strength of 3,695 boys accepted or rejected as candidates for employment as telegraph messengers.

1881. Published London, 1882, pp. 225–272: The report shows few new observations. Mr. Charles Roberts contributed a paper showing the mean height, weight, chest girth, and strength of the British population as far as observed, at the different ages, the "mean" representing the value of greatest frequency; the average height and weight of several classes of the population yielding material for study of the comparative effects of town and country life. Mr. Francis Galton added a paper on the range in height, weight, and strength of the different classes at every age, the range being measured through an extension of the principle by which probable error is ascertained. Doctor Lawson summarized the results of inquiries into eyesight and color blindness, to which Mr. Roberts added a report on eyesight and color blindness as observed at Marlborough College.

1882. Published London, 1883, pp. 278–280: Brief report, enumerating the additional data secured on height, weight, and color of eyes and hair of both sexes but omitting the results of these observations. Some observations on adults.

1883. Published London, 1884, pp 253–306: A summary of all the work of the committee to date, with sample of the cards used by the committee in collecting observations and index to the tables given in each year's report. This report adds statistics on children in the industrial schools and in the York Friends' School and some observations on infants at birth; also a list of monographs on anthropometry published in England and the United States.

1884. Published London, 1885, pp. 279–282: Observations on eyesight, tending to show that between the ages of 10 and 40 a slight improvement takes place.

1885 to 1904. No work except measurements of a small number each year, at the annual meetings of the society, not reported in form to be available for any work upon children.

1905. Published London, 1906, pp. 198–206: Report of a new committee which had drawn up a list of dimensions of the human body suitable for measurement and taken other preliminary steps toward an anthropometric investigation of the British Isles.

1906. Published London, 1907, pp. 349 to 369: Committee published charts of the adult male human figure with points marked between which measurements were to be made; also sample cards for inquiries and general remarks about the work to be done.

16 **Anthropometric Committee of the British Association for the Advancement of Science**—Continued.

1907. Published London, 1908, pp. 354–368: The anatomical subcommittee reported the chest measures that have been used in anthropometric investigations from early times and recommended the method to be used in this survey; also submitted a series of schedules for use in school anthropometric work.

1908. Published London, 1909, pp. 351–399: A final report of the work commenced by the committee in 1902, summarizing its efforts to date. The report deals only with methods and apparatus to be regarded as standard in anthropometric investigation.

1909. Published London, 1910, p. 286: Brief report of the extent to which anthropometric measurements were being undertaken in schools.

1910. Published London, 1911, p. 256: No statistical work done. Report very brief.

1911. Published London, 1912, p. 130: No statistical work done. Report very brief.

1912. No report.

17 **Antonov, A.:** [On the changes in the weight of the newborn in the first few days of life]. *Journal dietskikh bolieznici*, vol. 1 (1925), pp. 16–26. (Reviewed in *Zentralblatt für die Gesamte Kinderheilkunde* [Berlin], vol. 19 (1926), p. 278.)

The author studied the physiological loss of weight and the course of the weight curve of 493 newborn infants. About 6 to 7 per cent reached their original weight within the first eight days, 50 per cent within the first two weeks, and 75 per cent within the first three weeks. In 25 per cent of cases the increase in weight was abrupt, in 75 per cent slow and gradual. First-born children regained their original weight more slowly than second born. Children who were underweight at birth regained their original weight sooner than those born with a normal weight.

18 **Appleton, V. B.:** "Growth of Chinese." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 43–49.

Two hundred and twenty-four girls, aged from 6 to 22 years, students in two cities in Chekiang Province, East China, were measured, and examined for physical traits related to growth and development. All measurements were made by the author, with anthropometer and calipers. Age was accurately determined. Tables give average for age, for groups of from 5 to 34 subjects, of 12 absolute measurements, and of 10 computed relative measurements. The brain of a Chinese girl continues to grow after adolescence. Annual increase in height is accelerated from the tenth to the thirteenth year; growth in stature continues until the eighteenth year. Annual increase in weight is greatest from 9 to 16 years. Adolescence was found to be not as much delayed in Chinese as is frequently assumed. References.

19 ——— "Further study of the growth of Chinese." *China Medical Journal* [Shanghai], vol. 40 (1926), pp. 259–264.

One of a series of studies made by the author to discover factors which govern the growth of Chinese children and to determine which variations are due to innate racial growth impulse and which to accidental accessory causes, such as climate and hygienic condition. The material for analysis consists of a series of weight-height-age measurements made on 345 male students in Fukien, from 9 to 24 years of age, and a similar series made on 242 Chinese boys in Hawaii. The Chinese in Hawaii were superior in height, weight, and rate of growth. The author notes that dental caries is more prevalent among Chinese children in Hawaii than among those in China. Tables and references.

20 **Arnold, Felix:** "Weights and school progress." *Psychological Clinic* [Philadelphia], vol. 10 (1916), pp. 33–39.

To test the theory that school progress of children is determined in large measure by their weight the author weighed the children in four schools in New York City successively for a number of terms. Technique and number of observations are not given. Analysis of the results, in the author's opinion, confirmed the theory that the heavier the child for his age the higher will be his school grade.

21 **Aron:** "Über Körperbau und Wachstum von Stadt- und Landkindern" [Build and growth of city and country children]. *Berliner Klinische Wochenschrift*, vol. 56, pt. 2 (1919), pp. 742–744.

Aron and Lubinsky measured height and weight of 223 school boys of the village of Deutsch-Rosselwitz, 202 from private schools in Breslau, and 261 from city public schools. All were of the same race. Ages were 7 to 13. Results are put in tables. The private-school pupils showed greatest height and weight. The country children showed lowest height and weight, but little above that of city public-school children. However, for Livi's index ponderalis, $\frac{100\sqrt[3]{wt}}{ht}$, the country children showed the best results and the private-school pupils the worst. Thus the work of the country children seems to retard height and develop muscles. The superior height of the city children is but a temporary phenomenon; other children later equal them.

22 **Aschenheim, Erich:** "Ergebnisse von Schuluntersuchungen in Remscheid" [Results of examinations of school children in the city of Remscheid]. *Ztschr. f. Kinderh.* [Berlin], vol. 37 (1924), pp. 109–118.

An account of an original study of the physical condition of 7,665 public-school children, boys and girls in nearly equal numbers, in a medium-sized industrial town in Germany in the year 1922–23. About one-half of the children were 5½ to 7 years of age, the rest, 14 to 15 years. The author gives in several tables their height and weight and the deviations of both from normal.

23 **Ascher:** "Über Schülerfürsorge" [Care of school children]. *Zeitschrift für Medicinalbeamte* [Berlin], vol. 25 (1912), pp. 79–89.

From a study of anthropometrical measurements made by Florschütz, of insured people, and by Villaret, of recruits, and by the author, of 7,087 Westphalians and 14,000 East Prussians, all school boys and girls from 6 to 14 years of age, the author concludes that the "constitution" can not be appraised from the height alone or the weight alone but from their relation to each other and from a physician's estimate of the appearance of the bare chest. The author's data are presented in two tables.

24 **Astengo, Alphonse:** Rapport du poids des enfants à la durée de la grossesse [Relation between the Weight of Infants and the Length of Gestation]. Paris, no. 544, 1905. 48 pp.

A thesis (University of Paris) giving statistics of the weight at birth of 18,660 infants as related to the period of gestation.

25 **Atlassoff:** "De la périodicité dans le développement de l'organisme dans l'âge scolaire et de son importance" [Periodicity in the development of the organism at school age and its importance]. *Congrès international de médecine*, C.-r. 1903, xiv, section de pédiatrie [Madrid], (1904), pp. 848–853.

A study based on 10,218 measurements collected at a boarding school for boys, the pupils having been measured at the beginning and end of each school year during their entire course. Original figures and curves are not given. The author found periodicity in growth a well-established fact of great importance to educator and physician.

26 **Auden, George A.:** "Heights and weights of Birmingham school children in relation to infant mortality." *School Hygiene* [London], vol. 1 (1910), pp. 290–291.

The author presents two tables of heights and weights of children from 4 to 6 inclusive, and of boys and girls of 7 and 8, in five wards representing different social conditions of the city of Birmingham.

27 **Ausset:** "Les stagnations de poids chez les enfants et particulièrement les nourrissons" [Arrested increase of weight in children and particularly in infants]. *Bulletin de la Société de pédiatrie de Paris*, vol. 6 (1904), pp. 191–209.

A discussion of two cases of infants who, without apparent cause, failed to gain in weight, and of other cases of children whose weight suddenly increased after a long period of arrest following illness.

28 **Ayrton, M. C.:** Recherches sur les dimensions générales et sur le développement du corps chez les Japonais [Investigation on the General Bodily Dimensions and Physical Development of the Japanese]. Paris, no. 535, 1879. 46 pp.

Thesis (University of Paris). Original measurements of 227 Japanese males aged 13 to 73 years and 24 females between the ages of 7 and 50 years. Author gives for each case age, occupation, height, and span; also averages for all persons of the same age.

29 **Bachauer:** "Körpermasse von Augsburger Volksschulkindern vor und nach dem Kriege" [Body measurements of children in the Augsburg public schools before and after the war]. *Zeitschrift für Schulgesundheitspflege* [Leipzig], vol. 34 (1921–22), pp. 113–120.

The author gives weights and heights of 4,873 Augsburg boys and girls of 6 and 7 years of age (age given as the even year). He finds that the war did not affect children anthropometrically, although anemia was greatly increased.

30 **Bacher, C. W.:** Die Reife der Neugeborenen [Maturity of Newborn Infants]. Wuerzburg, 1887. 16 pp.

This dissertation shows from other students' statistics that the length and weight of infants are too variable to constitute authoritative proofs of maturity. The author recommends instead the more or less cartilaginous condition of certain bones, the relative size of sternum or pelvis, the formation of the sinuses, the development of muscular, vascular, and nervous systems, etc.

31 **Backhaus:** "Grundsätze und Erfahrungen auf dem Gebiete der Kindermilchbereitung" [Principles and experiences in the preparation of milk for infants]. *Münchener Medizinische Wochenschrift*, vol. 3 (1905), pp. 1883–85.

The author studied at the Empress Augusta Victoria House the weight of 1,000 newborn infants, most of whom were first-born children of unmarried working women between 25 and 35 years of age. The initial loss of weight and gains in weight were studied in relation to birth weight, amounts of food consumed, etc.

32 **Baldwin, Bird T.:** "A psycho-educational study of the fourth and fifth school grades." *Journal of Educational Psychology* [Baltimore], vol. 4 (1913), pp. 364–365.

A short report of a longer study on the interrelations between chronological, physiological, and pedagogical age. See author's "Physical Growth and School Progress," Bulletin United States Bureau of Education, 1914, no. 10.

33 ——— Notes on School Observation. The Physical Nature of a Child. University of Texas Bulletin, vol. 1, no. 188 (1911). 26 pp.

A syllabus designed to help teachers in detecting physical defects. It includes a table of height-and-age and age-and-weight distributions, based on author's study of children at the University of Chicago elementary and high schools and the Francis W. Parker School; charts representing graphically the growth in height and weight of 14 boys and 11 girls; simple tests of lung capacity; standards of cephalic index; suggestions for observation of asymmetry of body, defective teeth, enlarged tonsils, adenoids, nasal obstructions, malnutrition, defective vision, and hearing. A sample record card and a bibliography are included.

34 ——— Physical Growth and School Progress. Bulletin, U. S. Bureau of Education, 1914, no. 10. Washington. 212 pp.

An important investigation based on consecutive measurements, at yearly and half-yearly intervals for periods of 3 to 12 years, of 861 boys and 1,063 girls in elementary schools of high standing in Chicago and New York. A total of 33,840 measurements of height, weight, and lung capacity were taken by trained anthropologists, and measurements were recorded in age groups within three months of the exact age of the child. A detailed study was made of records of health and school progress, and 34 tables and 39 charts were constructed showing results of the investigation. The general conclusion is drawn that the tall, heavy boys and girls with good lung capacity are older physiologically and more mature mentally than short, light boys and girls. The bulletin concludes with a historical summary of the science of physical measurements.

35 ——— The Physical Growth of Children from Birth to Maturity. University of Iowa Studies, vol. 1, no. 1 (1921). Iowa City. 411 pp.

The author's most extended work, to date of publication. An intensive analysis of the problem of physical growth from birth to maturity treated from the ontogenetic standpoint, bringing the material of his previous monograph, "Physical Growth and School Progress," up to date and adding much new material. Part I discusses anthropometric instruments and methods and gives data on 5,772 Iowa children. Part II adds, as original data, 5,000 weight measurements on 400 infants; height and weight of 9,074 infants with comparative curves from other investigations; height and weight of 27,912 preschool children; 400 individual growth curves; and 1,548 total or partial coefficients of correlation. Part III presents an analysis of original data on anatomical and physiological ages from 6,500 boys and girls. Part IV includes a survey of 911 investigations of physical growth in this country and abroad. Part V summarizes in 643 comparative tables of measurements data from approximately 5,385,400 recorded cases in various countries. Part VI is an annotated bibliography comprising 911 works on physical measurements. Each section, or chapter, is summarized, and author's conclusions, based on his own data, recorded.

36 ——— "The relation between mental and physical growth." *Journal of Educational Psychology* [Baltimore], vol. 13 (1922), pp. 193–203.

The author, after referring to his former studies on this subject, urges use of the individualizing method. From data on about 2,500 normal boys and girls under physical training he gives growth curves in height for boys and girls and points out that on account of the evenness of growth predictions in respect to this can be made by the Pearson method or the regression formula. From 143 boys and girls examined at the Iowa Child Welfare Research Station by the Stanford revision of the Binet scale, of whom 42 had had four school examinations and 36 had had five, the author makes mean mental growth curves of average and of superior boys and of girls up to 14 years. He next gives the intelligence-quotient curves of superior and average boys and girls. Finally he repeats an earlier statement that tall, heavy children are more mature physiologically and mentally than short, light children.

37 ——— **L. W. Campbell, and H. J. Kefauver:** Studies in Experimental Education. Johns Hopkins University, Baltimore, 1920. 80 pp.

An introduction to and summary of diagnostic studies of 129 boys and girls assembled at a summer school of education at Johns Hopkins University. In connection with the author's work as instructor in a course in experimental education the physical measurements of these boys and girls were taken and

compared with their mental tests. The author outlines the method of correlating the results of the two systems of measurement and derives a sample graph showing development of an accelerated and of a retarded boy. Actual record of the physical measurements, compiled by L. W. Campbell and H. J. Kefauver, appears as chapter 2 of the bulletin.

38 **Ballantyne, J. W:** An Introduction to the Diseases of Infancy. Oliver & Boyd, Edinburgh. 1891. 235 pp.

The author devotes a large part of this volume to the anatomy and physiology of infancy, adding to the material collected from other writers a number of original investigations. Nine plates.

39 **Barr, A. L.:** "Some anthropometric data of western college girls." *American Physical Education Review* [Brooklyn], vol. 8 (1903), pp. 245–248.

A comparative study of physical measurements of girls from Wellesley, Oberlin, and the University of Nebraska. The charts upon which the remarks are based are not reproduced.

40 **Baudraud, J. M.:** L'accroissement; ses caractères normaux et anormaux chez le nourrisson: ses rapports avec l'hérédité [Growth: Its Normal and Abnormal Characteristics in the Infant; Its Relation to Heredity]. Paris, no. 217, 1911. 648 pp.

A thesis (University of Paris) on the theory of growth. Author takes up (1) normal growth of the human cell from the beginning of intrauterine life until the end of the second year of extra-uterine life, and proper care of the mother and child during this time; (2) irregular growth caused by lack of proper care or bad environment; (3) effects on growth of bad heredity, mainly alcoholism, tuberculosis, and syphilis. The discussion is not based on cases investigated by the author with the exception of a few illustrations of bad hereditary influences. Bibliography.

41 **Bean, Robert Bennett:** "Filipino types: Manila students." *Philippine Journal of Science*, Sect. General Science, vol. 4, no. 5 (1909), pp. 263–296.

A comparison of the physical characteristics of several hundred Manila students from about 18 to 30 years of age, divided into eight classes: Primitive, modified primitive, australoid, etc. For each class the maximum, mean, and minimum measurements are given for cephalic index, nasal index, stature standing, stature sitting, morphologic face index, physiognomic face index, head length, head width, head height, nose length, nose width, chin to nasion, chin to hair line, bizygomatic width, frontal circumference, parietal circumference, forehead circumference, occipital circumference, fronto-parietal index, forehead occipital index, fronto-occipital index, forehead parietal index, occipito-parietal index, weight, and age. Bibliography.

42 ——— "The pulse of growth in man. A preliminary report." *Anatomical Record* [Philadelphia], vol. 28 (1924), pp. 45–61.

A discussion of the wavelike nature of growth to which attention has been directed by numerous observers. The author presents four charts of superimposed curves and two diagrams, derived from the figures of many investigators, showing alternations in development of various parts and organs of the body. References.

43 ——— The Racial Anatomy of the Philippine Islanders. J. B. Lippincott Co., Philadelphia, 1910. 236 pp.

Largely on adults, but containing, on pages 54 and 55, remarks on the relation of stature to age among the Filipinos, and on pages 160 to 165, notes on the omphalic index in the early years.

44 ——— "The sitting height." *American Journal of Physical Anthropology* [Washington], vol. 5 (1922), pp. 349–390.

A report of a study of sitting height, based upon observations of about 6,000 persons of various races, among whom were 1,500 children from Ann Arbor, Mich., more than 700 Filipino children of Manila, and more than 300 male Filipino students 18 years or over. The author prefers Hrdlička's instruments, method, and technique. Tables and curves show the comparative length and the rate of growth of the torso for the different groups and for the two sexes at various ages, and data are given for the groups, on the sitting-height index (i. e., "the sitting height or torso in terms of the stature taken as 100").

45 ——— "The stature and the eruption of the permanent teeth of American, German-American, and Filipino children. Deductions from the measurements and examination of 1,445 public school children in Ann Arbor, Mich., and 776 in Manila, P. I." *American Journal of Anatomy* [Philadelphia], vol. 17 (1914–15), pp. 113–160.

An extensive, detailed study to establish standards as to the time of eruption of the teeth and furnish data on the extent of decay. The records were made in 1906, 1907, and 1908, from children in the public schools of Ann Arbor, Mich., and the normal and trade schools of Manila. Methods are fully described. Results are tabulated, as far as possible, and summarized under: The eruption of the teeth in relation to (1) development of the individual, (2) stature, (3) race, (4) sex, (5) school grade; the eruption and decay of the teeth in relation to morphologic form; the law of alternation of development. Bibliography.

46 **Beaudouin:** "Pesées quotidiennes et alimentation d'un enfant né avant terme" [Daily weighing and feeding of a child born before term]. *Normandie médicale* [Rouen], vol. 3 (1888), pp. 234–236.

Study of the weight of one child born 6 weeks before term and weighed 16 times in the first 40 days of its life. Though its gain in weight was much more rapid than that of a normal child, at the end of the fortieth day its weight was still below normal.

47 **Belemann, Wilhelm:** Das Verhältnis zwischen Körperlänge, Kopfumfang, und Gewicht bei Neugeborenen [Relation between Length, Head Circumference, and Weight of Newborn Infants]. Wuerzburg, 1889. 27 pp.

An inaugural dissertation. After discussing the difficulty of determining whether or not a child is premature, the author gives original data on the length, weight, and fronto-occipital circumference of 51 newborn boys and girls. Mother's age and number of children are recorded. These data he works over mathematically into a formula of development, which he believes useful in prognosis of infants' viability.

48 **Belot, J. B. M. P.:** Contribution à l'étude du développement physique de l'enfant: taille, poids, périmètre thoracique, rhythmes cardiaque et respiratoire, tension artérielle [Data on the Study of Physical Development of the Child; Height, Weight, Chest Circumference, Cardiac and Respiratory Rhythms, Blood Pressure]. Bordeaux, no. 56, 1913. 118 pp.

Thesis (Bordeaux University). Original investigation made in Bordeaux of physical development of 661 boys and 667 girls, varying in age from a few hours to 15 years. Author gives weight, height, chest circumference, pulse, respiration, and blood pressure for every case and also averages by sex for the first month of life and for each year of life.

49 **Bendix, Bernhard:** "Zur Ernährungsphysiologie des Säuglings. II. Über die Entwicklung von Zwillingen" [Nutritional physiology of the infant. II. The development of twins]. *Jahrb. f. Kinderh.* [Berlin], vol. 54 (1901), pp. 703–720.

After commenting on the fact that some infants thrive on the most unscientific diet the author describes 11 cases of twins who received identical fare and treatment and differed little in weight at birth and yet in 9 out of the 11 cases showed diverging development. Full data on the twins are afforded by the comparative curves and tables.

50 **Beneke, F. W.:** Die anatomischen Grundlagen der Constitutionsanomalieen des Menschen [The Anatomical Basis of the Constitutional Anomalies of Man]. Marburg, 1878. 262 pp.

A general and pathological treatise on the heart and arterial system, lungs, larynx, trachea, liver, spleen, and kidneys, containing data on normal growth of children. The size is given of various organs in the eight periods: Birth to 11 days, 11 days to 3 months, 3 months to 1 year, 1 to 2 years, 2 to 3 years, 3 to 7 years, 7 to 14 years, 14 to 21 years. Ninety-nine subjects were examined and nearly 600 measurements made on the arterial system. In connection with the data on each organ there is a discussion of the changes at puberty. Comparisons are made in 15 tables with Quetelet's findings. Attention is repeatedly called to the fact that the child's heart is relatively much smaller than the adult's and that the child's blood pressure is higher in the lungs and lower in the circulation than the adult's.

51 **Benestad, G.:** "Die Gewichtsverhältnisse reifer norwegischer Neugeborener in den ersten 12 Tagen nach der Geburt" [Proportionate weights of mature Norwegian infants in the first 12 days after birth]. *Archiv für Gynäkologie* [Berlin], vol. 101 (1913), pp. 292–350.

Study of weights of 1,979 mature newborn infants, obtained from the records of a hospital in Christiania. Average weight was 3,466 grams; a loss, averaging 189 grams, took place within the first two to three days; the original weight was again reached within eight days. First-born children showed a smaller initial weight than children of pluriparæ, also a greater loss at the end of the third day and a smaller gain at the end of the ninth day. Smaller children suffered less loss and began their increase earlier than large children. Author presents his statistical data in 10 tables and gives a long list of references.

52 **Benfey, Arnold:** "Zur Ernährung Neugeborener mit Eiweissmilch" [Nutrition of newborn infants with protein milk]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 75 (1912), pp. 280–314.

Observations are given of the weight changes, etc., of 83 infants under 3 weeks of age, in the Children's Asylum of Berlin, between October, 1910, and July, 1911. Full data on these cases are given in two long tables and six curves.

53 **Bergmann, E.:** "Die physiologische Gewichtsabnahme und die Beziehungen zwischen Ernährung und Gewichtsverlauf bei 1,000 Neugeborenen" [The physiological decrease in weight and the relation between feeding and the course of weight in 1,000 newborn infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 14 (1916), pp. 149–165.

Author observed 1,000 newborn infants in a maternity hospital in Berlin to determine the decrease in their weight after birth and the subsequent increase. Of these 1,000 infants, 611 regained or exceeded their original weight in periods varying from a few days to over three weeks; 389 were discharged from the hospital after three weeks, weighing less than they did at birth. The decrease in weight took place, in most cases, in the first three to four days after birth; it was proportionate to the weight and amounted on an average to 7.8 per cent of the original weight. Heavy children regained their original weight more slowly than those of average or less than average weight at birth. No definite correlation was found between quantity of milk taken and increase in weight.

54 ——— "Zur Frage der Beeinflussung der Brustkinder durch die Kriegsernährung der Mütter" [The question of the effect upon breast-fed children of their mothers' war diet]. *Ztschr. f. Kinderh.* [Berlin], vol. 20 (1919), pp. 75–111.

Observations by the author concerning the apparent effects of different types of diet, one a war diet, upon the development of her two children. The children weighed 3,300 grams at birth and were of about the same length. The changes in weight and the development of the children are discussed in detail. The child born when the mother was on a poor diet during and after pregnancy seemed to develop more slowly than the other.

55 **Bernard, P.:** "Considérations médico-légales sur la taille et le poids depuis la naissance jusqu'à l'âge adulte" [Medico-legal considerations on height and weight from birth to adult age]. *Archives de l'anthropologie criminelle et des sciences pénales* [Paris], vol. 2 (1887), pp. 213–225.

After commenting on the medico-legal significance of human weight and height when age is to be ascertained or comparison made of assailant and victim, etc., the author quotes and discusses statistics collected thereon by Leffage, Pagliani, Bouchaud, Fleischmann, Gerhardt, Buffon, Zeising, Quetelet, Bowditch, et al.

56 **Berry, F. M. D.:** "On the physical examination of 1,580 girls from elementary schools in London." *Brit. M. J.* [London], vol. 1 (1904), pp. 1248–1249.

A report by the medical examiner of the Technical Education Board, London County Council, as to physical examination of girls applying for scholarships in higher-grade schools. Methods are not given. A table shows average height and weight of 1,385 girls grouped by ages 11 to 15 and compared with height and weight of boys of the same ages examined for scholarships and consequently coming from the same social class. Weight is also compared with statistics from other countries. Comparative figures for chest expansions are given for boys and girls.

57 **Bertillon, Jeanne:** "L'indice encéphalo-cardiaque, d'après les documents laissés par le docteur Parrot" [The encephalo-cardiac index, from documents left by Dr. Parrot]. *Bulletins de la Société d'anthropologie de Paris*, ser. 3, vol. 10 (1887), pp. 149–158.

A paper composed largely of tables, with explanatory notes, compiled from records left by Doctor Parrot, of the weights of different organs of the body as determined by him at autopsy. Number of observations is about 500. The tables show the comparative development, from birth to 6 years, of stature, weight of body, brain, heart, and spleen; the proportion of increase for various periods of time; comparative development of the sexes; relationship between brain weight and body weight, brain weight and heart weight.

58 **Betke, Hans:** "Die Couveusenbehandlung der Frühgeborenen und Lebensschwachen" [Incubator treatment of premature and weak infants]. *Monatsschrift für Geburtshülfe und Gynäkologie* [Berlin], vol. 40 (1914), pp. 255–275.

A detailed study of the weight, temperature changes, and caloric requirements of premature infants brought to the children's clinic at the University of Berlin. The majority of the infants were kept two months. Nine tables are included of weights, diseases affecting the infants, mortality, etc.

59 **Beyer, H. G.:** "Some observations on normal growth and development of the human body under systematized exercise." *Transactions of the First Pan-American Congress*, 1893 [Washington], (1895), pt. 2, pp. 1196–1217.

A report of two successive measurements made on 50 naval cadets in September, 1892, and April, 1893, the items selected for record being height, weight, lung capacity, and total strength, with brief outline of the gymnastic exercises taken during the interval between measurements. Tables show the distribution, by height in millimeters, of 230 cadets (average age 18 years)

who were previously admitted to the academy and comparison of their measurements with those of Amherst students and Boston school boys. The measurements showed an average gain in height, in the six-month period, of 8 millimeters; in weight, of 3.3 kilograms; in lung capacity, of 154 centimeters; in total strength, of 123½ kilograms. Analysis of data, comparison with various other anthropometric statistics, and discussion of methods of physical training conclude the report.

60 **Beyer, H. G.:** "The influence of exercise on growth." *American Physical Education Review* [Boston], vol. 1 (1896), pp. 76–87.

The author, a surgeon in the United States Navy, reports the effect of regular gymnastic exercises upon the development of the cadets coming under his observation. Accurate annual measurements of 186 cadets, aged 16 to 22, compared with the normal growth curve from records of 4,537 naval cadets previously measured, showed a distinct gain in height above the normal gain, amounting to about 1 inch during the four years of systematic exercise; a gain in weight proportionately greater than the gain in height but more easily lost; and a gain in strength. There was, however, a loss in vital index—the ratio of lung capacity to weight.

61 ——— "The relation between physique and mental work." *American Physical Education Review* [Boston], vol. 5 (1900), pp. 149–160.

Report of the examination of 85 boys applying for positions as navy-yard apprentices. The physical examinations were marked by a table of percentile grades compiled by the author from many observations. The mental examinations were made by other members of the examining board. Later, examinations of 15 more boys were added to the original list. From these figures the author worked out various correlations between physical and mental development, confirming, in his opinion, the results obtained by Porter in his researches on "Precocity and Dullness."

62 ——— "The value to physiology of anthropometric tests and measurements in the form of statistics and their importance to education." *American Physical Education Review* [Brooklyn], vol. 6 (1901), pp. 181–193.

In a general discussion of his subject the author includes an interesting comparative study of physical measurements of 4,541 cadets and 3,445 other men and boys, mostly landsmen and naval apprentices, made to determine the effect of mental upon physical development. Living conditions in the two classes being as nearly equal as could be found for such a study the author concluded that brain work may favorably influence bodily development.

63 **Biedert, P.:** "Zur Beurtheilung der Wägungsresultate bei Säuglingen" [On the judging of results of weighing infants]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 19 (1882), pp. 275–291.

Author weighed four infants twice daily—the first for 47 days, the second for 68 days, the third for 100 days, and the fourth for 4 days. He found that intake and evacuation produced some fluctuations in weight; therefore, in order to avoid mistakes, he recommends "double weighing"; that is, weighing before and after feeding and taking the average of these two weights. The article is principally a discussion of how to control weight.

64 **Biermer, R.:** "Beiträge zur Frage der natürlichen Ernährung" [Contribution to the question of breast feeding]. *Arch. f. Kinderh.* [Stuttgart], vol. 47 (1907), pp. 68–94.

In connection with data on amounts of food taken the author gives tables on the weights of his two sons during their first year.

65 **Binet, A., and Th. Simon:** "La misère physiologique et la misère sociale" [Physiological poverty and social poverty]. *Année psychologique* [Paris], vol. 12 (1906), pp. 1–24.

As an experiment in the practical value of health inspection of school children the authors examined 245 boys and 308 girls from 6 to 14 years of age in a public school of Paris. The investigation included a medical examination, anthropometric measurements, and tests of organs of sense. Methods of measurement are carefully described and results are tabulated. Results of medical examination are not reported. Physical retardation or advancement is discussed in detail, especially its correlation with social conditions.

66 ——— **and N. Vaschide:** "Mesures anatomiques chez 40 jeunes garcons" [Anatomical measurements of 40 young boys]. *Année psychologique* [Paris], vol. 4 (1897), pp. 133–136.

A short chapter in a memoir "La psychologie à l'école primaire," giving results of measurement of weight, stature, and length of step. Methods are described.

67 **Bird, Fridericus:** De dimensionibus corporis humani inter se comparatis. [The Relative Proportions of the Human Body]. Halle, 1817. 36 pp.

An inaugural dissertation in which the author discusses the relations apparently existing between certain body dimensions and the "architectura phthisica" or "nervosa," etc. It contains tables of the breadth of the chest and its girth, of the length of the collar bone, of the distance between the xiphoid process and the symphysis pubis; of the girth of the abdomen, of the extremities, and of the head. Some of the tables concern childhood from early infancy to the twenties.

68 **Bischoff, E.:** "Einige Gewichts- und Trockenbestimmungen der Organe des menschlichen Körpers" [Some determinations of weights and dry values for organs of the human body]. *Zeitschrift für Rationelle Medicin* [Leipzig and Heidelberg], ser. 3, vol. 20 (1863), pp. 75–118.

To secure exact data on the weight of the human body the author in 1861 and 1862 dissected five cadavers of normal individuals: A man of 33, a woman of 22, a newborn boy, a newborn girl, and a prematurely born boy of 6 months. He also used the weights ascertained by his father in 1853 of the body of a boy of 16 years. The method of dissection is described, and numerous tables give weights for each body of blood, fat, skin, bones, muscles, and organs, separately and in groups. Other tables compare different parts of the same body or the same part of different bodies. The dry weights are determined for the man and one infant. The article is preceded by a sketch of similar work previous to 1863.

69 **Blagovidoff, I.:** Materiali k izsliedovaniu zdoroviia inorodtzev Simbirskoi gubernii Buinskavo uiezda [Results of an Investigation of the Condition of the Health of Mongolian Tribes of the Province of Simbirsk, Buinski County]. N. A. Lebedeff, St. Petersburg, 1886. 105 pp.

An original study of boys from 8 to 20 years old belonging to three Mongolian tribes living in northeastern Russia. The author gives in numerous tables for each year of age the vertical and horizontal diameter of the head, circumference of head, neck, and chest, length of neck, trunk, and arm, circumference of shoulder, length of leg and foot, circumference of hip and thigh, height and weight of body, capacity of lungs, and power of compression of right hand. He discusses his findings in detail and compares them with those obtained by several Russian and West European writers who studied other races. Bibliography.

70 **Bleyer, A.:** "Mesures anthropométriques de deux mille enfants d'une ville industrielle du Dauphiné" [Anthropometric measurements of 2,000 children in an industrial city in the Province of Dauphine]. *Archives de médecine des enfants* [Paris], vol. 22 (1919), pp. 311–314.

Investigation of the body measurements of 1,010 boys and 1,055 girls, aged 4 to 14 years, was made in a French industrial city as a part of the work of the American Red Cross in France. Average weight, height, circumference of head and chest are given for every year of age and for boys and girls. For the purpose of comparison statistics for Paris obtained by other writers and American figures quoted from Holt are included. It was found that many children in Dauphine, notwithstanding their unsatisfactory physical condition and lack of proper care, were taller and heavier than either the American children or those in Paris.

71 ——— "Periodic variation in the rate of growth of infants, based upon the weight of 1,000 infants." *Arch. Pediat.* [New York], vol. 34 (1917), pp. 366–371.

A study of the seasonal variations in the rate of increase in weight of 1,000 infants attending the Washington University Dispensary in the first and second years of life. The data show that there is an acceleration from midsummer to late fall, a retardation in winter, and a greater retardation in spring and early summer. Gains in the first year of life are greater in summer and fall and in the record year best gains were in August. This periodic variation does not appear to be due to change of diet or heat. Three charts and many references are included.

72 **Boas, F.:** "Anthropological investigations in schools." *Pedagogical Seminary* [Worcester], vol. 1 (1891), pp. 225–228.

A résumé of investigations made to the date of writing, with references. No original observations.

73 ——— "Anthropometry of Central California." *Bulletin of the American Museum of Natural History* [New York], vol. 17, pt. 4 (1905), pp. 347–380.

The material for this study of Indians was collected by Dr. Roland B. Dixon in 1899 and 1900, in connection with the work of the Huntington California Expedition, and by Mr. V. K. Chestnut in 1892 and 1893, in connection with anthropometric investigations for the World's Columbian Exposition. Most of the measurements are of adult subjects, but a few measurements of children are included.

74 ——— Changes in Bodily Form of Descendants of Immigrants. U. S. Senate Document No. 208. Washington, 1911. 573 pp.

Report of an investigation for the United States Immigration Commission on the physical characteristics of immigrants. An extended and important work, giving the results of many measurements of foreign-born children, discussing the relations between time of immigration and change of type; rate of physiological development of foreign born and American born; probable cause of change in type; problem of heredity; phenomena of growth; effect of size of family. The points selected for inquiry were stature, weight, physiological development, length and width of head, width of face between the zygomatic arches, color of hair, eyes, and skin, to which were added notes on the descent of the individual measured and the record of his immigration. For com-

parison material was collected from the records of Newark Academy, N. J., as showing development of American families living in this country for several generations under most favorable conditions. Many tables and charts are given. It was found that bodily traits supposed to be most stable change under the influence of environment, and it is concluded that the adaptability of the immigrant seems greater than was supposed.

75 Boas, F.: "Growth." Monroe's Cyclopedia of Education, vol. 3, pp. 187–190. The Macmillan Co., New York, 1912.

A résumé of the scientific investigations on this subject to the date of writing. No new material.

76 ——— "On Dr. William Townsend Porter's investigations of the growth of the school children of St. Louis." *Science* [New York], new ser. vol. 1 (1895), pp. 225–230.

A critical examination of Doctor Porter's statistical methods. No original data are given.

77 ——— "Physical characteristics of the Indians of the North Pacific Coast." *American Anthropologist* [Washington], vol. 4 (1891), pp. 25–32.

With various measurements of adult Indians are included notes on the cephalic index of a small number of Indian children. Twelve boys near Puget Sound gave an average of 83.9; 13 from southern Oregon, 87.3.

78 ——— "The anthropometry of Porto Rico." *American Journal of Physical Anthropology* [Washington], vol. 3 (1920), pp. 247–253.

Report of observations taken in connection with the survey of Porto Rico by the New York Academy of Sciences. Measurements of school boys contain an element of uncertainty because of the difficulty of determining exact age, but on the whole show a growth curve lower than that of Mexican and Italian children; since the adults of Sicily and of Porto Rico have approximately the same stature, a retardation in growth of Porto Rican boys seems to be indicated. Eruption of permanent teeth, however, seems to be about one year in advance of normal. The cephalic index shows Porto Rican boys to be roundheaded. References.

79 ——— "The growth of children." *Science* [New York and Lancaster, Pa.], new ser. vol. 5 (1897), pp. 570–573.

Statistics gathered in 1891 and 1892 in the schools of Worcester, Mass. Full particulars will be found in the Report of the Commissioner, United States Bureau of Education, 1904, pp. 47–132. The author derives tables showing the average increase in stature in boys and girls in one-year periods from 5 to 16; also a table showing comparative rate of growth of short and tall children, in one-year periods, from 6 to 16. He concludes that young children grow more uniformly than older children; that short children are retarded in development throughout growth, but are likely to make this good by longer adolescence. From examination of the figures of Bowditch as to Boston children of differing nationalities, he concludes that differences in development in varying social classes are largely results of acceleration and retardation of growth and tend to disappear during the last years of growth.

80 ——— "The growth of first-born children." *Science* [New York], new ser. vol. 1 (1895), pp. 402–404.

Observations and measurements were made of school children in Toronto, Ontario, and Oakland, Calif., to determine whether the rate of growth varies with first-born and later-born children. Tables give height, weight, sex, age, number of cases, and order of birth. Number of cases observed not stated. Second-born children exceeded third-born and later-born children in height and weight. First-born children exceeded all later-born children in stature and weight. The difference prevailed from sixth year to adult life in females and from sixth year to fifteenth year in males.

81 ——— "The growth of Toronto children." *Report of the British Association for the Advancement of Science*, 1897 [London] (1898), pp. 443–449.

A report on a series of measurements of the school children of Toronto, Ontario, and Oakland, Calif., taken for the anthropological exhibit of the World's Columbian Exposition. Data were collected on stature without shoes, finger reach, sitting height, weight, age in years and months, place of birth, nationality of grandparents, place of birth and occupation of parents, numbers and ages of brothers and sisters, order of birth of child, and mental ability. Methods of measurement and number of cases (several thousand) are not given. Variability of series is computed and tables formulated showing statures of Toronto children as compared with American; differences between average statures of boys and statures of children of various orders of birth, and their mean errors; differences between average statures of girls and the statures of first-born girls, and their mean errors; comparative sizes of families in Oakland and Toronto; nationalities of grandparents of Toronto girls.

82 ——— "The influence of environment upon development." *Proceedings of the National Academy of Sciences* [Washington], vol. 6 (1920), pp. 489–493.

A general discussion with no detailed statistical work. From observation of about 120 pupils at Newark Academy and of several thousand Jewish children in differing social environments in New York the author concludes that environment plays an important part in determining bodily form.

83 **Boas, F.:** "The relation between civilization and stature." *Journal of Sociologic Medicine* [Easton, Pa.], vol. 18 (1917), pp. 397–401.

From a study of the findings of other authorities the author believes that stature is influenced by environment as well as by heredity and that stature increases with civilization.

84 ——— "Third report on the Indians of British Columbia." *Report of the Sixty-first Meeting of the British Association for the Advancement of Science*, 1891 [London] (1892), pp. 408–447.

This extended report deals largely with customs and physical characteristics of adult Indians but contains some anthropometric data on children.

85 ——— "Zur Anthropologie der nordamerikanischer Indianer" [The anthropology of the North American Indians]. *Zeitschrift für Ethnologie* [Berlin], vol. 27 (1895), pp. 366–411.

A report of the author's study of the bodily measurements of the North American Indians, mostly adults. It contains also a number of tables and curves including observations of individuals from 5 years of age.

86 ——— **and L. Farrand:** "Physical characteristics of the tribes of British Columbia." *Report of the British Association for the Advancement of Science*, 1898 [London] (1899), pp. 628–683.

This report, largely on adults, contains one table (p. 644) on the growth of Shushwap children from September, 1894, to June, 1897. Records of 16 children are given, measurements of each having been taken at the two dates.

87 ——— **and C. Wissler:** "Statistics of growth." Report of Commissioner, U. S. Bureau of Education, Washington, 1904, vol. 1, pp. 25–132.

A discussion of the methods of collecting and reducing observations on growth. Data consist of measurements of several thousand school children, in Worcester, Mass., in 1891 and 1892. Weights with clothing, without shoes, are given in pounds; all measures of length are in millimeters. Stature measured standing free, by rod with sliding arm; height, sitting on a level seat, whenever possible knees above level of seat. Head measurements taken with pointed calipers. Breadth of hand, from first to fourth finger across knuckles, hand flat. Pages 47–132 give graphic and tabulated summaries of these measurements. The authors conclude that peculiarities of growth are due to varying rapidity of development and that this variability conforms with the general variability in the rapidity of physiological development as deduced from observations on gestation, dentition, puberty, senility, and mental achievement. From these data and conclusions there is deduced a new table of growth giving the typical—not average—statures for each age.

88 **Bobbitt, J. F.:** "The growth of Philippine children." *Pedagogical Seminary* [Worcester], vol. 16 (1909), pp. 137–168.

A study of the measurements of 1,180 Filipino boys and 438 Filipino girls from 6 to 21 years of age as to height, span of arms, weight, vital capacity, and grip of right and left hands. Methods are the same as those described by Smedley in his report on Chicago children. There are many tables and growth curves, the latter based on median values. Comparisons are made with results of Smedley and Boas in studies of white children and of Misawa's measurements of Japanese. Additional study was made of 60 Chinese boys at the Tondo Chinese School in Manila and results compared with a study of 659 Chinese boys made by A. H. Crook at Queen's College, Hongkong.

89 **Bouček, B.:** "Vysledek opětného váženi školni mládeže za doby jedneho roku" [Results of repeated weighings of school children during one year.] *Časopis pro veřejné zdravotnictví* [Prague], vol. 2 (1900–1901), pp. 210–214.

An account of repeated weighings of 418 boy and 357 girl pupils in a small-town school in Bohemia. The children were weighed five times in one school year. In a table are given average weights of the children by sex and by classes at each weighing. No immediate effect of vacations was observed; a loss of weight was noticed during the spring and summer months; the greatest gain took place in the fall in the first six weeks after vacation; the increase during the period from December to February was much smaller than in the fall.

90 **Bordier and Fabre:** "Valeur de la surface spécifique chez les enfants nouveau-nés" [The "specific-surface" value for newborn infants]. *Bulletin de la Société d'obstétrique de Paris*, vol. 6 (1903), pp. 212–214.

A comparison is made of the specific surface (i. e., the relation of the body surface to body weight) of infants and adults. The weight, height, surface measurements and the specific surface values are given for 10 newborn infants, measured by the author with the Bordier instrument for measuring surface area. The surface area in relation to body weight is much greater for infants than for adults.

91 **Borrino, A.:** "Sulla diminuzione fisiologica del peso del neonato" [On the physiological loss of weight of the newborn infant]. *La Pediatria* [Naples], vol. 25 (1917), pp. 413–430.

An account of the author's study of 1,110 newborn normal infants at a clinic in Turin. The loss of weight after birth and of gain following the initial loss is studied, and several tables and extensive quotations are given. The

author concludes that (1) the physiological loss of weight of the newborn infant fluctuates between 100 and 300 grams and reaches its maximum on the second or third day of life, the amount of this loss depending only upon the infant's weight and not upon any other factor; (2) the physiological loss is caused, above all, by elimination of large quantities of water from the skin and lungs; (3) in a majority of breast-fed infants the weight starts to rise on the third or fourth day; (4) failure to gain weight or slow or irregular gain must be called to a physician's attention. Bibliography.

92 **Bouchaud, J. B.:** De la mort par inanition et études expérimentales sur la nutrition chez le nouveau-ne [On Death from Inanition and Experimental Studies on Nutrition of the Newborn]. Paris, no. 141, 1864. 134 pp.

A thesis (University of Paris) giving an account of author's investigation of weight of 54 newborn infants at a maternity home in Paris. The changes in weight and the amount of milk given during the first 9 or 10 days of life were studied. Twelve cases were studied during the first year of life. Conclusions: A loss of weight takes place within the first two days, amounting to 65 grams the first day and 35 grams the second; the original weight is regained within the week; the average weight is 3,250 grams at birth and 9,000 grams at the end of the year; the daily gain in weight is 20 to 25 grams during the first few months and 10 to 15 grams after the fifth month; the increase in length amounts to 19 centimeters in a year and is rapid at first but very slow at the end of the year. Two tables are given.

93 **Bouchut, E.:** "Du changement de nourrice" [Change of wet nurse]. *Gazette des hôpitaux civils et militaires* [Paris], vol. 47 (1874), pp. 617–620.

The initial loss of weight and the monthly changes in weight, together with food requirements, are given for an infant during the first year.

94 **Boulton, Percy:** "Some anthropometrical observations." *Brit. M. J.* [London], vol. 1 (1876), pp. 280–282.

The author gives tables of age, height, weight, and rate of increase in weight per inch of total height from birth to height of 7 feet. Methods of derivation are not fully described.

95 **Bowditch, H. P.:** "The growth of children." Eighth Annual Report State Board of Health, Massachusetts, vol. 8 (1877), pp. 273–323. Boston.

A report of measurement of 24,500 children in public and private schools of Boston. The survey extended over one year (1875–76), data having been secured by teachers under superintendence of principals. Heights were taken without shoes; weights with clothing, and allowance for clothing estimated; birthplace of subjects, nationality and occupation of parents, and color (white, black, or mulatto) were noted. Average heights and weights for different ages and nationalities were calculated. The author found: (1) Boys are heavier and taller than girls to age 11, when for two or three years this condition is reversed; (2) children of American-born parents are taller and heavier than those of foreign-born parents; (3) pupils in selected (private) schools are superior in height and weight to public-school children and to English boys of nonlaboring classes; (4) below 58 inches boys are heavier than girls in proportion to height; above 58 inches the reverse is the case. Many tables and graphs.

96 ——— "The growth of children, studied by Galton's method of percentile grades." Twenty-second Annual Report of the State Board of Health of Massachusetts, (1891), pp. 479–522. Boston.

The author explains Galton's method of percentile grades and arranges statistical data on about 24,000 school boys and girls of Boston in 12 tables giving heights and weights of boys and girls of all nationalities, from 5 to 18 years, in inches and centimeters, and in pounds and kilograms, with 11 percentile grades from 5 per cent to 95 per cent and averages. He rearranges the same material in curves, adding a comparison of the percentile rank of Italian children based on observations of Pagliani, and of Russian factory children, based on observations of Emilmann, with Boston children. He concludes that maximum yearly growth is greater in boys than girls but occurs two or three years later in boys; that large children make their most rapid growth earlier than small ones; that the period of accelerated growth in large boys differs from that in small boys rather in duration than in intensity; that the retarded-growth period occurs in boys at about 11 years and in girls at about 9; and that during the period of female superiority height is more marked in the lower and weight in the higher percentile grades. He comments on the fact that children of American parentage in the public schools are usually larger than those of other nationalities.

97 **Boyd, Robert:** "Tables of the weights of the human body and internal organs in the sane and insane of both sexes at various ages, arranged from 2,614 post-mortem examinations." *Philosophical Transactions of the Royal Society of London*, vol. 151, pt. 1 (1861), pp. 241–266.

Tables give age, sex, body weight, height, weight of cerebrum, cerebellum, pons, and medulla, encephalon, lungs, heart, thymus, stomach, liver, spleen, pancreas, kidneys, renal capsule, ureters. Assigned causes of death are indicated.

98 **Bradford, E. H.:** "The effect of recumbency on the length of the spine." *Bost. M. & S. J.*, vol. 109 (1883), pp. 245–246.

The author calls attention to the fact that lying down immediately increases the length of the body and substantiates his statement by measurements of 11 individuals, aged 3½ to 40 years, measured erect and in dorsal recumbency. The method of measurement is not given.

99 **Brenton, Helen:** "Climate and race as factors influencing the weight of the newborn." *American Journal of Physical Anthropology* [Washington], vol. 5 (1922), pp 237–249.

Data for this study were obtained from the birth records of about 2,000 Minneapolis infants as given in the obstetrical charts of three hospitals, for the years 1915 to 1919. Statistical methods are described and illustrative charts presented, with many references to the work of other investigators. The author found that temperature has little if any influence on birth weight, and that there is no direct seasonal variation in the weight of the newborn. Children of American-born parents showed higher birth weights than those of foreign born; figures from observers in Europe showed higher birth weights than those of first generation American-born children of the same nationalities.

100 **Breslau:** "Über die Veränderung im Gewichte der Neugebornen" [Variations in weight in the newborn]. *Denkschrift der Medizinisch-Chirurgischen Gesellschaft des Kantons* [Zurich] (1860), pp. 111–118.

Study of weights of 100 normal newborn children at a maternity hospital in Zurich immediately after birth and again at the time of discharge from the hospital, which took place on the average about 10 days after birth. Data presented by sex and method of feeding. As a rule a decrease was found in the weight of the newborn amounting on the average to one-fifteenth of the weight of the body.

101 **Broca, Paul:** Mémoires d'anthropologie (Memoirs of Anthropology). C. Reinwald et Cie., Paris, 1871. 3 vols.

The collected writings of the author, arranged by subject but giving dates of publication so that the reader may trace the progress of the science of anthropology in France.

102 **Broman, Ivar:** Normale und abnorme Entwicklung des Menschen [Normal and Abnormal Development of the Human Being]. Verlag von J. F. Bergmann, Wiesbaden, 1911. 808 pp.

Pages 153 to 167 are devoted to post-embryonic development of the human form in three periods: Neutral childhood (birth to 7 years), bisexual childhood (8 to 15 or 17 years), and youth (16 or 18 to 20, females developing earlier). Tables are given on these stages, including one compiled from Biedert, Monti, Stratz, and Hochsinger on food, weight, length, and cranial circumference of the newborn. Six hundred and forty-two cuts and eight plates.

103 **Brotzu, Giuseppe:** "Indagini antropometriche sugli allievi delle scuole all' aperto di Sienna" [Anthropometrical studies of pupils in the open-air schools in the city of Siena]. *Igiene della scuola* [Genoa], vol. 15 (1924), pp. 169–177; 193–205; 217–223.

Anthropometrical studies of 257 children in four open-air schools in the city of Sienna, boys and girls in nearly equal numbers. Each child was examined twice, the second time after an interval of five to six months. The author gives in tables by sex for each year of age the height, weight, Rohrer's index, chest circumference, bisachromial diameter, vital capacity, muscular force, and hemoglobin content as found in the first examination. This is followed by an account of the differences found by him in the same children six months later. He concludes that the children, who were found underdeveloped at the time of the first examination, reached a normal condition after a six-month stay in the open-air schools.

104 **Broudic, Louis:** "Contribution à l'étude de la progression du poids du nourrisson au cours de la première année" [Contribution to the study of the gain in weight of the nursling during the first year]. *Nourrisson* [Paris], vol. 7 (1919), pp. 15–22.

Basing his study on records of 300 infants at a maternity institution in Paris, varying numbers of whom were weighed at frequent intervals during the first year of life, the author finds that the average infant at birth weighs 3,280 grams; at 5 months, 6,250 grams; at 6 months, 6,710 grams; and at 1 year, 8,770 grams; that the gain in weight is much more rapid in the first than in the second half year of life; that the normal curve of weight increase has many irregularities.

105 **Brüning, H.:** "Zur Frage der Kriegsneugeborenen" [Status of infants born during the war]. *Deutsche Med. Wchnschr.* [Leipzig], vol. 44 (1918), p. 581.

Whereas Keltner, in *Zeitschrift für Säuglingsschutz*, 1916, volume 2, contends that infants born during the war are inferior, Hofmann in 1918 found from comparing material in a Rostock maternity clinic for the period January 1, 1915, to June 30, 1917, with the same for the period January 1, 1912, to June 30, 1914, that there had been no decrease of weight in such infants nor increase of defective children, but that the loss of weight following birth was not regained so rapidly as with pre-war infants.

106 **Brünniche, A.:** "Et Bidrag til Bedömmelsen af Börns Legemsudvikling" [A contribution to the determination of the physical development of children]. *Bibliothek for Laeger* [Copenhagen], ser. 5, vol. 11 (1865), pp. 361–384.

To secure a basis of comparison for the physical condition of children coming under his care the writer collected data on the children who came to the children's hospital in Copenhagen. Measurements of height, weight, and circumference of head and chest were taken for more than 300 children 2 to 8 years of age. Three tables show the measurements mentioned.

107 **Budin, P.:** Le nourrisson; alimentation et hygiène, enfants débiles, enfants nés à terme; leçons cliniques [The Nursling; Feeding and Hygiene of Premature and Full-term Infants; Clinical Lessons]. O. Doin, Paris, 1900. 394 pp. Translation by W. J. Maloney. The Caxton Publishing Co., London, 1907. 198 pp.

A general treatise containing many individual case histories with charts of growth and development.

108 ——— and **P. Planchon:** "Note sur l'alimentation des enfants" [Note on the feeding of children]. *Pédiatrie pratique* [Lillie], vol. 2 (1903–4), pp. 13–21.

A record of age, weight, and amount of food taken by 129 infants cared for at a children's clinic.

109 **Bürgers:** "Messungen von Düsseldorfer Volksschulkindern" [Measurements of public-school children of Dusseldorf]. *Archiv für Hygiene* [Munich and Berlin], vol. 94 (1924), pp. 276–283.

The author weighed and measured 2,643 children, boys and girls in nearly equal numbers, 6 to 8 years old, pupils in the public schools of Dusseldorf. His figures and similar data for 14 other cities he gives in two tables, arranging the height and weight by sex and for each six months of age. Most of the article consists of a discussion of the data presented in the tables.

110 **Burgerstein, L.:** "Untersuchung der Schüler und Schülerinnen in Kristiania" [Examination of public-school boys and girls in Christiania]. *Zeitschrift für Schulgesundheitspflege* [Leipzig], vol. 34 (1921), pp. 11–12.

An account of the measurement and weighing of 30,000 school children of Christiania, Norway. The children were divided for every year of age into three groups according to weight; this method of studying the children's physical condition the author considers much superior to the usual designations such as "state of nutrition," "development," "good," "medium," and "bad."

111 **Burk, Frederic:** "Growth of children in height and weight." *American Journal of Psychology* [Worcester], vol. 9 (1898), pp. 253–326.

The salient facts from studies previously made of the physical and mental development of children during the years usually spent in common schools. Extensive bibliography. No original observations.

112 **Burtscher, Hugo:** "Das Wachsthum der Extremitäten beim Menschen und bei Säugethieren vor der Geburt" [Growth of limbs of men and mammals before birth]. *Zeitschrift für Anatomie und Entwickelungsgeschichte* [Leipzig], vol. 2 (1876–77), pp. 357–374.

To investigate the growth of limbs of human beings and other mammals the author measured whole limbs and parts of limbs of the fetus, comparing results with measurements of the adult made by Professor Alby. Sex was noted, and data arranged according to size, not age. For human beings nine tables are given showing absolute length of limbs, relative length in percentages of body length, dimensions of parts of hand and foot in percentages of body length, length of upper limbs as compared with lower, relative length of fingers, etc., and the conclusions are drawn that hand and foot grow more rapidly than arm and leg before birth and less rapidly after birth; that the middle finger and big toe are relatively longer before birth than after; that in the early fetus the upper and lower limbs are the same length, but the lower limbs become longer with development; that the thumb grows relatively shorter; that there is an interesting variation between ring finger and forefinger. He concludes that the law of growth for the extremities of human beings and other mammals is probably the same but that further study should be made before definite conclusions can be formulated.

113 **Burtseff, P. A.:** "K voprosu o fizicheskom razvitii vospitannikov morskovo uchilishcha" [Physical development of the cadets of the naval academy]. *Medizinskiia pribavlieniia k morskomu sborniku* [St. Petersburg], 1886, pp. 112–132; 173–190.

After discussing the works of several investigators on the physical development of school boys author gives an account of his own study of 954 Naval Academy pupils ranging in age from 14 to 21 years, of whom 1,923 measurements were made. Average weight, height, and chest circumference, annual increase in these measurements, and periods of greatest development are given, and data

are compared with those obtained by 11 other writers, Russian and foreign. The author concludes that his findings agree with those of the other investigators.

114 Cadre, Maxime: Étude sur les modifications du poids, de la taille et de la suture sagittale chez le nouveau-né (dans les 9 premiers jours) [A Study of the Modifications of Weight, Stature, and the Sagittal Suture of the Newborn during the First Nine Days]. Paris, no. 83, 1910. 120 pp.

Thesis for medical degree (University of Paris). The original work consists of observations of the condition of the sagittal suture of 203 infants, from birth to 9 days of age, with detailed accounts of 42 cases, and length and weight of 209 infants, measured at birth and on the fifth and the ninth day. The author found overlapping of the sagittal suture at birth most frequent among the infants of primiparæ; length at birth most frequently found was 49 centimeters. Bibliography.

115 Calvary, Martin: "Die Bedeutung des Zuckers in der Säuglingsernährung" [Significance of sugar in infant feeding]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 10 (1913), pp. 699–725.

The author presents weight curves for nine infants whose digestion of sugar was studied. Bibliography.

116 Camerer, W.: "Beiträge zur Physiologie des Säuglings" [Data on physiology of the infant]. *Zeitschrift für Biologie* [Munich and Leipzig], new ser. 15, vol. 33 (1896), pp. 521–534.

A history of two children observed by the author. For one, a normal breast fed infant, amount of food, progress of weight, and amount of insensible perspiration for every day of the first 113 days of life, and brief history of the next seven weeks are given. At the end of 162 days the child weighed 8,020 grams. For the other, an underweight, premature, artificially fed child, the quantity and chemical composition of the food and the weight every two or three weeks for the first 75 weeks of life are given. At the end of the 75 weeks the child weighed 6,700 grams. Author found that the artificially fed infant was overfed at some periods in spite of the great care with which his food was selected. Overfeeding of artificially fed infants he considers usual.

117 ——— "Das Gewichts- und Längenwachstum des Menschen, insbesondere im 1. Lebensjahr" [The growth in weight and height of the human being, particularly in the first year of life]. *Jahrb. f. Kinderh.* [Berlin], vol. 53 (1901), pp. 381–446.

Account of weights and heights of 283 children in well-to-do families of Berlin in the first 10 years of life, with special emphasis on those under 1 year old. The weights for the latter are given for each week of life according to sex, method of feeding, and weight at birth. Data as to the eruption of teeth are arranged in the same way. For the children between the second and eighth years of age the average weights are given for each month of life by sex and for both sexes combined. The height is given for each week of age for all children under 1 year old; for each month for children over 1 but under 2 years old, and for each year for those over 2 years old. A large number of tables are given, but no general averages nor conclusions.

118 ——— "Gewichtszunahme von 21 Kindern im ersten Lebensjahre" [Increase in weight of 21 children in the first year of life]. *Jahrb. f. Kinderh.* [Liepzig], new ser. vol. 18 (1882), pp. 254–264.

History of development of 21 children in the first year of life. Author gives separately for each child sex, number of previous births by the mother, age of parents, method of feeding, and history of child's physical development during the first year of life. The tables given by the author refer to each case separately; there are no general conclusions.

119 ——— "Untersuchungen über Massenwachstum and Längenwachstum der Kinder" [Investigations on the increase in weight and height of children]. *Jahrb. f. Kinderh.* [Leipzig], vol. 36 (1893), pp. 249–293.

A study of the weights and heights of 116 persons varying from newborn infants to men and women 20 years old. The weights of children under 1 year were studied for the entire year and the figures given for every week; the weights and heights of the older children are given for various periods. About three-fourths of these cases (exact number not available) are from original investigations; the others were taken from other writers.

120 Camerer, W., Jr.: "Gewichts- und Längenwachstum der Kinder" [Increase in the weight and height of children]. *Medizinisches Correspondenzblatt des Würtembergischen Ärztlichen Landesvereins* [Stuttgart], vol. 75 (1905), pp. 454–459.

From other students' statistics and a few personal observations the author gives two tables, one on increase in weight and one on increase in height, of boys and girls separately, from 1 to 18 years of age. He enumerates various phenomena of absolute and relative growth, such as regular fluctuations in weight and height during the day and the year, the periods of accelerated growth, the effects of sex, occupation, and material prosperity.

121 **Camerer, W., Jr.:** "Gewichts- und Längenwachstum der Kinder" [Children's growth in weight and height]. Pfaundler und Schlossmann: Handbuch der Kinderheilkunde, vol. 1, pp. 232–247. Leipzig, 1910.

The author notes variations in length and weight due to time of day and year, state of nutrition, and time spent in bed and discusses the advantages and disadvantages of the generalizing and individualizing methods in statistics. He describes the general laws of growth, first in weight and then in height, and discusses initial loss of weight after birth, the difference produced by natural and artificial feeding, the long-continued effect of low weight at birth, the superiority in weight of boys over girls except when the earlier puberty of girls gives them the advantage, and the cessation of physiological growth at 16 for girls and 19 for boys. The length of boys at birth he puts at 49 centimeters and of girls at 48 centimeters. He calls attention to the periods of most rapid growth—the first year of life and puberty. Pubertal growth in length begins at 12 in girls and 13 in boys. Three tables give weights of breast-fed and artificially-fed infants and weights and lengths of children from 1 to 18 years of age. The figures are based chiefly on the elder Camerer's observations. Many details of growth are illustrated in 13 graphs.

122 ——— "Gewichts- und Längenwachstum der Kinder, insbesondere solcher im ersten Lebensjahre" [Growth in weight and height of children, especially up to 1 year of age]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vols. 14–16 (1897–99), pp. 1–9.

Using data collected by his father and by Vierordt concerning 250 boys and girls, most of them infants, the author compiles tables of weights of breast-fed and artificially-fed infants up to 1 year of age; also tables of heights and weights of children up to 6 years and up to 19 years of age. Boys grow least from 4 to 12 years of age and girls from 6 to 10. The former have concluded rapid growth in height by 17 and the latter by 14.

123 ——— "Gewichts- und Längenwachstum der Kinder, insbesondere solcher im 1. Lebensjahre" [Growth in weight and height of children, especially in their first year of life]. *Wiener Klinische Rundschau*, vol. 14 (1900), pp. 28–30.

Account of weights of 250 children. Author arranges the weights for each week of the first year of life according to the method of feeding and the initial weight and concludes that the weight of the first year of life is affected not so much by the method of feeding as by the initial weight. He also gives tables showing the development in height of 12 persons for each year of life during the first 19 years.

124 **Camescasse, J. E. L.:** "Étude statistique sur l'évolution du poids des enfants de Paris entre quatre ans et quinze ans" [Statistical study on evolution of weight of Parisian children between 4 and 15 years of age]. *Archives de médecine des enfants* [Paris], vol. 21 (1918), pp. 113–149.

Weights and data are given on the growth of 2,571 boys and 2,506 girls sent from Paris to Forges-les-Bains because of poor health. Weights were taken every four weeks. Amount of clothing worn at time of weighing is stated. Data were accumulated between 1904 and 1914. The author found girls lighter than boys from birth to 11 years of age, heavier from 12 to 15 years, and lighter again after 16 years.

125 **Carlier, G.:** "Recherches anthropométriques sur la croissance; influence de l'hygiène et des exercices physiques" [Anthropometric researches in growth; the influence of hygiene and physical exercises]. *Mémoires de la Société d'anthropologie de Paris*, ser. 2, vol. 4 (1889), pp. 265–346.

Data were obtained by the systematic weighing and measuring of boys in the military schools at Montreuil and Saint-Hippolyte at six-month intervals in the years 1886 to 1890—a total of 10,497 observations. Weights and measurements were taken without clothing. Results are tabulated to show arithmetical average of height, weight, and chest circumference, ages 13 to 18, progress of growth, and relationships between the measures taken. Extended discussion of the influence of puberty, race, sex, surroundings, and school training, climate, seasons, and sickness is given. Author finds that environment and seasons affect growth and that there are periodic variations in growth rate.

126 **Carstadt, Fritz:** Über das Wachstum der Knaben vom 6 bis zum 16 Lebensjahre" [Growth of boys between 6 and 16]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 1 (1888), pp. 65–69.

This principal of a Breslau school containing 600 boys from 6 to 16 years old measured their height without shoes on the 1st of April, July, October, and January of two years. The resulting 4,274 measurements he put into two tables according to age, one of heights and annual and semiannual growth in height and the other of maximum and minimum heights, with the difference between them. The annual increase in height was about 4.8 centimeters to the age of 12, after which it kept increasing to 7.5 at 15. Variations in height at a given age increase to age of 15.

127 **Cassel, J., and H. Kamnitzer:** "Versuche mit Albulactin bei künstlich genährten Säuglingen" [Tests with albulactin on artificially fed infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 49 (1908–9), pp. 168–188.

With a case history and curve for each of nine infants the authors demonstrate the successful use of albulactin as a food. The experimentation was conducted in the children's asylum, Berlin-Wilmersdorf, from September, 1907, to March, 1908.

128 **Cassinelli, L. R.:** "Desarollo fisico y psiquico del niño en edad escolar (6 a 14 años)" [Physical and mental development of the school child between 6 and 14 years of age]. *La Semana médica* [Buenos Aires], vol. 24, pt. 2 (1917), pp. 437–441.

A table based on investigation of 10,000 school children in Buenos Aires gives their average weight, height, bisacromial diameter, muscular force, chest expansion, and anterio-posterior diameter for each year of age and separately for the sexes. Part of the article takes up the mental development of a child from 6 years until the age of 14.

129 **Castell, August:** Über den Einfluss des Alters der Mutter auf Gewicht und Länge des neugeborenen Kindes [Effect of Age of Mother on Weight and Length of Newborn Child]. Königsberg, 1869. 31 pp.

An inaugural dissertation in which the author incorporates in his tables data on a great number of births in 1866, 1867, and 1868. He shows for comparison tables of Duncan and Hecker and discusses their theories, that weight of infants depends primarily on age of mother (Duncan) and on number of pregnancies (Hecker). Author believes that unprejudiced survey of tables will substantiate Hecker's view.

130 **Castellanos, I.:** "Estudio antropologico de las asiladas en la Escuela Reformatoria de Aldecoa" [Anthropological study of girl inmates of the reformatory school at Aldecoa]. *La Reforma Social* [Habana], vol. 3 (1915), pp. 150–163.

An account of anthropological investigations made by the author of 56 girls of 10 to 23 years, inmates of a reformatory near Habana. The author deals mainly with the physical and mental abnormalities of these persons and refers only incidentally to their height, cephalic index, and facial index.

131 ——— "Estudio antropologico de los asilados en el Correccional de Guanajay" [Anthropological study of boy inmates of the correctional institution of Guanajay, Cuba.] *La Reforma Social* [Habana], vol. 4 (1915), pp. 17–40.

Anthropological study of 101 boys from 10 to 19 years old, inmates of a correctional institution in Cuba. Tables are given for age, height, race, maximum anterio-posterior diameter, iniac diameter, maximum transverse diameter, cephalic index, horizontal circumference, inio-frontal curve, facial angle, and force of right and left hand.

132 **Cattell, J. McKeen, and Livingston Farrand:** "Physical and mental measurements of the students of Columbia University." *Psychological Review* [New York and London], vol. 3 (1896), pp. 618–648.

An account of measurements and tests made on students of Columbia University in 1894–95. The paper is considered by the authors rather a description and discussion of methods than an important contribution to knowledge of the subject, but results (averages) of 100 cases, average age 18, are given. The tests were largely psychological but include a few physical measurements.

133 **Chaillé, Stanford E.:** "Infants, their chronological progress." *New Orleans Medical and Surgical Journal*, new ser. vol. 14 (1887), pp. 893–912.

A general discussion of the physical, mental, and moral development of infants.

134 **Chalmers, A. K.:** "Preliminary notes of an inquiry into the physique of Glasgow school children." *Journal of the Royal Sanitary Institute* [London], vol. 25 (1905), pp. 903–913.

Report of examination of 750 children, 150 of whom were of Jewish parentage, in four districts in Glasgow, one where the death rate was high, two where it was lower, and one where it was still lower. Ages were 6 to 14. Methods of measurements are not given. The results are shown in tables (Kay's) of height, weight, mental capacity, condition of nutrition, teeth, etc.

135 **Channon, Harold John, and Geoffrey Arthur Harrison:** "The chemical nature of the subcutaneous fat in the normal and sclerematous infant." *Biochemical Journal* [Cambridge], vol. 20 (1926), pp. 84–92.

The analytical constants of the subcutaneous fat of eight infants, normal for the purposes of this study, were determined by methods which are fully described. The iodine value was found to be lowest at birth, increasing to the adult value from the eighth to the twelfth month of life. There was a corresponding decrease of melting point with age. The saponification value was almost constant at 200. Tables and references.

136 **Chapin, H. D.:** "A plan of infantile measurements." *Medical Record* [New York], vol. 46 (1894), pp. 649–651.

The author presents a plan for 10 cranial measurements, girth of abdomen and chest, and weight and length in infants. He has measured 98 cases from birth to 2 years of age and gives the data for them in tabular form. The prominence of the parietal bosses in infancy the author attributes to the rapid development of the sensory-motor areas. He considers altered relation in the chest and abdominal circumferences evidence of the presence and extent of rachitis.

137 **Charles:** "Viabilité des nouveau-nés, à terme et avant terme; accouchement spontané et provoqué" [Viability of the newborn, at and before term. Delivery spontaneous and induced]. *Nouvelles archives d'obstétrique et de gynécologie* [Paris], vol. 8 (1893), pp. 404–417.

With discussion of methods of determining the age of the fetus and methods of artificial delivery the author includes data on infants, collected at the Maternity Hospital at Liege during nine years, the total number of births considered being 3,714. An analysis shows the proportion of these infants who survived and ages of the fetuses at birth.

138 **Charrin and Nobécourt:** "Influence des maladies de la mère sur le développement de l'enfant" [Influence of sickness in the mother on the development of the child]. *Comptes rendus des séances et mémoires de la Société de biologie* [Paris], ser. 10, vol. 2 (1895), pp. 703–704.

Observation of the growth rate of five infants, two with healthy mothers and three with mothers in poor health. The daily increase in weight of those with healthy mothers was found to be five or six times that of the others.

139 **Children's Bureau, U. S. Department of Labor:** Statures and Weights of Children under Six Years of Age, by Robert M. Woodbury. Publication No. 87. Washington, 1921. 117 pp.

A detailed report of the results of weighing and measuring 172,000 children in the United States. All but 1,612 of these children were under 6 years of age, and all were white except 4,976. Many tables are given and comparisons made of heights and weights of city and country children, children of native and foreign parentage, and negro and white children. Average weights and heights are given for white boys and white girls, by months. The relation of rickets, malnutrition, heart abnormality, carious teeth, diseased or enlarged tonsils, and adenoids to defects in stature and weight is discussed, and tables show the average weights and heights for these children, compared with normal children.

140 **Chose, Efim:** Über den Einfluss durchgemachter Rachitis auf die Körpermasse von Schulkindern [Effect of Rickets on Physique of School Children]. Munich, 1914. 28 pp.

This dissertation (University of Munich), after stating opinions of other students on the crippling and stunting effects of rickets, introduces the author's own investigation on the weight and height of rachitic boys and girls from 5½ to 7½ years of age in three public schools of Munich. Eight tables present actual weights and heights of such children. Averages calculated from this material, and the Riedel and Skibinsky figures for normal children, are put into tables, interpreted through the Pirquet-Index and Livi-Index, represented by diagrams and variation polygons. The author found that rachitic children evidence practically no inferiority in height and very little in weight. Even this inferiority the author believes due not to rickets but to other ill effects of the same factors that caused the rickets.

141 **Christopher, W. S.:** "Measurements of Chicago school children." *J. A. M. A.* [Chicago], vol 35 (1900), pp. 618–623; 683–687; 918.

A report of measurements of 5,636 children (2,537 boys and 3,099 girls) in Chicago public schools, made under the direction of the author, the investigation extending from March, 1899, to May, 1900. Data were secured as to height (allowance for heels), weight (correction for clothing), strength of grip, vital capacity, fatigue and endurance, hearing, and vision. Tables of norms for boys and girls. Charts and curves. Author found that his observations confirmed the conclusions of Dr. Porter that mediocrity of mind is associated with mediocrity of physique.

Clark, Taliaferro: Heights and Weights of School Children. *See* U. S. Public Health Service.

——— The Physical Care of Rural School Children. *See* U. S. Public Health Service.

——— **Edgar Sydenstricker, and Selwyn D. Collins:** Heights and Weights of School Children. *See* U. S. Public Health Service.

142 **Coerper, Carl:** "Die Habitusformen des Schulalters" [Habitus in school age]. *Ztschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 144–157.

Author discusses at length "habitus" of school children. He considers the pathological types, Stratz's, Sigaud's, and Kretzschmer's, and their value in diagnosis. Giving his technique in measuring the child he presents two tables on types in 6,000 boys and girls of ages from 8 to 13.

143 **Cohn, Moritz:** "Die Kenntnis der Körperlänge, ein Massstab für die normale Entwicklung der Schulkinder" [Science of height; a standard for the normal development of school children]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 25 (1912), pp. 693–696.

Measurements of 90 healthy, normal boys are given. A table, arranged for 11 heights, shows average, minimum, and maximum age and weight and number of children measured in each case. The ages range from 6 years 7 months to 13 years 11½ months.

144 **Collier, W. A.:** "Das Geburtsgewicht der Unehelichen und seine Bedeutung" [The weight at birth of illegitimate children and its significance]. *Klinische Wochenschrift* [Berlin and Munich], vol. 1, pt. 2 (1922), pp. 2051–2052.

For the purpose of determining the differences in the weight of legitimate and illegitimate newborn infants the author studied the weight at birth of 1,982 infants born alive in the city hospital of Frankfurt on the Main. In three tables he presents the weights according to legitimacy, order of birth, and sex. There was practically no difference between the legitimate and illegitimate first-born children; legitimate second-born children were heavier than illegitimate; this, in the author's opinion, was due to general social conditions and to the mother's environment. The prevailing viewpoint that illegitimate children are generally lighter in weight than those of legitimate birth is attributed by the author to the fact that first-born are most frequent among them.

145 **Combe, A.:** "Körperlänge und Wachstum der Volksschulkinder in Lausanne" [Height and growth of public-school children in Lausanne]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 9 (1896), pp. 569–589.

Measurements of height and weight of 1,000 girls and 1,000 boys in the first seven years of the Lausanne public schools are given, and comparisons are made with findings of other workers. Attention is called to periods of unusual increases in weight and height and to the importance of the nationality factor in relation to height and weight.

146 **Cordeiro, F. J. B.:** "A contribution to anthropometry." *New York M. J.*, vol. 45 (1887), pp. 484–487.

As a contribution to the study of the growth curve between the ages of 14 and 18 the author gives figures and curves derived from measurement of over 5,000 candidates for the naval service on board the U. S. S. *Minnesota*. Subjects were nude, height registered to the nearest eighth of an inch, pounds to the nearest quarter. The results are compared with the work of Roberts, Bowditch, and Quetelet. From study of numerous investigations the author constructs what he believes to be the normal curves of length and weight for all living things, from the beginning of life to old age.

147 **Cramer, H.:** "Zur Diätetik des Frühgeborenen" [Dietetics of the premature child]. *Monatsschrift für Kinderheilkunde* [Leipzig and Vienna], vol. 6 (1907–8), pp. 489–496.

In a study of the feeding of premature infants the author gives data on weight changes, amounts of nourishment taken, etc., for three healthy, first-born infants, born at 7, 8, and 9 months of gestation, respectively.

148 **Crampton, C. W.:** "Physiological age, a fundamental principle." *American Physical Education Review* [Springfield], vol. 13 (1908), pp. 141–154; 214–227; 268–283; 345–358.

Data for this paper were taken from records made by the writer or under his immediate supervision of New York City high-school boys during the years 1901 to 1906. All tables are based upon a large number of observations, often in the thousands. On this evidence the writer believes that all observations of the adolescent—anthropological, medical, educational, or social—must hereafter rest upon classification as prepubescent or postpubescent and not upon chronological age. Following careful definition of the terms involved he constructs curves showing the expectancy of pubescence and degree of postpubescence for half-year groups from 12¼ to 18¼ years of age; derives an empirical percentage for each half year and compares with it the values for children of German and American parentage derived from records of about 600 high-school children. Correlating weight, height, strength, and scholarship with pubescence, he finds postpubescents differing from prepubescents, both mentally and physically. He finds that growth rates are dependent upon pubescent periods and not upon age; that accelerations in weight, height, and strength occur at the same time; and that the more rapid the development the more rapid is the gain in weight, height, and strength. Concluding with a discussion of the significant features of life centering about puberty, he adds as appendixes an analysis of the racial constitution of the group studied; an investigation of elementary-school boys as to correlation between eruption of the teeth, and weight and height; a chart of various physiological epochs, founded upon Boas, and a table of preliminary observations as to correlation of weight, height, and first menstruation.

149 **Crum, Frederick S.:** "Anthropometric statistics of children—ages six to forty-eight months." *Publications of the American Statistical Association*, 1916–17 [Boston], new ser. vol. 15, no. 115 (1918), pp. 332–336.

From over 10,000 sets of measurements of babies at better babies' contests and baby health conferences the author compiled tables of average physical measurements (weight, height, circumference of head, chest, and abdomen, diameter of chest, length of arm and leg) for ages 6 to 48 months. These are here reproduced with a brief discussion.

150 **Curjel, D. F.:** "The weight at birth of infants in India." *Indian Journal of Medical Research* [Calcutta], vol. 8 (1920–21), pp. 363–365.

The author investigated the condition of development and nutrition as shown by weight of the normal Indian infant at birth. In various parts of India 1,849 infants were weighed by medical women, and for purposes of comparison weights at birth of 289 normal infants born in India of other than Indian parents were also collected. Results show that the average weight of Indian infants (6.5 pounds) compared favorably with that of infants of other parentage; that there is no appreciable difference in birth weight of Mussulmans, Hindus, and Indian Christians; that the early marriage age has no adverse effect on birth weight; that high mortality must be due largely to postnatal conditions.

151 **Curtiss, F. H.:** "Some investigations regarding loss in weight and gain in height during sleep." *American Physical Education Review* [Cambridge, Mass.], vol. 3 (1898), pp. 270–273.

A study of three college students, aged 17, 19, and 21, weighed nude in the evening and morning through a school year. A slight nocturnal loss in weight and a slight gain in height were found to occur.

152 **Daffner, Franz:** "Über Grösse, Gewicht, Kopf- und Brustumfang beim männlichen Individuum vom 13. bis 22. Lebensjahre, nebst vergleichender Angabe einiger Kopfmasse" [Height, weight, head and chest girth in the male from the thirteenth to the twenty-second year, with a comparative estimate of some head measuremnts]. *Archiv für Anthropologie* [Braunschweig], Supp. 15 (1885), pp. 121–126.

A table gives age, height, weight, circumference of head and chest of 180 Bavarian cadets from 13 to 20 years old and of 520 Bavarian soldiers 21 and 22 years old. Author's discussion includes maximal and minimal measurements and comparisons with infants and apes. He believes that brachycephalism represents a higher stage than dolichocephalism.

153 ——— "Vergleichende Untersuchungen über die Entwicklung der Körpergrösse und des Kopfumfanges" [Comparative investigations on the development of the size of the body and head]. *Archiv für Anthropologie* [Braunschweig], vol. 15 (1884), pp. 37–44.

Author gives figures for size of head and height for 426 boys and 344 girls from the time of birth to 6.4 years old and compares his findings with those of Hecker, who measured nearly 1,000 newborn infants.

154 **Danson, J. T.:** "Statistical observations relative to the growth of the human body (males) in height and weight, from eighteen to thirty years of age, as illustrated by the records of the borough gaol of Liverpool." *Journal of the Statistical Society of London* [London], vol. 25 (1862), pp. 20–26.

The author discusses Quetelet's observations and constructs tables of height and weight for ages 18 to 30 from measurements of prisoners who had been taken at the Liverpool jail, using groups of 100 for determining the average for the various ages.

155 ——— "Statistical observations on the growth of the human body (males) in height and weight, from 18 to 30 years of age, as illustrated by the records of the borough gaol of Liverpool." *Journal of the Statistical Society* [London], vol. 44 (1881), pp. 660–674.

The author obtained the material for this study from the measurements made at a Liverpool jail of prisoners committed in three two-year periods, 1857–58, 1867–68, and 1877–78. Measurements of 8,771 subjects are recorded in tabular form, showing average, maximum, and minimum heights and weights in each of the time periods, and number who attained the respective heights of 5 feet 5 inches, 5 feet 6 inches, and 5 feet 8 inches at each age in each period. The author reaches the conclusion that men in European countries do not reach physicial maturity until about 30 years of age.

156 **Davenport, C. B.:** Body-build and Its Inheritance. Carnegie Institution of Washington, Washington, 1923. 176 pp.

Examination of thousands of young men during the World War aroused the interest of the author in the extraordinary diversity of body build and in the factors which might be responsible for such variation. This exhaustive report embodies the results of his study not only of his own data but of much material contributed by other workers. It contains, in addition to the text, 53 tables, 53 text figures, and 9 plates.

157 **Davenport, C. B.:** "Human metamorphosis." *American Journal of Physical Anthropology* [Washington], vol. 9 (1926), pp. 205–232.

The author presents data in support of the view that in man growth of the body is not a continuous process but is the resultant of several growth-promoting internal stimuli acting at different times and upon different organs. To anthropometric material collected by many investigators he has added measurements made by himself and two assistants on boys and girls of all ages from 3 to 17, inmates of the Orphan Asylum of Brooklyn. The racial stock he describes as predominantly "Nordic." Fourteen growth curves and seven basal tables of stature and weight derived from this mass of material support the theory of discontinuous growth. References.

158 **Davidsohn, Heinrich:** "Die Wirkung der Aushungerung Deutschlands auf die Berliner Kinder mit besonderer Berücksichtigung der Waisenkinder der Stadt Berlin" [Effect of scarcity of food in Germany upon Berlin children, with special reference to orphans of city of Berlin]. *Ztschr. f. Kinderh.* [Berlin], vol. 21 (1919), pp. 349–407.

The author found the weight and height of 1,384 orphans between 2 and 14 years of age and compared his findings with those of Camerer and Rietz. Distinct retardation in height and weight as a result of the war was noted.

159 **Debierre:** "Le développement des membres du côté droit l'emporte-t-il originairement sur celui des membres du côté gauche?" [Is the development of the extremities of the right side originally superior to that of the left?] *Comptes rendus des séances et mémoires de la Société de biologie* [Paris], ser. 8, vol. 4 (1887), pp. 28–31.

The author weighed the extremities of 11 subjects less than 2 years old, 3 fetuses of 6 to 7 months, and 8 infants from birth to 2 years of age. Methods are exactly described. He concludes that there is no original difference in the dimensions of the two sides of the body and that the race is right-handed because of education and possibly hereditary influence.

160 **De Busk, B. W.:** "Height, weight, vital capacity, and retardation." *Pedagogical Seminary* [Worcester], vol. 20 (1913), pp. 89–92.

A study of 105 boys in the Colorado Teachers' College Training School, ages 7 to 16, inclusive, who were weighed (clothed) on gymnasium scales and measured with stadiometer, and whose vital capacity was tested with wet spirometer. Results were tabulated to show retardation or acceleration in school grades. On account of the small number studied, no definite conclusions are drawn, but it is suggested that retarded children are likely to be below the normal in height and weight; that vital capacity varies most from the norm; that the accelerated and normal show a higher vital capacity per pound than the retarded.

161 ——— "The vital index in development." *Pedagogical Seminary* [Worcester], vol. 24 (1917), pp. 1–18.

Data were obtained from the Colorado Teachers' College as to age, physiological age from the teeth, mental age, grade, height, weight, vital capacity, condition of teeth, tonsils, and nasal tract of 200 children (104 boys and 96 girls). Results of the investigation are compared with those of many others, and it is concluded that children of a given chronological age who have higher vital indexes are more mature and test mentally higher than those with lower vital indexes. Tables and bibliography are given.

162 **Dehio, Karl:** "Über fortlaufende Körperwägungen während der Dentitionsperiode" [Continuous weighing during dentition period]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 20 (1883), pp. 64–71.

From an examination of other authors' material and a long table compiled for him of weights taken about every week of a very healthy breast-fed boy from his fourteenth week to the seventieth, the author decides that dentition, even when it progresses normally, as in this case, affects the vegetative development of an infant's body; the coming of almost every tooth causes a loss of weight. Only the third and fourth incisors and last canine tooth were cut by the infant without a fluctuation in weight.

163 **Demoor, J.:** "La taille et le poids des élèves des écoles communales de Bruxelles pendant la guerre" [Stature and weight of pupils in the public schools of Brussels during the war]. *Bulletin de l'Académie royale de médecine de Belgique* [Brussels], ser. 4, vol. 29 (1919), pp. 37–118.

Following a résumé of studies on normal growth the author reports the result of an investigation based on annual measurements recorded by school authorities, of children 3 to 14 years of age during the years 1914 to 1918. Methods are described in detail. Tables show the development in weight and stature during the years of the war and various comparisons with established standards and with pre-war records. The author found that the development of Brussels children was retarded and modified slightly in the first two years of war, and still more in the two following years. Bibliography.

164 **Desfosses, P.:** "Proportions du corps des enfants" [Proportions of the bodies of children]. *Presse médicale* [Paris], vol. 16 (1908), pp. 185–187.

A brief general account of the changes in the relative proportions of the human body from birth to the time of maturity.

165 **Devine, Wm. H.:** "Comparative statistics on physical examinations of pupils of the Boston Public Schools from December 1, 1915, to March 1, 1920, and remarks, with especial reference to malnutrition." *Bost. M. & S. J.*, vol. 182 (1920), pp. 658–660.

A report of work done in Boston public schools to combat malnutrition. Statistical table is given showing that of 504,593 children weighed and measured by school nurses in Boston between 1915 and 1920, 10,430 showed malnutrition. Statistics quoted from New York, Cincinnati, Cleveland, Newark, Rochester, and Worcester show from 1.1 per cent to 5 per cent of the children to be malnourished.

166 **Dick, A.:** "Materiali k izsliedovaniu rosta, viesa, okruzhnosti grudi i zhizniennoi iemkosti lekhkikh dietskago i iunosheskago vozrastov" [Data on the investigation of height, weight, chest circumference, and vital capacity of lungs in childhood and adolescence]. *Voyenno-meditsinsky zhurnal* [St. Petersburg] (1883), pt. 146, pp. 223–302; 363–450.

Account of investigation made by author in St. Petersburg in 1876–1879 of the height, weight, chest circumference, and vital capacity of lungs of 1,153 children varying in age from 4 to 20 years, boys and girls in nearly equal numbers. Author reviews the literature and summarizes the findings of Quetelet, Liharzik, Zeising, Pagliani, and others. He gives the data mentioned in a large number of tables, by sex, separating the children in the asylums from the others. He analyzes at length the effects of sex, age, and social condition and discusses the reciprocal relation between height, weight, and the other findings. He also compares in detail his data with those obtained by other investigators and presents conclusions on the growth of children of school age, which on the whole agree with those drawn by other writers.

167 **Dickson, S. H.:** "Some additional statistics of height and weight." *Charleston Medical Journal and Review*, vol. 13 (1858), pp. 494–506.

Author continues observations of a previous article (Charleston Medical Journal and Review, 1857, vol. 12, pp. 607–613). Data procured by questioning 141 members (male) of a class in the Medical College of South Carolina as to weight, height, and lineage are compared with material similarly obtained by other investigators. Data were also obtained for 166 girls in South Carolina private schools. These data are compared with statistics of Quetelet, Forbes, Whewell, Horner, Cowell, Harrison, and Villermi, and the conclusion is reached that young men and women of the United States show no deterioration as compared with the parent stocks.

168 ——— "Statistics of height and weight." *American Journal of the Medical Sciences* [Philadelphia], new ser. vol. 52 (1866), pp. 373–380.

The author adds to statistical material previously published by him results of investigations of height, weight, nativity by States, and lineage of 286 young men in Jefferson Medical College, Philadelphia. Methods of measuring and of obtaining the data are not given. General comparisons are made with the figures of others for men of different countries.

169 **Dietrich, Henry:** "The food requirement of the breast-fed infant." *Arch. Pediat.* [New York], vol. 37 (1920), pp. 278–281.

In connection with statements on this subject, based on various authorities, the writer presents a chart showing the actual food intake and gain in weight of his own child from birth to the twenty-first week of age.

170 **Dluski Madame Bronislas:** Contribution à l'étude de l'allaitement maternel [A Contribution to the Study of Maternal Nursing]. Paris, no. 355, 1894. 118 pp.

Thesis for medical degree (University of Paris), which concerns largely the mother, but contains four chapters (pages 79 to 90) on the weight of infants. For 369 infants the average initial loss was 212 grams, the extreme limits being 10 and 700 grams. For 250 infants whom their mothers had never nursed the average loss was 221 grams; for 35 whose mothers had nursed them a little the average was 214 grams; for 84 whose mothers had nursed them more the average was 183 grams. Tables show the date of commencement of gain in weight of the same infants, and three chapters discuss the time when birth weight was regained, the average daily gain, and the time of the detachment of the umbilical cord. Bibliography.

171 **Dolgenkov, V. I.:** "O zhisniesposobnosti dietiei do pervago goda v zavisimosti ot vremeni ikh rozhdienia po miesazam goda" [Longevity of children in the first year of life in relation to the month of their birth]. *Vrachebnaya Gazeta* [St. Petersburg], vol. 9 (1902), p. 541.

Author analyzes records of births and infant deaths in a rural district of Russia for a period of two years to find the expectation of life of children born in different seasons. His results disprove the prevailing theory that peasant children conceived in the fall and winter, when the peasants' food supply is greater, live longer than those conceived in the season of harvesting, when the parents are exhausted by hard work. According to author, expectation of life of the children is affected by climate, mode of living, and many other conditions.

172 **Dovodchikoff, K. K.:** "Narodniia shkoli Romanov-Borisogliebskago ouiezda i ich ucheniki" [Public schools of Romanov-Borisoglieb district and their pupils]. *Vestnik obshtshestvennoy higieni, sudebnoy i prakticheskoy meditzini* [St. Petersburg], vol. 8, pt. 2 (1890), pp. 1–35.

The author noted in each case the height, weight, chest circumference, relation of height to weight, pulse, breathing, sight, and any pathological conditions found and gives in his article a part of the data obtained.

173 **Downes, Rupert M.:** "The interrelationship of some trunk measurements and their relation to stature." *Journal of Anatomy and Physiology* [London], vol. 48 (1914), pp. 299–314.

To determine the ratio between the interspinous and vertical trunk diameters in the human body, the author examined 201 subjects, of which 47 were male children and 53 female. Methods and apparatus are fully described and results tabulated. The vertical trunk diameter was found to be greater relatively to body height in female than in male children; the interspinous and intercristal diameters, relatively to trunk diameter and body height, greater in the male children than in female; the intertrochanteric diameter, relatively to body, greater in female children than in male; asymmetry present in more than 50 per cent of all subjects. Bibliography.

174 **Dubois, Maurice:** "Le poids et la taille des enfants de 6 à 17 ans à Liège en 1918" [The weight and stature of children from 6 to 17 years of age at Liege in 1918]. *Bulletin de l'Académie royale de médecine de Belgique* [Brussels], ser. 4, vol. 29 (1919), pp. 1568–1594.

To determine the effect of the war upon the stature and weight of the children of Liege the author selected from records of the medical examination of 15,000 children, the records of 1,827 boys and 2,460 girls 6 to 17 years of age, whom he felt to be representative of the average normal child population. Of these he classified about 1,350 as "well," about 2,350 as "ill," and the remainder as indeterminate in reference to health. Tables and curves of growth were constructed for each of these classes. Since his statistical methods differed from those of Quetelet, he had no standard for comparison with children in normal times. The retardation of growth in weight and stature of the children classified as ill is shown in comparison with the growth of healthy children in the same abnormal years.

175 **Duckworth, W. L. H.:** "Observations on 104 school children at Vori and at Palaikastro in Crete." *Report of the British Association for the Advancement of Science*, 1910 [London] (1911), pp. 237–251.

The author in 1903 measured and observed 59 boys and 25 girls at Vori in Crete and 20 schoolboys of corresponding age at Palaikastro, also in Crete. This paper records hair color, eye color, and cephalic and breadth index of head and compares these with measurements of 100 school children in Spain.

176 **Dudrewicz, L.:** "Pomiary antropologiczne dzieci Warshawskich" [Anthropological measurements of children in Warsaw]. *Zbiór Wiadomósci do antropologii krajowéj akademii umiejętności w Krakowie* [Krakow], vol. 6, pt. 2 (1882), pp. 3–23.

Original measurements in Warsaw of 3,138 children from 2 to 15 years, boys and girls in nearly equal numbers. Numerous tables give the average, minimum, and maximum height of the children for each year of age and the average amount of yearly growth, and color of skin, eyes, and hair; length, width, and diameter of head, cephalic index, width of forehead, length and width of face, and shape of nose.

177 **Dukes, C.:** "A record of the physical examination of 1,000 boys at their entrance on public-school life." *Lancet* [London], vol. 2 (1907), pp. 512–514.

An account of the form used in conducting examinations at Rugby of youths 13 to 15 years of age. Tables give by age the average and mean height and weight and the physical defects noted.

178 **Dumoutet:** "Contribution à l'étude du poids harmonique chez les enfants du deuxième age." [Contributions to the study of harmonic weights among children]. *Archives de médecine des enfants* [Paris], vol. 24 (1921), pp. 352–361.

By "harmonic weight" the author means the weight corresponding to the age which a child of a given height should have reached. Study of children, normal and abnormal, led him to the conclusion that there is a harmonic weight which every normal child can and should attain and that it is the necessary accompaniment of general physical and physiological well-being.

179 **Duncan, J. Matthews:** "On the weight and length of the newly-born child in relation to mother's age." *Edinburgh Medical Journal*, vol. 10, pt. 1 (1864), pp. 497–502.

The question is discussed whether or not primiparity affects dimensions of the newborn, as Hecker believes that he has proved. The author's observations involve 2,070 pregnancies and 2,087 infants in the Edinburgh Royal Maternity Hospital. Results are presented in five tables. Primiparous mothers

had children averaging 7.17 pounds in weight and 19.213 inches in length; the corresponding figures for children of multiparous mothers were 7.277 pounds and 19.202 inches. The data show that the infants' dimensions increase up to mothers' age of 25 to 29 and then decrease. Therefore the author believes that the age of the mother, not the order of pregnancy, is the decisive factor.

180 **Dwight, Thomas:** "The sternum as an index of sex, height, and age." *Journal of Anatomy and Physiology* [London], vol. 24 (1889–90), pp. 527–535.

A continuation of a previous report. In this article the author gives the sternal length, body length, and total height in 228 cases—142 male and 86 female.

181 ——— **and T. M. Rotch:** "The neck and head in infancy." *Arch. Pediat.* [Philadelphia], vol. 8 (1891), pp. 641–653.

The author discusses in detail the development and relations of the larynx, the nose, the tonsils, Eustachian tube, and the jaws, and the proportions of the face to the cranium. On page 645 he gives a table of his own measurements of the height of the posterior nares and the breadth between pterygoid processes at the hard palate for children of ages ranging from birth to 17 years. The number of cases is not stated.

182 **Education, Bureau of, U. S. Department of the Interior:** Experimental Study of Children Including Anthropometrical and Psycho-physical Measurements of Washington School Children, by Arthur MacDonald. U. S. Bureau of Education Report, 1897–98, vol. 1, pt. 1, pp. 985–1204. Washington, 1899.

Records of two special studies of normal physical characteristics are included in this report. One is a study of 1,074 chilren, considering cephalic index and sensibility to heat and locality upon the skin, with relation to sex, mental ability, and sociological condition, based upon observations by the author; the other, an anthropometrical and sociological study of 16,473 white children and 5,457 colored children based upon measurements by their teachers. Instruments and methods are fully described, and data are grouped in tables showing many correlations of physical characteristics with sex, sociological conditions, nativity, race, and mental ability. Summaries of the investigations of Bowditch, Peckham, Porter, Chamberlain, Boas, West, Gilbert, Greenwood, Beyer, and Kline, as well as of foreign investigators, are given for comparison. Bibliography.

——— Physical Growth and School Progress, by Bird T. Baldwin. Bureau of Education Bulletin, 1914, No. 10. Washington, 1914. 212 pp. *See* Baldwin, Bird T.

——— Statistics of Growth, by Franz Boas and Clark Wissler. Report of Commissioner, Washington, 1904, vol. 1, pp. 25–132. *See* Boas, F., and C. Wissler.

182[a] **Einhorn, D.:** "Predvaritelnye dannye antropometricheskogo naselenia shkolnikov Minska v 1922–1923 gg." [Preliminary anthropological data on school children in the city of Minsk in 1922–23]. *Vrachebnoie Dielo* [Kharkov], vol. 8 (1925), columns 217–222.

An anthropological study of 1,965 school children (723 girls, 1,242 boys), varying in age from 8 to 15 years, to ascertain the physical condition and the physical type of the children of Minsk. The author gives for each year of age the average, minimum, and maximum height by sex and by race, for Jews and Russians. He found that the average height of the Jewish girls at 8 and 9 years of age was below that of the boys of those ages; at age 10 it was superior, and at age 14 again inferior. Russian girls of this district at ages 8 to 15 were taller than boys of the same ages. A table of heights correlated with social condition of the parents shows that the children of well-situated parents were taller than those of parents in poorer social condition. Heights of Jewish children as obtained by him in 1922–23 were inferior to corresponding heights obtained in 1916.

183 **Ekkert, A. I.:** "Opit fisicheskago izsliedovaniia uchashchihsiia v nachalnikh gorodskih shkolah Peterburga" [Study of physical development of pupils in elementary public schools of St. Petersburg]. *Vrach* [St. Petersburg], vol. 15 (1894), pp. 708–713.

Account of a study of the physical development of pupils in the public elementary schools of St. Petersburg made by the author in 1892–93. Author examined once, at the end of the academic year, 1,145 children (boys and girls in nearly equal numbers) ranging in age from 6 to 14 years, and gives in 11 tables and 7 charts their average height, chest circumference, and weight for each year of age by sex, also the average annual increase in these measurements and the relation between chest circumference and height. He found that until the age of 11 years the boys gained in height, weight, and chest circumference more rapidly than the girls; from 11 to 14 years the advantage was on the side of the girls.

184 **Elderton, Ethel M.:** "Height and weight of school children in Glasgow." *Biometrika* [Cambridge], vol. 10, pts. 2 and 3 (1914–15), pp. 288–339.

A mathematical discussion of statistics as to the heights and weight of over 60,000 school children in Glasgow, between the ages of 5 an 14, grouped in four classes according to the economic standing of their parents. Data were obtained from the records of an inquiry made in 1905–6 in the schools, the teachers taking the measurements and recording weight to nearest pound, height to nearest quarter inch, age to nearest year. Curves show comparison with those of the British Association Anthropometric Committee for the artisan class; comparisons are also made with data on the children in Staffordshire and Worcestershire. Over 70 tables and 1 plate are included.

185 **Elsässer, M. A.:** "Klinik von Heil-, Entbindungs-, und Irrenanstalten" [Clinic of infirmary, lying-in hospital, and insane asylum]. *Schmidt's Jahrbücher* [Leipzig], vol. 7 (1835), pp. 314–329.

The author gives statistics on 543 infants born between 1828 and 1833 in a lying-in hospital, Stuttgart. Of these infants, 281 (141 boys and 140 girls) were first born. Figures are given on weight and length; there was little difference in the figures for the boys and the girls.

186 ——— "Medicinisch- gerichtliche Mittheilungen. II. Über die Gewichts- und Massverhältnisse bei neugeborenen Kindern" [Medico-legal Communications. II. Weight and measurement of newborn children]. *Zeitschrift für die Staatsarzneikunde* [Erlangen], 21st year (1841), pp. 235–258.

In the obstetrical department of Catherine Hospital in Stuttgart author weighed 500 newborn boys and 500 newborn girls. Number of infants for each weight from 4 to 10 pounds, and average weight of boys and girls and length of 100 boys and 100 girls are given. In full-term newborn children the umbilicus is usually more than an inch below center of the body. Relation of upper and lower parts of the body is not constant in the newborn.

187 ——— "Medicinisch-gerichtliche Mitteilungen. III. Über die Neugeborenheit" [Medico-legal Communications. III. The meaning of "newborn"]. *Zeitschrift für die Staatsarzneikunde* [Erlangen], 22d year (1842), pp. 219–288.

The author considers, with citation of many observations of individual cases, the condition of the skin in the newborn living child, the discharge of meconium, and the changes in the umbilicus.

188 **Elsom, J. C.:** "Statistics regarding short-course students, University of Wisconsin, season 1909–10." *American Physical Education Review* [Boston], vol. 15 (1910), pp. 348–349.

Data were secured by director of physical education by measurement of 150 short-course men, who came from farms, and results were compared with averages for 8,000 college students of all classes, and for the freshman class. The men from the farms appeared physically more vigorous than those from the city.

189 **Emerson, William R. P.:** "Malnutrition in children; a class clinic." *International Clinic* [Philadelphia], ser. 29, vol. 4 (1919), pp. 212–236.

Gives in detail the method of organizing and conducting a nutrition class, with table of weight and height standards; forms for history and physical examination, weight record, and record of physical defects; specimen individual record charts, and tables showing the average increases in weight and height of a class selected as an example, and a comparison of actual and expected weight gains in the same class.

190 **Enebuske, C. J.:** "An anthropometrical study of the effects of gymnastic training on American women." *Publications of the American Statistical Association* [Boston], new ser. vol. 3 (1892–93), pp. 600–610.

A study of the results of monthly measurements of 100 junior students of the Boston Normal School of Gymnastics as to weight, lung capacity, strength of legs, back, chest, left and right forearm, together with 53 different measurements taken at the beginning and end of a year's work.

191 ——— "Some measurable results of Swedish pedagogical gymnastics." *Proceedings of the American Association for the Advancement of Physical Education*, 1892 [Springfield], vol. 7 (1893), pp. 207–235.

Report of the development of 26 students at the Boston Normal School of Gymnastics, ages 17 to 42, during a seven months' course of study.

192 **Engelmann, George J.:** "The American girl of today." *Am. J. Obst.* [New York], vol. 42 (1900), pp. 753–796.

A presidential address before the American Gynecological Society dealing largely with the physiological condition of American girls in schools and colleges and in business life during the prepubertal, pubertal, and adolescent periods. Data were obtained from the author's dispensary practice in St. Louis and from a large number of records furnished him by college professors, directors of physical training, secretaries of statistical organizations, and employers in all parts of the country. Charts show life intensity, mortality, morbidity, and weight increases for girls aged 5 to 18; the similarity between the physical and psychical changes during the entire pubertal period and a single menstrual period. Bibliography.

193 **Ensch:** "Pourquoi la taille et le poids des enfants ne sont-ils plus les mêmes que du temps de Quetelet?" [Why are the height and weight of children not the same as in the time of Quetelet?] *Médecine scolaire* [Paris], vol. 9 (1920), pp. 24–27.

The author quotes the finding of Boas that stature in a family decreases from the first born to the last and suggests the lowered birth rate as a reason for increase of stature since the time of Quetelet.

194 **Erismann, F.:** "Die Schulhygiene auf der Jubiläumsausstellung der Gesellschaft für Beförderung der Arbeitsamkeit in Moskau" [School hygiene at the jubilee exposition of the Society for the Promotion of Diligence in Moscow]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 1 (1888), pp. 347–373; 393–419.

Data on the height of 3,212 boys and 1,458 girls in city schools and 16,988 boys and 14,382 girls in factories—all Russian children from 7 to 18 years of age. City children were found to have a greater height and smaller chest girth than other children. Additional tables are given on weight, visual defects, etc.

195 ——— "Untersuchungen über die körperliche Entwicklung der Arbeiterbevölkerung in Zentralrussland" [Investigations on the physical development of the working population in Central Russia]. *Archiv für Soziale Gesetzgebung und Statistik* [Tubingen], vol. 1 (1888), pp. 98–135; 429–484.

Description of the investigations conducted from 1879 to 1885 in Central Russia on the living conditions in 1,229 factories of all kinds and sizes, and on the health and welfare of the employees—64,820 men and 36,102 women from 8 to 80 years of age. The many statistics include the anthropometrical measurements of height, chest girth, and for a part of the number of weight and strength. The height was taken without foot covering and the chest measure below the shoulder blades and at nipple level. The article makes constant comparisons of the classes mentioned with other Russians and other nationalities. (Quetelet's figures are several times challenged.) There are also comparisons within the classes as to place of origin and kind of occupation. The article brings out the great irregularity of growth, the "spurts" before and during puberty, occurring earlier in the female than in the male and earlier in height than in chest girth and weight. The influence of occupation on health is established. The article contains many tables and diagrams.

196 **Evetsky, Étienne:** "On the growth of children during the first year and on the nutritive conditions of early childhood." *New York M. J.*, vol. 33 (1881), pp. 172–189.

Observations were made on 102 children at a New York infant asylum. The metabolism, changes in weight, amount of milk consumed, and elimination of waste products were studied. A combined table from Gregory and Kézmárksy shows the gain and loss in weight for the first seven days.

197 **Ewart, Robert J.:** "The influence of parental age on offspring." *Eugenics Review* [London], vol. 3 (1911–12), pp. 201–232.

Data for this study were collected in an ironworking town of 105,000 inhabitants by 4,000 to 6,000 observations of two groups of children, one in their sixth and one in their thirteenth year. Both individual and collective methods were used. Tables show age of parents at time of children's birth and height in inches of boys and girls at 6 years of age; best age combinations for father and mother; age of mother and physical development of child at birth; influence of social status on the age curve of physical development at end of sixth year; relationships of intervals of birth and physical development. The author finds some correlation between height and intellectual development in well-to-do classes. In general, he concludes that the physical and mental development and the vitality of the progeny vary with the age curve as related to fecundity of the parents, the best girls being produced shortly before the summit is reached and the best boys a year or two later.

198 ——— "The influence of the age of the parent at birth of child on eye color, stature, and intelligence." *Journal of Hygiene* [Cambridge], vol. 16 (1917–18), pp. 12–35.

In addition to giving data on the ages of parents in relation to eye color and intelligence of their children, the author gives data for several hundred cases on the relation of parents' ages at the time of the child's birth to the child's height. In general, he finds that age of parents per se has no effect on children's growth. Bibliography.

199 **Faber, Harold K.:** "A study of the growth of infants in San Francisco with a new form of weight chart." *Arch. Pediat.* [New York], vol. 37 (1920), pp. 244–254.

By use of a table giving first-year weights in different localities the author shows the need of a weight curve for each major section of the United States. From 5,227 weighings of normal, full-term infants, both breast fed and artificially fed, made between 1906 and 1919 at a San Francisco clinic, he constructs composite curves, showing maximum, mean, and minimum weights for the first year in that locality. He also constructs a chart showing seasonal variations in growth of infants compared with seasonal variations in humidity and temperature. Bibliography.

200 **Fasbender, H.:** "Mutter- und Kindeskörper. Das Becken des lebenden Neugeborenen" [Bodies of mother and child. The pelvis of the live newborn infant]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 3 (1878), pp. 278–304.

A study of the relation between physical development of the mother and that of the newborn child, based on 630 cases investigated at a maternity home in Stuttgart. Author found that children of primiparæ are lighter and shorter than those of multiparæ; that the largest children are those born to mothers between 25 and 35 years old; that taller women usually have taller and heavier children. Each of these points is illustrated by tables and by quotations from a number of writers.

201 **Faye, A. L.:** Nogle Undersøgelser Angaaende Nyfødte Børns Ernaerings-Forhold [Some Observations on the Nutrition of the Newborn]. C. C. Werner & Co., Christiania, 1874. 175 pp.

The author studied the daily weight curve of 80 infants (40 boys and 40 girls) born at a maternity hospital. Observations are given in the from of abbreviated case histories for each child and its mother. The findings of other investigators are discussed.

202 **Faye, F. C., and H. Vogt:** "Statistiske Resultater stöttede til 3,000 paa Födselsstiftelsen i Christiania undersögte Svangre og Födende samt Börn" [Statistical results of a study of 3,000 cases at the Lying-in Foundation in Christiania, observations on pregnancy, puerperium, and infants born]. *Norsk Magazin for Laegevidenskaben* [Christiania], ser. 2, vol. 20 (1866), pp. 1–39; 193–219; 289–312; 393–414.

In minute detail are given every phase of the mother's life history, of her pregnancy and puerperium, which might affect her offspring. Weight and length of the infants are given and numerous other observations.

203 **Feer, E.:** "Beobachtungen über die Nährungsmengen von Brustkindern" [Observations on amount of nourishment for breast-fed children]. *Jahrb. f. Kinderh.* [Leipzig], vol. 42 (1896), pp. 194–251.

In connection with observations of amounts of nourishment taken the author presents a large number of tables giving weights of three infants for a part of the first year. Three thousand five hundred weighings were made of one child. Bibliography.

204 **Feilchenfeld, Bruno:** "Erfahrungen mit der Aufzucht von Frühgeborenen in der Familie" [Experiences with raising premature infants in their own families]. *Zeitschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 121–143.

Between April 1, 1914, and June 30, 1921, the author studied for a year or more 118 premature infants and 43 twins of poor families. During the first year the mortality of the breast fed was 23.2 per cent and of the artificially fed 63.9 per cent. The weight of the infants was 2,500 grams or less. Premature children weighing more than 1,500 grams seldom showed mental defects. A great many in the second year reached such a degree of development that they were able to perform the same functions as normal children of the same age. Twins weighing less than 2,500 grams develop like premature children. The article contains graphs, tables, and a bibliography.

205 **Feldman, W. M.:** The Jewish Child. Its History, Folklore, Biology, and Sociology. Bloch Publishing Co., New York, 1918. 480 pp.

In this extensive work on many phases of Jewish childhood comparative physical measurements are given for 151 Jewish and 50 non-Jewish boys between 11 and 16 years of age. The measurements were made by the author, but methods are not stated. References.

206 **Fergus, Walter, and G. F. Rodwell:** "On a series of measurements for statistical purposes recently made at Marlborough College." *Journal of the Anthropological Institute of Great Britain and Ireland* [London], vol. 4 (1874–75), pp. 126–135.

A report of the measurement of 550 English boys 10 to 19 years of age, mostly sons of professional men, educated in the country. Weight, height, circumference of head, girth of chest, girth of the flexed arm over biceps muscle, and girth of calf of leg were the points considered. Technique is described. The paper was read to the institute by Francis Galton, who followed it with a mathematical discussion of the data, designed to show of how great value school measurements might be to anthropology.

207 **Fetherston, R. H.:** "Weight of Victorian infants." *Australian Medical Journal* [Melbourne], new ser. vol. 9 (1887), pp. 495–496.

Weights of 5,000 male and 5,000 female infants, taken from the records of the Women's Hospital, Melbourne, for the years 1857 to 1887, show an average of 7 pounds 5⅛ ounces; for the 5,000 males, 7 pounds 7 ounces; for the 5,000 females, 7 pounds 3⅛ ounces. Observations as to the averages by different groupings and comparative figures for other countries are given.

208 **Fleischmann, L.:** "Über Ernährung und Körperwägungen der Neugeborenen und Säuglinge" [Nutrition and weight of newborn and older infants]. *Wiener Klinik*, vol. 3 (1877), pp. 145–194.

Mostly quotations from a number of writers on the weight of newborn infants and their gain in weight during the first year of life. Histories and charts are also given of six original cases in which the method of feeding and progress of weight during the first year of life were studied.

209 **Fleischner, E. C.:** "The relation of weight to the measurements of children during the first year." *Arch. Pediat.* [New York], vol. 23 (1906), pp. 739–760.

Author seeks to determine the relation which weight and measurements of malnourished infants bear to normal weight and measurements and to each other and the degree to which increase in weight influences increase in measurements. Five hundred children arbitrarily classified as well nourished (25 per cent), fairly well nourished (35 per cent), poorly nourished (40 per cent), all under 1 year old and patients in New York hospitals, were measured (method not given); data were obtained as to weight, length, circumference of head, chest, and abdomen. Charts and tables summarize these measurements. Conclusion is reached that increase of measurements of malnourished children shows some variation from normal, and that during the first year the primary factor in increase of body measurements is steady increase in weight. References.

210 **Fleming, R. M.:** "Sex and growth features in social analysis: an abstract of a communication read before the Royal Anthropological Institute on February 28, 1922." *Man* [London], vol 22 (1922), pp. 69–75.

A study to show how far sex and growth influence physical characters. First measurements (method not stated) were taken on 2,000 to 3,000 children in schools of England and Wales, and remeasurements, at intervals of one to two years, were analyzed in 419 cases—187 male and 232 female. Author deduces: (1) Difference in rate of development of the sexes; (2) a tendency to increase in cephalic index with growth (table); developmental sex differences in changes of color of eyes and hair.

211 **Flores, D. A. C.:** "Qué desarrollo orgánico ha de tener el hombre sano para considerarle en la edad adulta?" [What degree of physical development must be reached by the normal man in order to be considered as an adult?] *Gaceta médica de Granada*, vol. 19 (1901), pp. 241–246, 289–297, 313–323.

After quoting several writers the author gives an account of his own investigation of 50 men ranging from 16 to 50 years. He states in each case the age, upper, lower, and median chest circumference, and left, right, and median vertical diameters. He discusses his findings in detail and presents conclusions on the physical development of the adult human being.

212 **Foisy, Louis-Hippolyte-Gaston:** De quelques applications de la balance à l'étude physiologique et clinique des nouveau-nés [Some Applications of the Scales to the Study, Physiological and Clinical, of the Newborn]. Paris, no. 4, 1873. 52 pp.

Thesis for medical degree (University of Paris), in three chapters: (1) The weight and growth of the newborn; (2) the causes of retardation or arrest of growth; (3) the infant's food. The original observations include a table of birth weight of about 1,200 infants, classified by age of the mother and her condition of primiparity or pluriparity; a note on the birth weight of 13 pairs of twins, and numerous individual case records. Bibliography.

213 **Forbes:** "Experiments on the weight, height, and strength of men at different ages." *Report of the Sixth Meeting of the British Association for the Advancement of Science*, 1836 [London], vol. 5 (1837), pp. 38–39.

A brief report of the measurement of about 800 students in the University of Edinburgh, aged 15 to 25, taken by the author as an extension of the work of Quetelet. Methods are not described. He found the Scotch apparently better developed than the Belgians.

214 **Forssberg, Edy.:** Växlingar i människokroppens längd" [Changes in the height of human beings]. *Hygiea medicinsk och farmaceutisk Månadsskrift* [Stockholm], vol. 65, pt. 2 (1903), pp. 295–336.

Following his discussion of the historical and modern aspects of and investigations in his subject, the author in three tables and one graph gives his observations of the average height, rate of growth, length of back, leg, etc., for 3,494 persons of both sexes from birth through 80 years of age, together with some racial comparisons. Bibliography.

215 **Foster, W. L.:** "Physiological age as a basis for the classification of pupils entering high school: relation of pubescence to height." *Psychological Clinic* [Philadelphia], vol. 4 (1910–11), pp. 83–88.

A study based upon examination of 459 boys entering a New York high school. Tables show degree of pubescence, minimum, maximum, and average weight, height, and age.

216 **Fourmann, Fritz:** Wovon ist das Gewicht der Neugeborenen abhängig? [On What Does the Weight of the Newborn Depend?] Carl Georgi, Bonn, 1901. 68 pp.

A discussion of the influence of mother's age, number of previous pregnancies, environment, diseases, etc., upon the weight of the infant at birth. The author gives data for over 1,000 cases with the following findings: The average weight of the newborn boys was 3,360.7 grams, of the girls 3,221.8 grams. The weight increased with the duration of pregnancy and with the number of previous pregnancies. Twins weighed less than children born singly—boys on the average 2,723.7 grams, girls 2,316 grams. Mothers of larger size had heavier children. This is also true of vigorously constituted women. Syphilis, tuberculosis, heart disorders, and rheumatism in the mother affect the weight of the child. The mother's age has no considerable effect on the child's weight. Many writers are quoted. Extensive bibliography.

217 **de Franco, Lauro:** Études historiques et recherches sur le poids et la loi de l'accroissement du nouveau-né [Historical Studies and Researches on the Weight and the Law of Growth of the Newborn]. Paris, no. 97, 1874. 71 pp.

Thesis (University of Paris). Original work consisted of observations of the weight of 530 infants, aged 1 day to 7 months, at the municipal nurses' directory, tabulated by age and sex and summarized by a growth curve. One table of weights of 20 pairs of twins, aged 2 to 99 days, shows their inferiority in weight to the average infant. The average weight at birth was 3,250 grams, and normal loss of weight in the first few days did not exceed 100 grams. Bibliography.

218 **Frankel, Lee, and Louis I. Dublin:** Heights and Weights of New York City Children 14 to 16 Years of Age. Metropolitan Life Insurance Co., New York, 1916. 53 pp.

A study to establish standards of height and weight by which the physical fitness of boys and girls for employment may be estimated. Data were secured from the records of 10,043 children, 14 to 16 years of age, who were certified for employment by the Board of Health of New York City during the nine months from July 13, 1914, to April 12, 1915. Ages are stated in years and months, 14 years and 1 day, for instance, being put into group 14 years 1 month. Heights include shoes, error for heels estimated; weights include clothing, error estimated. The question of race is considered and discussed at some length, with comparisons of the data of Boas (q. v.) in Changes in Bodily Form of Descendants of Immigrants. Physiological and chronological ages are also discussed. An appendix contains comparisons of figures for New York boys and girls with figures from employment certificates of 4,449 children in Buffalo, Rochester, Syracuse, Schenectady, and Yonkers. A table is derived of suggested minimum weight limits for each inch of height of New York boys and girls, ages 14 to 15 and 15 to 16, to be used in granting certificates, the results of the investigation of nationality not showing sufficient variations to warrant separate tables for the different races.

219 **Freeman, G. R.:** "Weights and measurements of infants and children in private practice compared with institution children and school children." *Am. J. Dis. Child.* [Chicago], vol. 8 (1914), pp. 321–326.

Weights and measures of 278 cases in private practice are given and compared with 1,000 institution cases studied by the author in the New York Roman Catholic orphan asylums, with 34 private cases reported by Camerer, with Holt's charts given in his textbook, and with measurements of 98,000 school children reported by Stanley Hall. Charts give weight and height for first year, weight for first 12 years, and height for first 11 years.

220 **Freudenberg, Karl:** "Grösse und Gewicht der Berliner Schulkinder" [Height and weight of school children of Berlin]. *Klinische Wochenschrift* [Berlin and Munich], vol. 3 (1924), pp. 1411–1413.

A discussion of weight and height of 40,290 school children of Berlin from 6½ to 16½ years old, boys and girls in nearly equal numbers, obtained in 1923 under the auspices of the public-health authorities of Berlin, and comparison with similar data obtained in 1902–1903. The author gives in several tables the height and weight of these children by sex and for every year of age, also the percentage of the decrease or increase between the two above periods by sex and for each year of age. The tables are arranged separately for the public-school children and for high-school pupils who usually belong to the more comfortably situated middle class. The results show that the high-school pupils were taller and heavier than the public-school children of the same ages; but in 1923 the difference in their favor was much smaller than before the war which shows that the middle classes suffered more from the bad economic conditions due to the war than the working classes.

221 **Freund, W.:** "Zur Pathologie des Längenwachstums bei Säuglingen und über das Wachstum debiler Kinder" [On the pathology of infants' growth in length and on the growth of delicate children]. *Jahrb. f. Kinderh.* [Berlin], vol. 70 (1909), pp. 752–773.

Author investigated 36 children under 1 year of age to determine whether length of the infant's body is affected by pathological conditions or debility. These children were admitted to a municipal infant hospital in Breslau on account of illness, and most of them were observed by the author during a large part of the first year of their life. He found that illness and digestive dis-

orders common in infancy and general debility affect very little the development of the length of the body but very much the increase in weight. Author gives curves and histories of 14 of his cases and quotes in detail from several writers who share his point of view.

222 **Friedberg, Edward, and C. Noeggerath:** "Entfettete Frauenmilch als Heilnahrung" [Fat-free mother's milk as a curative diet]. *Arch. f. Kinderh.* [Stuttgart], vol. 68 (1920–21), pp. 195–214.

In connection with a study of feeding experiments the authors give graphs for nine infants, with case histories.

223 **Friedenthal, H.:** "Das Wachstum menschlicher Säuglinge in den ersten Monaten nach der Geburt" [Growth of infants in the first months after birth]. *Verhandlungen der Physiologischen Gesellschaft zu Berlin*, vol. 35 (1911), pp. 75–78.

From data on 15 cases the author draws conclusions regarding the length of time it takes an infant to double his original weight.

224 ——— "Daten und Tabellen betreffend die Gewichtszunahme des Menschen und anderer Tierarten" [Data and tables on increase in weight of men and other animals]. *Arbeiten auf dem Gebiete der Experimentellen Physiologie* [Jena], pt. 2 (1911), pp. 221–259.

From a great mass of material collected partly by himself author shows in numerous tables and graphs increases in weight with dates, periods in which weight is doubled, increases in weight with amount of food consumed, duration of pregnancy and of suckling, for human beings and animals.

225 ——— "Über das Wachstum des menschlichen Körpergewichtes in den verschiedenen Lebensaltern und über die Volumenmessung von Lebewesen" [Increase in human weight at various ages and measurement of the volume of living creatures]. *Arbeiten auf dem Gebiete der Experimentellen Physiologie* [Jena], pt. 2 (1911), pp. 40–48.

An authoritative discussion, based largely on author's own experiments, of the increase in human weight at various ages, and of measurement of volume. Figure I shows graph of weights of mammals, according to age; Figure II, their duration of pregnancy and weights at birth. A diagram gives ages when human weight is doubled beginning with fertilization of egg. Figure III is a stereopticon view of man, photographed before two mirrors, from which the man's volume and weight may be derived, as described by Pulfrich and elsewhere by author. This method he recommends for very small creatures.

226 **Fröbelius, W.:** "Über die Bestimmung der grösseren oder geringeren Lebensfähigkeit der Neugeborenen" [Determination of greater or less viability in newborn infants]. *St. Petersburger Medicinische Zeitschrift*, new ser. vol. 4 (1873–74), pp. 363–373.

In a foundlings' home in St. Petersburg the author divided 1,208 infants born in 1872 into three classes according to length and weight, and 452 newborn children in 1873 into three groups according to relations of head, chest, and the body length, thus ascertaining that mortality and morbidity vary inversely as physical development. For a favorable prognosis chest girth must not be exceeded by head girth by more than 2 to 2.5 centimeters and must itself exceed one-half the body length by 7 centimeters. The article contains three tables.

227 **Frölich, H.:** "Die menschliche Körperlänge" [Human height]. *Allgemeine Medicinische Central-Zeitung* [Berlin], vol. 65 (1896), pp. 58–59; 69–70; 82–83; 94–95; 107; 119–20; 132–33; 144–45; 156–57.

From ancient and medieval history, from military statistics and from the measurements conducted by Quetelet, Bowditch, Schmidt, Hansen, himself, and others, the author presents a mass of detail on the height of children and adults. He discusses height in different epochs, races, and countries, height as affected by social class, etc.

228 **Fuchs, K. E.:** Die Abhängigkeit des Geburtsgewichtes des Neugeborenen vom Stand und der Beschäftigung der Mutter [Relation Between the Infant's Weight at Birth and Mother's Social Condition and Occupation]. K. A. Linsel, Luetzen, 1899. 47 pp.

Discussion is based on the study of 849 cases. Author disagrees with Pinard and other writers who think that women not engaged in strenuous work give birth to heavier children. He divided his cases according to the mother's occupation and concluded that (1) the highest average weight is attained by children of married women staying at home; (2) very little difference is noticed between the above and the children whose mothers were engaged in strenuous work; (3) children of women engaged in occupations requiring no physical exertion were about 110 grams lighter than those whose mothers were doing strenuous work; and (4) bad hygienic conditions of the mother affect adversely the infant's weight.

229 **Fürst, Kamillo:** "I. Über aussergewöhnliche Entwicklung der Frucht" [Extraordinary development of the fetus]. *Wiener Medizinische Wochenschrift*, vol. 33 (1883), pp. 344–346.

Of 3,307 newborn infants in Professor Braun's obstetrical clinic during 1881, 71 weighed more than 4,000 grams; 20 of these were first born. Of the 20

first born, 17 were boys and 3 were girls. Of the other 51, 38 were boys and 13 were girls. Two short tables show how weights were distributed. The heaviest infants were 2 boys—one, 5,000 grams in weight and 55½ centimeters in length, the other, 5,300 grams and 57 centimeters.

230 **Fuhrmann, E.:** "Einiges über die Gewichtskurven der Neugeborenen" [On weight curves in newborn infants]. *Medizinische Klinik* [Berlin], vol. 3 (1907), pp. 510–512.

The author studied the weight of 495 male and 505 female newborn infants in the Alexandra Foundation for Women at St. Petersburg. When divided into two groups, more than and less than 3,337 grams, the heavier group showed an initial loss of 9.2 per cent of the birth weight, the lighter group of 9.06 per cent. It was found further that the weight of the infant increases with the age of the mother, that the first born is lighter than other infants. No effect of season was discernible.

231 **Galton, F.:** "On the height and weight of boys aged 14, in town and country public schools." *Journal of the Anthropological Institute of Great Britain and Ireland* [London], vol. 5 (1875), pp. 174–181.

Data on height and weight of about 1,000 boys in town and country schools, showing the physical superiority of the country boys. A large part of the article deals with the author's methods of handling the data mathematically.

232 **Gandini, V.:** "I caratteri antropometrici di 400 bambini delle scuole elementari" [The anthropometrical characteristics of 400 children in elementary schools]. *L'Igiene della scuola* [Genoa], vol. 4 (1913), pp. 193–209; 227–235.

Account of an original study of 400 public-school boys 6 to 12 years old, to ascertain the effect of the child's social and economic environment on his mental and physical development. After a summary of similar data obtained by other writers the author gives for each boy weight, height, chest circumference, chest expansion, muscular force, measurement of skull, face, and nose; also detailed information on the boy's intelligence, emotions, will, conduct, and memory. He presents these findings in a number of tables and concludes that children of the poor are inferior in physical development to children of the well to do; that on the whole there is little physical difference between the intelligent and unintelligent children and that there is no relation between intelligence and social and economic conditions. Bibliography.

233 **Gardiner, C. F., and H. W. Hoagland:** "Growth and development of children in Colorado." *Transactions of the American Climatological Association* [Philadelphia], vol. 19 (1903), pp. 258–264.

A preliminary study of effect of climate on development. Over 1,000 public-school children of Colorado Springs were measured as to weight, height, inspiration and expiration, chest girth, and thoracic perimeter. Age and length of residence in Colorado are recorded. Height with shoes, weight with indoor clothing, chest measure over undergarments, with steel tape, vital capacity on wet spirometer, three trials allowed. Ages from last birthday, 9 to 15 years, inclusive. Results compared with observations of Porter, St. Louis, and Christopher, Chicago. Curves show apparent superiority of children in Colorado Springs, but authors do not consider work final.

234 **Gaujoux, E.:** "Essai sur l'évolution du poids et de la taille chez l'enfant" [Evolution of weight and stature in the child]. *Annales de médecine et chirurgie infantiles* [Paris], vol. 13 (1909), pp. 37–43.

After reminding the reader that in order to understand the pathology of the child, a knowledge of its healthy state is essential, the author emphasizes the importance of systematic measurements of weight and height. He quotes the formulas used by Terrian, Weill, and Schwartz, and cites the tables compiled by Marfan, Comby, Perrien, Quetelet, Schwartz, Variot et Chaumet, and Gaujoux. He suggests the following formulas: From 5 years when the height is 1 meter, the increase is calculated by adding to 1 meter as many times 6 centimeters as years have passed since 5. The child weighs 9 kilos at 1 year and increases as many times 1,500 or 1,750 grams as the number of its years up to 7. Thereafter it increases as many times 2,500 to 2,750 grams as its years exceed 7 up to 14.

235 **Gaupp, Ernst:** Über die Mass- und Gewichtsdifferenzen zwischen den Knochen der rechten und linken Extremitäten des Menschen [Differences of Measurement and Weight between the Bones of the Right and Left Extremities of Man]. Breslau, 1889. 37 pp.

An inaugural dissertation (University of Breslau). Author discusses anatomical asymmetry at great length as investigated by others in case of animals and human adults. His own work on children includes studies of skeletons of a 10-year-old girl, a 16-year-old youth, and a 17-year-old girl, in which the right clavicle, humerus, and radius showed a slight superiority over the left; a large number of measurements on living children between 5 and 12 years in whom the right arm after the age of 9 surpassed the left by about 1 centimeter; and the skeletons of eight newborn infants, in three of which the arms right and left were alike, in two the right was larger, in three the left was larger. In these infants' skeletons the right leg was larger in four cases and the left in four cases.

236 **Gebhart, John C.:** The Growth and Development of Italian Children in New York City. The New York Association for Improving the Condition of the Poor, Publication No. 132. New York, 1924. 36 pp.

The three major subjects of this report are: (1) The stature and weight of Italian children in New York City as compared with other racial groups; (2) the dentition of Italian children; (3) the seasonal variation in growth of Italian children in New York City. Average statures were obtained from measurements of 1,608 boys and 1,899 girls, aged 1½ to 13½ years, brought to the clinic of the Mulberry Health Center for physical examination; average weights, from 1,753 boys and 2,030 girls, aged 1½ to 14½ years, from the same group. Weights were taken with indoor clothing, heights with shoes. Measurements were recorded to the nearest pounds and inches. Age was reckoned to the last birthday. Records of dentition were secured by the supervising school dentist and recorded in the case of 1,150 boys and 1,200 girls between 4 and 13 years of age. Records of successive weight were available for 363 boys and 614 girls under the supervision of the nutrition workers. The average period of observation for girls was 4.15 months; for boys, 3.8 months. Charts and tables show comparison of these results with the Woodbury and Burk-Boas norms of growth, with the growth of southern children, and with the growth of "Latin" children in Detroit public schools; also of the seasonal variation in growth with that of Boston school children.

237 **Geissler, Arthur:** "Messungen von Schulkindern in Gohlis-Leipzig" [Measurements of school children in Gohlis-Leipzig]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 5 (1892), pp. 249–253.

Geissler discusses measurements of height and weight made by Hasse at the end of the summer vacation in 1889 on 1,386 boys and 1,420 girls from 6 to 14 years old attending the schools of Gohlis-Leipzig. Measurements were taken without shoes and upper garments. Average results are shown in a table. By using special weight-height indexes, which he explains, for the two age groups, 6 to 11 and 11 to 14, the author found that these children were well developed as compared with those measured by Erismann, Pagliani, Landsberger, Carstadt, Geissler, and Uhlitzsch, and even by Kotelmann and Bowditch. Better development was found among well-to-do than among poor children.

238 ——— **and Richard Uhlitzsch:** "Die Grössenverhältnisse der Schulkinder im Schulinspektionsbezirk Freiberg" [Height relations of school children in the school district of Freiberg]. *Zeitschrift des Königlich-Sächsischen Statistischen Bureaus* [Dresden], vol. 34 (1888), pp. 28–40.

Height was measured of 10,343 boys and 10,830 girls from 6½ to 14½ years of age. The authors compare their figures with those of Quetelet for Belgium, Bowditch for Boston, and Erismann for Central Russia, and with the official statistics for the Kingdom of Saxony. They conclude: The children of the school district of Freiberg are below the normal height of Saxon children; the boys are superior to the girls in height, except from the eleventh to the sixteenth year; the children of the mining class are inferior in height to those of the burgher class.

239 **Gihon, A. L.:** "Report based upon the examination of 6,129 candidates for admission to, and pupils in, the Naval Academy," in "Report of the Surgeon General of the United States Navy for the year 1879." Report of the Secretary of the Navy, pp. 183–205. Washington, 1880.

A tabulation of all the physical measurements recorded at the Naval Academy from 1852 to 1880. For ages 14 to 23, measurements are given of weight, height, chest circumference, chest expansion, vital capacity, and strength. A description of methods and a table of minimum physical measurements for candidates for naval service are included.

240 **Gilbert, J. Allen:** "Researches on the mental and physical development of school children." *Studies from the Yale Psychological Laboratory* [New Haven], 1892–1895, pp. 40–100.

A report of an investigation made in 1893–94 in the public schools of New Haven, Conn., as to: (1) Muscle sense, (2) sensitiveness to color differences, (3) force of suggestion, (4) letter memory, (5) voluntary motor ability and fatigue, (6) weight, (7) height, (8) lung capacity, (9) reaction with discrimination and choice, (10) time memory. About 100 children from 6 to 17 inclusive were tested, the teachers being asked to grade the subjects as bright, average, and dull. Results are shown in many tables and charts. In comparing physical results with the work of other investigators the author found New Haven children heavier than Boston or Milwaukee children, probably because of a smaller proportion of foreigners studied.

241 ——— "Researches upon school children and college students." *The University of Iowa Studies in Psychology* [Iowa City], vol. 1 (1897), pp. 1–39.

Data for this study were obtained in the public schools of Iowa City, West Liberty, and Cedar Rapids; Iowa City Academy; and the State University of Iowa. About 100 pupils of each year of age from 6 to 19 were examined. Mean value was used in computations in preference to arithmetical average, and the following tests were made: (1) Pulse, (2) pain threshold, (3) wrist lift, (4) weight, (5) height, (6) estimation of length by sight, (7) estimation of length by arm movement, (8) lung capacity, (9) lift with arms, (10) voluntary motor

ability and fatigue, (11) pulse after fatigue. Tests 4, 5, 6, 7, 8, 10, and 11 showed a degree of correlation with mental ability as rated by the teachers; this correlation is illustrated by charts.

242 **Goddard, H. H.:** "The height and weight of feeble-minded children in American institutions." *Journal of Nervous and Mental Diseases* [New York], vol. 39 (1912), pp. 217–235.

The author collected data from 19 American institutions for the care of the feeble-minded and from these constructed tables and curves showing the comparative height and weight of normal and feeble-minded children. From comparisons with data for normal children from Boas, Burk, and Roberts, the author decides there is a remarkable correlation between physical and mental development. Bibliography.

243 **Godin, L. G.:** "Note sur la taille minima que doivent présenter les enfants de 13 ans destinés à s'engager à 18 ans (au sujet de l'admission des enfants dans les écoles militaires préparatoires d'infanterie)" [Note on the minimal height which should be attained by 13-year-old boys destined to enlist at 18 (with relation to their admission to military preparatory schools)]. *Archives de médecine et de pharmacie militaires* [Paris], vol. 36 (1900), pp. 117–121.

To discover, if possible, a definite standard of height for admission to military schools the author examined the records of 1,000 cadets at Saint-Hippolyte, finding none of 130 centimeters and under at 13 years and few of 132 centimeters, who reached 154 centimeters at 18 years. Studying at Andelys a series of 400 of 130 and 132 centimeters he found his results confirmed. By further researches, his own and others, he estimated the average growth in stature from 13 to 18 years as 20 centimeters, making the required stature at 13 years 134 centimeters.

244 **Godin, Paul:** "De la puberté à la nubilité chez l'adolescent moyen au point de vue de la croissance" [The growth of the average adolescent from puberty to the age of marriage]. *Bulletins et mémoires de la Société d'anthropologie de Paris*, ser. 5, vol. 10 (1909), pp. 497–501.

From measurements of 100 adults (details not given in this article) the author constructed a table showing the average which an adolescent must reach, in 6 anthropometric values, to become adult. From measurements of a number of adolescents he determined the average of adolescent growth and the growth to be made between the adolescent age and full maturity. Estimating the rate of postadolescent growth, he concludes that puberty commences at 15½ and ends at 17½ and that three more years are necessary for the attainment of full physiological maturity.

245 ——— "Difference de l'évolution de la croissance chez le garçon et chez la fille" [Difference in the evolution of growth between the boy and the girl]. *Médecine scolaire* [Paris], vol. 9 (1920), pp. 100–102.

Representing the index of growth by the relationship between volume of trunk and volume of head the author compiles a table showing the variations in growth in the sexes from birth to 21 years of age. Original data are not given in this article.

246 ——— "Du rôle de l'anthropométrie en éducation physique" [The rôle of anthropometry in physical education]. *Bulletins et mémoires de la Société d' anthropologie de Paris*, ser. 5, vol. 2 (1901), pp. 110–134.

To illustrate the value of anthropometry in physical education the author gives in detail the results of the semiannual measurements of 200 boys at a military school, ages 14½ to 18 years. From these boys he selected two groups of 50 each—one group composed of those who had regular gymnastic training with apparatus, the other of those who did not. Ten measures of each boy were taken at each half-year period, the results showing the value of the gymnastic training in increased growth and more perfect growth rhythm. Two other groups were also measured, including 14 boys of subnormal physical development, of whom 7 were given regular gymnastic training. Careful measurements proved the value of the physical training.

247 ——— "Formule individuelle de croissance physique pour les enfants des deux sexes" [A formula of individual physical growth for children of the two sexes]. *Comptes rendus hebdomadaires de l'Académie des sciences* [Paris], vol. 162 (1916), pp. 50–52.

The author expresses physical growth by the formulas: $\frac{C}{V}$ and $\frac{O}{V}$, where C = the volume of the skull, V = volume of the trunk, and O = the length of the extremities. Details of the method of determination are explained, and an example is given illustrating the process.

248 ——— "Leggi dell'accrescimento alle quali mi hanno condotto le mie ricerche sull'accrescimento delle varie parti del corpo" [Laws of growth which I derived from my researches on the growth of various parts of the body]. *Archivio per l'antropologia* [Florence], vol. 43 (1913), pp. 89–97.

The author describes the laws of growth which he derived after twenty years of study of the children of French soldiers and of the children cared for at a Paris hospital. These laws are: (1) Law of alternate growth; by this

the author means that width and length of the body, or of parts of the body, do not increase at the same time; also, periods of growth alternate with periods of inactivity. (2) Law of puberty; here the author enumerates the well-known characteristics of puberty. (3) Law of proportion; in the body of the human being, from the newborn infant to mature man, every part has a certain proportionate relation to the whole. This proportion changes at the end of the sixth year, then at the end of the fifteenth year, and again at the time of maturity. (4) The law of asymmetry, which is found in the organs that come in pairs, for instance, legs, arms, shoulders. In the right-handed persons the right upper limb is longer and thicker than the left; the right shoulder lower; the left lower limb is longer and larger than the right. In left-handed persons the reverse is true.

249 **Godin, Paul:** "Les proportions du corps pendant la croissance de 13 ans ½ jusqu'à 17 ans ½ ainsi que à la naissance, à 6 ans ½ et à 23 ans ½ représentées en millièmes de la taille" [The proportions of the body during growth from 13½ to 17½ years of age, as well as at birth, at 6½, and at 23½ years, represented in thousandths of the height]. *Bulletins et mémoires de la Société d'anthropologie de Paris*, ser. 6, vol. 1 (1910), pp. 268–297.

The original data for this article are the same as those obtained by the author for his "Recherches anthropométriques sur la croissance des diverse parties du corps" (No. 251, this section). This article, in three parts, expresses in tables, charts, and textual notes: (1) The growth in length and width of the different parts of the body represented as thousandths parts of the total height, from 13½ to 23½ years of age; (2) a study in the same manner of the 10 subjects whose lower limbs bore the greatest proportion to length of trunk (Macroskéle) and the 10 whose lower limbs bore the least proportion (Brachyskéle); (3) a study of the evolution of the proportions of the body from the beginning to the end of postfetal growth and from birth to adult age.

250 ——— "Lois de croissance auxquelles m'ont conduit mes recherches sur la croissance des diverses parties du corps (1893-1913)" [Laws of growth derived from my researches on the growth of the different parts of the body (1893-1913)]. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* [London], vol. 44 (1914), pp. 295–301.

A summary of the laws of growth illustrated by charts and giving references to the author's publications in which may be found the original material from which these laws were derived. Twenty-eight laws are stated, grouped under: (1) Laws relating to alternations in growth, (2) laws relating to puberty, (3) laws relating to proportions, (4) laws relating to asymmetries.

251 ——— Recherches anthropométriques sur la croissance des diverses parties du corps. [Anthropometric Studies on the Growth of the Different Parts of the Body]. A. Maloine, Paris, 1903. 224 pp.

The author measured at six-month intervals a varying number of boys at a military school. From these subjects he obtained a series of 100 boys, aged 13½ to 18½, who had been measured 9 or 10 times, each with 129 different measurements. Technique is described. Height was measured from the ground to 17 different points, and a chart was constructed showing the comparative position of these points at different stages of growth. Most of the book is devoted to a discussion of comparative developments. Tables and bibliography.

252 ——— "Un série de lois de croissance basées sur 2,000 observations d'enfants, 300,000 mesures, et 100,000 notations (1891–1893–1914)" [Series of laws of growth based upon 2,000 observations of children, 300,000 measurements, and 100,000 notations (1891–1893–1914)]. *Comptes rendus des séances de l'Académie des sciences de Paris*, vol. 159 (1914), pp. 99–102.

This article enumerates without discussion the laws of growth as formulated by the author. The laws are arranged in four groups—6 on the alternations of growth; 10 on puberty; 8 on proportions during growth; and 4 on normal asymmetry.

253 **Gohde, E.:** "Die Ernährung der Jugend während des Krieges" [Nutrition of young people during the war]. *Zeitschrift für Schulgesundheitspflege* [Leipzig], vol. 29 (1916), pp. 338–339.

This report declares that on the basis of 6,391 weighings (every 14 days) of 913 pupils in Bochum from November 1, 1915, to February 1, 1916, the weight of school children was progressing normally, in spite of the war. Only 64 poor children fell below average figures.

254 **Goldfeld, Z.:** "Die Abhängigkeit der körperlichen Entwicklung Neugeborener vom Berufe der Eltern" [Relation between the physical development of newborn infants and the occupation of the parents]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 72 (1912), pp. 407–437.

The author makes comparisons of the weight and height of 780 newborn infants at a maternity hospital in Wurzburg. Children of parents in 18 occupations are studied. Age of the mother and number of previous pregnancies are given.

255 **Goldstein, Fritz:** "Klinische Beobachtungen über Gewichts- und Längenwachstum unterernährter schulpflichtiger Kinder bei Wiederauffütterung" [Clinical observations on growth in weight and height induced by giving extra feedings to undernourished children of school age]. *Ztschr. f. Kinderh.* [Berlin], vol. 31–32 (1921–22), pp. 178–198.

In a children's infirmary at Buch in 1920 the author observed many undernourished children, 1 to 14 years old, from the proletariat of Berlin. The children were weighed in their shirts before breakfast and measured after their siesta. Their nutrition was not estimated according to fat pad or the indices of Rohrer, Pirquet, and others. The small children 2 to 6 years old had suffered much from rachitis and fell far below Camerer's normal figures; those from 6 to 14 years old, 271 boys and 241 girls, also fell below Rietz's figures. The diet and general treatment of the children are described. Eighty-nine per cent were subnormal in weight, 50 per cent in height. Under treatment the weight increased rapidly until almost normal, and then came an increase in height. The article contains seven curves and six tables.

256 **Gray, F. J.:** "Diurnal variations in weight." *American Physical Education Review* [Springfield], vol. 15 (1910), pp. 6–14.

Two groups of men were studied. The first group, consisting of 14 men 18 to 25 years of age who had had various degrees of physical training, were weighed two days a week four times a day for about five months. The second group, consisting of 16 seasoned athletes, were weighed daily, before and after exercise, for several weeks. Tables and charts are included.

257 **Gray, H.:** "Ideal tables for size and weight of private-school boys." (*Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 272–283.

Three hundred and eighty pupils were examined. From their measurements (height, weight, chest girth) and age, tentative ideal tables were made and compared with "average normal standards." Other standards of height and weight are freely quoted.

258 ——— "Size and weight in 130 boarding-school boys (Middlesex)." *Medical Clinics of North America* [Philadelphia and London], vol. 4 (1921), pp. 1899–1914.

Data are given for age at nearest birthday, weight taken stripped, height, chest girth taken at the midpoint between full expansion and forced expiration. These findings are compared with those of other workers, and a table of standards is constructed. Bibliography.

259 ——— **and W. J. Jacomb:** "Size and weight in 136 boarding-school boys." *Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 258–271.

A report of observations of 136 boys of the "higher economic class." Age, height, weight, and chest girth are compared with general standards.

260 **Gray, J., and Jas. F. Tocher:** "The physical characteristics of adults and school children in East Aberdeenshire." *Journal of the Anthropological Institute of Great Britain and Ireland* [London], new ser. vol. 3 (1900), pp. 104–124.

The number of children studied was 14,561; the color of the hair and eyes and shape of the nose were noted, and in some cases sitting and standing height. The data on the children are handled only by proportion; actual figures are not given.

261 **Greenwood, Arthur:** The Health and Physique of School Children. Published for the Ratan Tata Foundation, University of London, by P. S. King & Son, Westminster, 1913. 96 pp.

A study of the physical condition of children in the public elementary schools of England and Wales, based on the annual reports of school medical officers, made subsequent to the passage of the education act in 1907. The available data comprised records of about 800,000 individuals. The inquiry dealt mainly with heights and weights, the primary object being to determine the average height and weight at each age from 3 to 15 years; to compare the heights and weights of children of one district with those of another; to enable school medical officers to compare the development of the child population of the same district at different periods. In addition, the author discusses differences in physical development between boys and girls; between city and country children; between children in half-time employment and those attending school full time. The report has numerous tables and charts. Appendices give in condensed form the results of several comparable investigations by other workers.

262 **Greenwood, J. M.:** "Heights and weights of children." American Public Health Association Report, 1891, vol. 17, pp. 199–204. Concord, 1892.

Investigation by the superintendent of schools, Kansas City, Mo., to discover whether American children show physical deterioration as compared with children in other countries. In the school years of 1886 and 1890 measurements were taken of 6,708 children from 10 to 18 years of age, of whom 2,996 were girls (2,515 white American, 314 colored, 167 foreign) and 3,712 boys (3,002 white American, 493 colored, 217 foreign). Height was taken without shoes and weights without outer clothing. Each individual was measured but once. Age, average height, and average weight were tabulated and comparison was made with Mulhall's figures of height and weight of English, American, and

Belgian children, and figures of Crowell, Quetelet, Bowditch, Pagliani, and Leyet of height of children of various countries. The author found no indication of physical deterioration of Americans as compared with other races.

263 **Gregor, Konrad:** "Über die Verwendung des Mehles in der Säuglingsernährung" [Use of flour in infant nourishment]. *Arch. f. Kinderh.* [Stuttgart], vol. 29 (1900), pp. 95–162.

In connection with a study of the use of flour in infant nourishment the author gives data on the weights and weight curves of 90 infants in the Children's Clinic of Breslau University who remained under his supervision for a year.

264 **Gregory, J.:** "Über die Gewichtsverhältnisse der Neugeborenen" [On the weight of the newborn]. *Arch. f. Gynäkologie* [Berlin], vol. 2 (1871), pp. 48–60.

A study of changes in weight of 60 newborn infants in a Berlin clinic. Changes in weight, in grams, are given for full-term and premature infants. Attention is paid to method of feeding and age periods at which losses and gains occurred. Special attention is given to the decrease in weight soon after birth.

265 **Gribbon, Madge R.:** "Some factors modifying the nutrition of children. A survey of 3,000 of the most marked cases of malnutrition in Viennese children, made in summer of 1921." *Edinburgh Medical Journal*, vol. 29 (1922), pp. 12–17.

A survey to determine what factors caused the persistence of malnutrition. Children served by the Friends' Relief Mission were classified into four nutritional groups: O, normal; A, fair; B, bad; C, worst. Three thousand of the C class were studied, with 300 A children for comparison. Investigations were made by a trained social worker, with schedule for collection of information. (Sample given.) Methods of weighing and measuring are not given. Tables were compiled comparing average weights in kilos of children 6 months to 6 years old in A and C classes, with normal standard, taken from the Pirquet Clinique, and with weights in kilos of C class children, arranged with reference to the presence of rickets, tuberculosis, or other disease. Size of family and position in family, parental care, cleanliness, air space per person, and family income were considered, and a table was compiled giving the average duration of breast feeding. The author concludes that the three factors determining continuance of malnutrition are illness, size of the family, and position of the child in the family.

266 **Griffith, J. P. Crozer, and J. Claxton Gittings:** "The weight of breast-fed infants during the first two weeks of life." *Arch. Pediat.* [New York], vol. 24, no. 5 (1907), pp. 321–345.

In the Preston Retreat of Philadelphia for confinement of married working women the authors studied the weight during the first two weeks of life of 11 boys and 115 girls, all normal and full term. The greatest weights were found in boys whose mothers were between 25 and 29 years, multiparæ, and robust. The initial loss is greatest on third or fourth day and is regained by the tenth to the fourteenth day. The heaviest infants lose most, girls begin to regain sooner. The loss is most marked in first-born children.

267 **Grover, Joseph I.:** "Some measurements of normal children, especially of the leg and arm. Some interesting deductions and practical possibilities." *Arch. Pediat.* [New York], vol. 32 (1915), pp. 473–486.

A report of measurements of about 500 normal children from birth to 12 years and 9 months of age, giving in tabular form the weight, head circumference, antero-postero head measurement, chest circumference, length, leg length, arm length, percentage of leg and of arm length to height. Methods of measurement are given. Many relationships between various measurements are discussed. The author concludes that comparisons of the circumferences of the head and chest are much more accurate in relation to weight than to age; that the arms and legs grow in a definite relation to the increase in height; that age is a poorer basis for the comparison of any dimensions than is weight or height.

268 **Grulee, G. G., and B. E. Bonar:** "Some observation on the so-called inanition temperature of the newborn." *Transactions of the American Pediatric Society* [Chicago], vol. 33 (1921), pp. 59–69.

Previous literature on the subject is carefully reviewed. One hundred and eighty-two infants in the maternity ward of the Presbyterian Hospital, Chicago, were observed for 5 days. Weight, temperature, amount and kind of food, and body excretions were recorded. Tables give the data in full. The author concludes that there is no relation between the per cent loss of weight, or the quantity of food ingested, and the "transitory fever of the newborn." The probable cause of fever is the absorption of protein products from the intestines.

269 **Gundling, Xaver:** Über Gewichtsverhältnisse der Neugeborenen in den ersten Lebenstagen und die Ursachen der Gewichtsabnahme [Weight of Newborn Infants During the First Days of Life and Causes of Loss in Weight]. Erlangen, 1898. 45 pp.

In this thesis (University of Erlangen) on the weight of newborn infants the author first treats the work of former investigators on the subject and then describes the material he studied in 1896 in the women's clinic of the University

of Erlangen, where weighings are made at birth and daily thereafter. The children are all healthy and full-term, 30 boys and 30 girls that were first born and 30 boys and 30 girls of multiparæ, all born in the occipital presentation with no meconium lost during the birth act. The figures are shown in four tables of weights during the first nine days, and eight pages are given to conclusions from each group of figures and from the whole. Other tables give data on 32 infants, of whom 7 were first born and 25 not, 18 were girls and 14 boys, all born in the breech presentation. Children born in this position suffer a smaller initial loss than those born in the occipital and recover the birth weight sooner. The author concludes that the chief factor in causing loss of weight is meconium.

270 **von Gutfeld, Fritz:** "Über den Einfluss körperlicher und sozialer Verhältnisse der Mütter auf die Körpermasse ihrer Neugeborenen" [Influence of physical and social relations of mothers on proportions of their newborn infants]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 73 (1913), pp. 266–279.

In the case of 5,000 women confined in the Charité at Berlin between January, 1907, and January, 1909, the author studied age, height (in most cases), number of pregnancy, and occupation of the mothers, and length, weight, and head girth of their infants. Children are separated in the eight tables by sex and by legitimacy. Boys were regularly larger than girls. The length and weight of infants rose continuously with age of the mother to their maximum when the mother was 28 to 35 years. These same values increased with each additional pregnancy up to the fourth, after which they remained about the same. Legitimate boy infants were larger than illegitimate; with girls the reverse was true. Domestic servants had larger children than laboring women. Dimensions of children were proportional to height of the mother.

271 **Haake, H.:** "Über die Gewichtsveränderung der Neugeborenen" [On the variations in weight of newborn infants]. *Monatsschrift für Geburtskunde* [Berlin], vol. 19 (1862), pp. 339–354.

A brief summary of opinions of several writers on physiological decrease of weight, followed by an account of the author's study of 100 newborn infants at a maternity home at Leipzig. The author found that a decrease in weight invariably takes place immediately after birth and usually lasts a day or two, after which an increase begins. Most of his cases regained their original weight in the first nine days.

272 **Häberlin, Carl:** Über die körperliche Entwicklung von Kindern im Frieden und Krieg" [The physical development of children in peace and war]. *Arch. f. Kinderh.* [Stuttgart], vol. 66 (1918), pp. 370–384.

The author compares the condition of children 4 to 14 years old in a sanatorium at Wyk during peace and during war. A table gives figures for height, weight, chest girth, and strength. Another table gives hemochrome content according to Gowers-Sahli, and hematin content. These values are determined also for 64 poor boys and 83 poor girls between 6 and 14 in 1917, and the figures are compared with corresponding figures for 1907 to 1914. The author discovered no ill effects due to the war.

273 **Haehner, H.:** "Über die Nährungsaufnahme des Kindes an der Mutterbrust und das Wachsthum im ersten Lebensjahre" [Nutritional intake and growth of the breast-fed infant during the first year]. *Jahrb. f. Kinderk.* [Leipzig], new ser. vol. 15 (1880), pp. 23–78.

The author gives detailed observations upon a girl infant. The milk for every meal was weighed during the first 34 weeks. The infant was breast fed for 24 weeks, then received mother's milk and cow's milk until weaned in the twenty-seventh week. Her weight was taken every week during her first year and her length at frequent intervals. At birth she was 3,100 grams in weight and 50 centimeters in length; at 52 weeks her weight was 9,470 grams and her length 75 centimeters. The mother's milk was weighed separately for the right and left breast. The data obtained by other investigators are compared with those of the author.

274 **Hall, W. S.:** "The changes in the proportions of the human body during the period of growth." *Journal of the Anthropological Institute of Great Britain and Ireland* [London], vol. 25 (1895), pp. 21–46.

Two thousand school boys in and about Philadelphia were measured for standing height, height of pubes, height of knee; girth of head, neck, chest, abdomen, hips, thigh, knee, calf, ankle, upper arm, elbow, forearm, wrist; depth of chest, abdomen; the interacromial breadth; the length of the upper arm, forearm, hand, foot; weight; vital capacity; the strength of the back, extensor muscles of the thigh, pectoral muscles, forearm and upper arm extensors and flexors. Charts from the author and other authorities give computed comparative curves of development. Table 1 compares the measurements taken with the height as a modulus, grouping by age and giving the number of cases for each observation. Table 2 gives the measurement of the body parts according to ages. Table 3 gives the relation of weight to linear dimensions and of lung capacity to strength. Table 4 gives the strength of muscle groups by ages. Author's conclusion: Vertical and horizontal growth alternate. The weight at different ages varies either as the product of height, the interacromial breadth, and the depth of the abdomen, or as the product of the height and the depth of the chest squared.

275 **Hall, *Mrs.* W. S.:** "The first five hundred days of a child's life." *Child-Study Monthly* [Chicago and New York], vol. 2 (1896–97), pp. 330–342, 394–407, 458–473, 522–537, 586–608.

A mother's observations of her own child, from whom she was not absent more than three hours at a time during the waking hours of the first 16 months of his life. Measurements were taken by the father, a professor of physiology in Northwestern University Medical School, who also prepared the chapter on growth. The record is arranged under the headings: Ancestry, Environment, Physical Development, and Psychical Development, and the observations are recorded and summarized.

276 **Hammett, F. S.:** "The effect of the maternal ingestion of desiccated placenta upon the rate of growth of breast-fed infants." *Journal of Biological Chemistry* [Baltimore], vol. 36 (1918), pp. 569–573.

A study of the growth of 177 infants during the first 13 days of life, the mothers having been given desiccated placenta. Comparison with the normal showed a decided increase in growth rate.

277 ——— "The relation between growth capacity and weight at birth." *American Journal of Physiology* [Baltimore], vol. 45 (1917–18), pp. 396–405.

To discover the relation between weight at birth and early growth the author collected data from the records of the Boston Lying-in Hospital as to weights of 537 infants, all breast fed, on the first, third, fifth, seventh, ninth, eleventh, and thirteenth days after birth. Weights from 5 to 11 pounds were grouped in six classes and the per cent change in weight tabulated and shown by graph. Tables are also given showing the per cent recovery to or over the initial weight, per cent distribution according to birth weight of 1,000 consecutive cases, and individual and relative growth capacity, classified by birth weight. The author found growth capacity for first two weeks dependent upon, and inversely proportional to, birth weight, and ability to recover and pass initial weight dependent on same law. Bibliography.

278 **Hammond, John, and Hsia Sheng:** "The development and diet of Chinese children." *Am. J. Dis. Child.* [Chicago], vol. 29 (1925), pp. 729–742.

A study of the measurements and of the diets of 96 Chinese boys, ages 5 to 17, living in the School for Poor Children, Peking. A sample of the chart used is presented, showing space for 34 measurements. The subjects wore only short coolie cloth trousers for which no weight was computed. Allowance was made for the Chinese method of recording age by subtracting 1½ years from the given age of each boy. Growth curves are derived for sitting height and age, standing height and age, weight and height, showing comparison with Chinese boys in summer schools and American boys (Baldwin). Food intake was low compared with American standards, but physical condition excellent. Height, weight, and weight-for-height ratio were lower than those of American boys.

279 **Harding, H. W.:** "Physique and the mental ability of school children." *The Child* [London], vol. 2 (1911), pp. 766–768.

An article asking that more attention be paid to the physical health of school children and including one table compiled from measurement of 219 boys, aged 13 and 14, attending three schools in Yarmouth, which shows the superior physique of boys in a higher grade at school. No technique is given.

280 **Harrington, T. F.:** "Health and education." *American Physical Education Review* [Boston], vol. 15 (1910), pp. 373–388.

With a general discussion of health problems in education the author includes a series of measurements of 763 boys and 653 girls of Boston parentage, attending in 1900–1909 the same schools in which Bowditch took his measurements. It is very probable that these two sets of measurements represent, in many instances, two generations of the same family. Average height in inches, without shoes, for ages 7 to 14, and average weight in pounds for the same ages are recorded. Two thousand weights of Boston schoolboys, aged 7, 9, 11, and 13, taken at random from data collected by the author, are compared with average weight of Boston schoolboys in 1876. Study to be continued.

281 **Hartelius, J. G. W.:** "Undersökningar vid Arboga folkskolor" [Investigations of the public schools of Arboga]. *Hygica, Medicinsk och Farmceutisk Månadsskrift* [Stockholm], vol. 64, pt. 1 (1902), pp. 208–223.

In five graphs and two tables are shown height, weight, and chest measurements of 248 boys and 362 girls 8 to 14 years of age.

282 **Hastings, W. W.:** "Anthropometric studies in Nebraska." *American Physical Education Review* [Boston], vol. 5 (1900), pp. 53–66.

An address before the National Education Association, Los Angeles, 1899. A tentative report is included of the results of measurements in 10 schools in Lincoln, Nebr., during 1898, and many comparisons are drawn between the physique of Nebraska children and those from other parts of the country and (briefly) from Belgium and England.

283 **Hawkes, E. W.:** "Skeletal measurements and observations of the Point Barrow Eskimo, with comparisons with other Eskimo groups." *American Anthropologist* [Lancaster, Pa.], vol. 18 (1916), pp. 203–244.

Report of a year's study of a skeletal collection from Point Barrow, Alaska, in the Wistar Institute of Anatomy, Philadelphia. It is based largely on adult material but contains a brief note (page 216) on infantile and adult characteristics.

284 **Hecker, C.:** "Über Gewicht und Länge der neugeborenen Kinder im Verhältniss zum Alter der Mutter" [On the weight and length of newborn infants in relation to the mother's age]. *Monatsschrift für Geburtskunde und Frauenkrankheiten* [Berlin], vol. 26 (1865), pp. 348–363.

The purpose of the article is to dispute the contention that the child's weight increases with the mother's age only until she reaches 25 to 29 years, after which there is a steady decrease. The author collected information on 4,449 cases in a maternity home in Berlin and presents his data in tables giving the children's weight according to sex and mother's age. He found that the weight of the infant increases with the mother's age until she becomes 44 years old and also with the number of preceding childbirths.

285 **Hedger, Carolina:** "The school children of the stockyards district." *Transactions of the Fifteenth International Congress on Hygiene and Demography*, 1912 [Washington], vol. 3 (1913), pp. 170–188.

The article deals largely with economic data, but contains two tables of height, weight, and chest girth for boys of 7 to 16 years and girls of 6 to 15 years. Methods of measurement are not given.

286 **Heidemann, M.:** "Über Gewichtsschwankungen Neugeborener mit besonderer Berücksichtigung der Resultate bei vierstündlichem Anlegen" [On fluctuations in weight of newborn infants, with special reference to the results obtained with the four-hour feeding schedule]. *Monatsschrift für Geburtshülfe und Gynäkologie* [Berlin], vol. 33 (1911), pp. 168–184.

A study of the effects of various feeding methods upon the growth of 528 newborn infants in a maternity hospital at Heidelberg.

287 **Heim, P., and M. K. John:** "Die kaseinfettangereicherte Kuhmilch (K. F. Milch) als Dauer- und Heilernährung [Casein-fat milk as a regular and a therapeutic food for infants.] *Monatsschr. f. Kinderh.* [Leipzig and Vienna], vol. 11 (1912–13), pp. 621–643.

In connection with a study of infant feeding changes in weight of infants are discussed and 10 weight curves are presented.

288 ———— "Über die Verwendbarkeit caseinangereicherter Kuhmilch. Theoretische Überlegungen" [On the use of casein milk; theoretical considerations]. *Ztschr. f. Kinderh.* [Berlin], vol. 4 (1912), pp. 1–31.

In connection with a discussion of the addition of casein to cow's milk the authors give case histories and weight curves for five infants in a children's polyclinic in Budapest.

289 **Heimann, Fritz:** "Physiologische Gewichtsabnahme und transitorisches Fieber beim Neugeborenen" [Physiological loss of weight and transitory fever in newborn infants]. *Monatsschrift für Geburtshülfe und Gynäkologie* [Berlin], vol. 51–52 (1920), pp. 27–41.

A discussion of the many phases and factors involved in the physiological loss of weight following birth, the discussion being based on previous publications by others and on the writer's own observations during eight years in the Breslau's Woman's Clinic of 1,581 infants that were kept over 10 days in the clinic and were not subject to severe illness. These infants belonged to the lower classes, had an average birth weight of 3,262 grams, and were 97.5 per cent breast fed, receiving five meals a day. After taking up in turn many details on the initial loss and showing that it is lessened by beginning early to feed the infant, the author considers from his experience with 8,441 infants the harmless transitory fever accompanying the initial loss.

290 **Heller:** "Physiologie der Neugeborenen" [Physiology of the newborn]. *Deutsche Med. Wchnschr.* [Leipzig and Berlin], vol. 40, pt. 2 (1914), p. 1832.

A series of investigations was conducted in a midwives' school. The same amount of milk was given in five meals to 200 children, six meals to 70, and seven meals to 20. Of the first series 10.5 per cent reached initial weight on the ninth day, of the second group 10 per cent, and of the third group 15 per cent. Tests of blood-sugar content on 12 newborn and 3 premature infants by Bang's method showed that this content lies within the same limits as in the case of older infants and adults. It remained constant in spite of variations in amount and time of meal, etc. Temperature, on the other hand, as tested on 52 children showed great variation, due perhaps to abnormal metabolic processes.

291 **Hellmuth, Karl, and von Wnorowski:** "Variationsstatistischer Beitrag zur Frage des Einflusses der Jahreszeit auf das Körpergewicht der Neugeborenen" [Contribution according to variation statistics concerning the question of the effect of season on body weight of the newborn]. *Klinische Wochenschrift* [Berlin and Munich], vol. 2 (1923), pp. 75–78.

The authors differ in their conclusions from Abels, who from statistics on 3,459 births became convinced that the average weight of newborn infants in other seasons is considerably greater than during the winter on account of the poverty of foods in vitamins in the latter season. The authors had data on 26,515 births occurring between 1912 and 1922. Tables of this material are divided according to first-born and later-born infants. Curves are also given. The authors find that from the standpoint of statistics there is no fluctuation of the birth weight according to season. They cite instances in which critical evaluation of statistical results has corrected many fallacies.

292 **Heron, David:** The Influence of Defective Physique and Unfavorable Home Environment on the Intelligence of School Children. Galton Eugenics Laboratory Memoirs, No. 8. London. 1910. 60 pp.

A lengthy statistical examination of a pioneer school survey by the London County Council, dealing with 12 boys' schools and 13 girls' schools, a total of 4,286 boys and 4,474 girls. For every child there is a statement of age, height, weight, and mental capacity, with additional reports, not complete, of state of teeth, nutrition, hearing, condition of adenoids, tonsils, and cervical glands, condition of clothing, and degree of cleanliness. The analysis of these records led to the conclusion that too much latitude was given for personal judgment. No sensible effect on intelligence of nurture, environment, and physique was discovered.

293 **Herrman, C.:** "One hundred infants followed from birth to the end of the first year." *Arch. Pediat.* [New York], vol. 30 (1913), pp. 97–110.

A summary of the records of about 100 infants born in the maternity ward of a hospital and followed with observations at periods of one month or less during the first year of life. Charts are given of the unusual records, with descriptive notes on the cases.

294 **Herskovits, Melville J.:** "Correlation of length and breadth of head in American negroes." *American Journal of Physical Anthropology* [Washington], vol. 9 (1926), pp. 87–97.

In a general study of variability under racial crossing with special reference to the American negro-white population the author collected data on the length and breadth of head of 1,211 boys from Public School 89, New York City. Tables.

295 ——— "A further discussion of the variability of family strains in the negro-white population of New York City." *Journal of the American Statistical Association* [Concord, N. H.], vol. 20 (1925), pp. 380–389.

Tables show the interpupillary distance, width of nostrils, height of ear, and length of middle finger in two groups of negro-white children, comprising about 1,200 boys and about 120 girls.

296 ——— "The influence of environment on a racial growth curve." *School and Society* [Lancaster, Pa.], vol. 22, no. 551 (1925), pp. 86–88.

From the records of the Colored Orphan Asylum at Riverdale, New York City, the author secured a series of measurements of height and weight of about 300 boys who had been measured at least three times a year "over an appreciable length of time." Measurements were taken with outer clothing and shoes removed. Weighing was on an ordinary scale and height was recorded from a feet-and-inches recorder attached to the scale. In the statistical computations allowance was made for inaccuracies due to the use of this instrument. Comparison of the results with statistics from a public school for boys with negro-white racial background showed the colored orphanage children lighter in weight and smaller, year for year, from 5 to 16, than public-school children of the same racial type, the differences being about the same as those found by Boas between Hebrew children in and out of orphanages.

297 ——— "Some observations on the growth of colored boys." *American Journal of Physical Anthropology* [Washington], vol. 7, (1924), pp. 439–446.

One thousand and six boys of Public School 89, New York City, a mixed racial group of low economic standing, were measured as to height and weight by the author. Height was measured with shoes, to the nearest centimeter, on a wooden measuring rod with a projecting arm. Deduction was made for the heel. Weight was taken without coats, sweaters, or overcoats, with an ordinary scale. Age was checked with the school record, calculated in years, months, and days, and tabulated to the nearest half-year. Tables show the mean and standard deviation of the mean, the standard deviation of the series, and the increment for each year over the preceding year in height and weight, with comparative data from Boas, Greenwood, and Hrdlička; also the coefficients of variability for Iowa white boys (Baldwin) and for the present series. The colored boys were found to grow faster in height and weight to the sixteenth year than the white boys. The adolescent acceleration in growth was found to occur approximately one year earlier in colored than in white boys.

298 **Hertz, Poul:** "Investigations on the growth of children in the Copenhagen elementary schools." *School Hygiene* [London], vol. 3 (1912), pp. 175–178.

A report of measurements of 2,365 children attending two schools in Copenhagen, one a pay school, one free. Methods are not given. The children of the pay school were found heavier and taller, the difference being at a minimum at about 10 years of age. Tables give average weight and height of boys 6 to 13 and girls 6 to 14 and comparative figures for the two schools.

299 **Héry Lucien:** Sur l'allaitement des nouveau-nés [Feeding the Newborn]. Paris, no. 166, 1897. 72 pp.

Thesis for medical degree (University of Paris). Two chapters on loss and gain of weight in the newborn contain tables on the comparative loss of weight of 336 infants of women who had not previously nursed an infant and of 184 infants of women who had nursed, showing a greater initial loss in the former series. Gain in weight began sooner in the second series. Bibliography.

300 **Herzfeld, B.:** "Das neugeborene Kind und seine Eigentümlichkeiten" [The newborn child and its peculiarities]. *Jahrb. f. Kinderh.* [Berlin], vol. 99 (1922), pp. 78–85.

The author discusses weight and temperature of newborn children without stating the number of children observed. His tables show the initial loss to be 9.79 per cent and the end of such loss to occur on the second day in 82 per cent of cases, on the third day in 45 per cent, on the fourth day in 31.3 per cent, later than the fourth day in 15.5 per cent. According to his statistics birth weights are seldom regained by the tenth day. The temperature after birth is 37° C. to 38.2° C. Children born "dry" have relatively low temperature. During the first 12 to 18 hours the temperature of all infants falls to about 35° C., then rises to 36.2° C., where it remains for the next six days, and then rises on the eighth day to 37°C. Detachment of the umbilical cord does not affect temperature, but any irregularity in feeding does. The author had not observed the so-called transitory fever.

301 **Hess, Julius H.:** Premature and Congenitally Diseased Infants. Lea & Febiger, Philadelphia, 1922. 397 pp.

The author describes the characteristic features of the fetus and gives tables of the weight, length, head, and other measurements, as given by many authorities, by weekly and monthly periods of intrauterine development. He also gives tables from other authorities of a large number of measurements of the body, limbs, brain, and internal organs for mature and premature infants. The development of premature infants is discussed in detail. The formulas of DuBois and DuBois and of Howland and Dana for estimating body surface are explained, and Pfaundler's dermatograph for measuring body surface is discussed and shown in a photograph.

302 **Hesse, W.:** "Bestimmungen des Gewichtes und Messungen der Körperlänge bei einem Kinde im ersten und zweiten Lebensjahre" [Determination of weight and measurement of length of body in the case of one child in the first and second year of life]. *Archiv für Gynäkologie* [Berlin], vol. 14 (1879), pp. 491–493.

Data as to the weight, height, and feeding of one child in the first two years of his life. Two pages of tables are included.

303 ——— "Bestimmungen des Gewichtes und Messungen der Körperlänge bei einem Kinde im ersten und zweiten Lebensjahre" [Determinations of weight and measurements of length of a child in the first and second years]. *Archiv für Gynäkologie* [Berlin], vol. 17 (1881), pp. 150–152.

This table gives date, weight, length, record of teeth, diet, etc., of a girl in Saxony from birth in October, 1878, to October, 1880. In the first year she gained 18.22 grams per day; in the second year, 7.38 grams.

304 **Heubner, O.:** "Wachstum des Kindes" [Growth of the child]. *Lehrbuch der Kinderheilkunde* [Leipzig], vol. 1 (1911), pp. 1–12.

After describing changes in growth between infancy and maturity the author asserts that all growth proceeds according to laws. These can be ascertained by weighing and measuring either many children of the same age or the same children at different ages. The first table, compiled from Camerer and others, gives weight of nurslings from 4 to 52 weeks old and of boys and girls separately from 2 to 18 years old. Two tables from Camerer, Lansberger, et al., give the length during the first year, and another table the height of boys and girls separately for each year up to 19. From these data the author draws the conclusions that growth both in weight and in height shows periodical fluctuations, being retarded in the third quarter of the first year and during the years 8 to 11 in girls and 9 to 13 in boys, and that increase in height and increase in weight are not congruent—height increases slightly between November and March, considerably between April and August, whereas weight increases from August to November. The circumferences of skull and of chest are given in a table based on the investigations of Schmid-Monnard and Monti and of Landsberger and Ranke, and the quotient of height to skull according to Rudnitz.

305 **Hillebrand, Franz,** "Untersuchungen über die Milchzufuhr und über die Jodkaliumausscheidung des Säuglings" [Investigation into the intake of milk and elimination of iodide of potassium in the infant]. *Archiv für Gynäkologie* [Berlin], vol. 25 (1884–85), pp. 453–481.

In the obstetrical clinic at Bonn the author studied 25 newborn girls during their first 10 days of life; of these, 16 were normal. He gives case histories of these 16, including 9 first born, and tables of weights and food intake. Perspiration was not determined. Results obtained by other students are discussed and shown in comparative tables. The author concludes that first-born infants are 1½ days behind others in weight and appetite.

306 **Hillenberg:** "Betrachtungen über den Einfluss der natürlichen und künstlichen Ernährung auf die körperliche Entwicklung der Säuglinge im Stadt- und Landkreis Zeitz" [Observations on effect of natural and artificial feeding on physical development of infants in city and district of Zeitz]. *Zeitschrift für Säuglingsfürsorge* [Leipzig], vol. 6 (1912), pp. 157–169.

The author gives observations of the weighing of 1,659 infants. Tables show weights of infants with relation to method of feeding over definite periods of time. For the ages 4 to 6 months bottle-fed infants are heavier; in the second half of the first year breast-fed infants are heavier. The author believes first teeth come later with artificial feeding.

307 **Hirsch, J.:** "Die 'physiologische Gewichtsabnahme' der Neugeborenen" [The "physiological decrease" in the weight of the new born]. *Berliner Klinische Wochenschrift* [Berlin], vol. 47 (1910), pp. 11–13.

Study of 17 normal newborn infants in a maternity hospital in Berlin to determine the nature of the "physiological loss" in weight. The author disagrees with the theory that the decrease is due to an increased output of the infant's body accompanied by small intake and attributes it to the discharge of meconium; he says it can not be considered as a real decrease. He also found that there is a very small real decrease amounting to 10 to 20 grams and due to the decomposition of albumin and evaporation of water through the skin. If the food is sufficient the original weight is regained within eight days. One table and two curves are given.

308 **Hirschl, Henry:** "Bericht über die Gesundheitsverhältnisse bei 1,000 Neugeborenen in den ersten Lebenstagen" [Report on the state of health of 1,000 infants during the first days of life]. *Archiv für Gynäkologie* [Berlin], vol. 69 (1903), pp. 702–716.

A discussion of the weight of 1,000 infants in an obstetrical clinic at Prague is included, and two tables are given.

309 **Hirst, Barton Cooke:** "Weight sheets of infants fed entirely or partially upon the bottle in the Philadelphia Hospital, during the five months, August to December, inclusive. *Annals of Gynaecology and Pediatry* [Philadelphia], vol. 5 (1891), pp. 249–252.

Weights of 28 infants are given, 6 partly breast fed and 22 artificially fed.

310 **Hitchcock, E.:** "A comparative study of average measurements." *Proceedings of the American Association for the Advancement of Physical Education* [Ithaca], vol. 6 (1891), pp. 37–42.

Tables showing comparative measurements, in 52 dimensions, of Amherst, Mount Holyoke, and Wellesley students, from statistics of about 500 individuals at each of the three colleges, taken from the freshman classes, 1884 to 1889.

311 ——— "A synoptic exhibit of 15,000 physical examinations." *Proceedings of the American Association for the Advancement of Physical Education*, [Ithaca], 1890, p. 5.

A list of average measurements derived from the examination of nearly 15,000 students at Yale, Amherst, and Cornell. Fifty different measurements are listed without details of technique or discussion of results.

312 ——— The Results of Anthropometry. Carpenter & Morehouse, Amherst, 1892. 7 pp.

A paper read before the American Association for the Advancement of Physical Education in April, 1892. It gives the results of physical measurements of nearly 3,000 students at Amherst but does not state technique. A chart shows various groupings of measurements of 43 portions of the body, seven tests of strength, capacity of lungs and pilosity.

313 ——— **and H. H. Seelye:** An Anthropometric Manual Giving Physical Measurements and Tests of Male College Students and the Method of Securing Them. Carpenter & Morehouse, Amherst, 1893. 35 pp.

A report describing apparatus used and giving results of measurements and physical examinations of Amherst students.

314 **Hitchings, F. W., and G. W. Fitz:** "Seasonal variations in growth of boys." *Gaillard's Medical Journal* [New York], vol. 77 (1902), p. 216.

A study of 20 boys, aged 7 to 14, at the Boys' Home at Dedham, Mass. Subjects were weighed stripped, once a week, and heights measured (method not given) every three months except in the third quarter. The author found that more than 90 per cent of the total increase in weight was made between June and December; that weight variations in individuals were more marked in the winter-spring than in the summer-fall period; that the general form of the curve of growth in weight was common to all subjects studied. Weather conditions showed little influence. Growth in height either was continuous or was more rapid at the period of rapid growth in weight.

315 **Höjer, J. A.:** "Körpergewichten von Säuglingen in einigen Vororten Stockholms 1920–1924" [Weight of infants in certain suburbs of Stockholm in 1920–1924.] *Acta paediatrica* [Upsala], vol. 5 (1925), pp. 59–78.

The author studied the weights of 550 infants in Stockholm under 1 year of age. The children were weighed at birth; then once a month during periods which varied from several weeks to nearly one year. Tables give the weight and increase in weight according to the method of feeding (breast, mixed, artificial) and length of the observation period. Swedish, Norwegian, and German breast-fed infants showed similarity in regard to gain in weight. The artificially-fed infants showed a much slower gain than those at the breast or on mixed feeding. The time required to double the original weight was found to depend mainly on weight at birth. When the course of growth was similar doubling of the original weight took place within 164 days in the case of children weighing at birth 3,500 grams and within 112 days in the case of those weighing 2,500 grams. References.

316 **Hoffman, F. L.:** Army Anthropometry and Medical Rejection Statistics. The Prudential Press, Newark, N. J., 1918. 114 pp.

A communication by the statistician of the Prudential Insurance Co. of America, who served as a member of the committee on anthropology of the National Research Council, urging a national anthropometric survey and new physical standards. Statistics show the results of recruiting experience from 1906 to 1915, giving various tables of height, weight, and chest measure from the age of 18 up.

317 **Hofmann:** "Über die Gewichtszu- und Abnahme neugeborener Kinder" [On the increase and decrease in the weight of newborn children]. *Neue Zeitschrift für Geburtskunde* [Berlin], vol. 27 (1850), pp. 145–148.

A study of 36 newborn infants made by the author in a maternity hospital at Würzburg to decide as to the existence of a decrease in weight of newborn infants. The author gives no statistics but presents his conclusion that such a decrease actually takes place, most frequently within 36 to 48 hours after birth, that on the third day the child begins to gain, and that on the fifth or sixth day it reaches its initial weight. The amount of decrease and increase, the author thinks, depends on the care received by the child.

318 **Holmgren, I.:** "Über den Einfluss der Basedowschen Krankheit und verwandter Zustände auf das Längenwachstum nebst einigen Gesetzen der Ossifikation" [Influence of Basedow's disease and related conditions upon height, together with some laws of ossification]. *Nordiskt Medicinskt Arkiv* (Inre medécin) [Stockholm], 1909, vol. 9, ser. 3, no. 5, pp. 1–117; 1910, vol. 10, ser. 3, no. 1, pp. 1–185, and no. 2, pp. 187–247.

In an effort to prove that Basedow's disease is accompanied by premature growth and ossification the author thoroughly works over a great mass of material found in other treatises and his own researches, conducted chiefly in the polyclinic for internal diseases in Stockholm, 1905–6. He presents detailed descriptions of many cases, also numerous tables and graphs, and attaches a full bibliography. He measures the height of the subject without shoes, with feet touching from heel to toe. He concludes that struma and abnormally rapid heart action are found with excessive stature in the adolescent stage and with a relatively early ossification of the epiphyseal cartilage.

319 **Holt, L. Emmett:** Standards for growth and nutrition. *Am. J. Dis. Child.* [Chicago], vol. 16 (1918), pp. 359–375.

The author discusses three standards of nutrition susceptible of application to large groups of children: (1) The weight-to-height relationship, (2) the annual rate of increase in weight and growth in height, (3) the general appearance of the child. By a comparative study of 1,774 observations made by a physical director on 350 boys of a favored social group whose weights were taken semi-annually, without clothing, for a period of years, with the studies of Porter, Hastings, Boas, and Bowditch, he shows that wide variations make the weight-for-age relationship of little value in determining nutrition. By similar analysis he shows that height-age curves are unreliable. In weight-to-height curves he finds surprising uniformity, pointing to the value of the weight-height index. His data also show the value of the record of annual increase in height and weight as a nutrition index, and the fact that growth is more rapid in summer than in winter. Deductions from any measurements, he feels, should be modified by inspection of the general appearance of the child.

320 **Holt, L. Emmett, and H. L. Fales:** "Observations on the health and growth of children in an institution." *Am. J. Dis. Child.* [Chicago], vol. 26, no. 1 (1923), pp. 1–22.

A 31-month study of the inmates of a home and school for poor children of both sexes, aged 4 to 16, who were housed during the early part of the study in New York and during the later part in the country. The routine of living is described and particulars as to diet are given, with typical diet sheet of a medium-sized boy. Weights without shoes and in indoor clothing were taken about once a month; heights, without shoes, about once in three months. Observations of weight on 151 boys and 195 girls numbered 2,995. These data are discussed with reference to racial distribution, relation of weight to height, of height to age, and of weight to age, progress in weight and height, and seasonal variations in growth. There are several tables and charts. The authors found good health and excellent nutrition possible in institutional life; a considerable deviation from the ideal diet consistent with good health; no regular seasonal variations in growth; a remarkably regular annual gain but wide monthly fluctuations.

321 ——— **and John Howland:** "Growth and development of the body." Diseases of Infancy and Childhood, Ch. II, pp. 15–32. D. Appleton & Co., New York, 1923.

Statements in previous editions have been revised and brought up to date. This chapter now contains average birth weights of 568 females and 590 males from records of consecutive cases at three New York institutions; observations upon weight during the first few weeks from the authors' own investigations of 100 healthy nursing infants, weighed daily, supplemented by 735 other cases for which the authority is not given; a weight curve for the first year from complete charts of about 200 healthy nursing infants weighed every week, and incomplete charts of about 700 other infants, representing 30,000 observations; a chart of average weight for height of boys of five nationalities, from figures of Baldwin and Bowditch; tables of standard weight for height, based on measurements partly original, heights without shoes, weights in clothing, including shoes (figures are given for average observed weight of clothing worn by boys and girls at the present time); tables of average annual increase in weight and height, birth to 18 years; average net weight, height, and circumference of head and chest, birth to 3 years; average length at birth of 442 infants (231 male, 211 female) from records of two New York institutions; average circumference of head at birth from 446 infants (231 male, 215 female) from two New York institutions; remarks upon growth of extremities compared with the trunk, closure of sutures and fontanels, shape of the head, measurements of chest and abdomen.

322 **Hrdlička, Ales:** Anthropological Investigations on One Thousand White and Colored Children of Both Sexes. Wynkoop, Hallenbeck, Crawford Co., New York and Albany, 1900. 86 pp.

A study of 1,000 children in the New York Juvenile Asylum and of 100 children in the New York Colored Orphan Asylum to learn something of the physical condition of children in asylums and the probability of their being made useful citizens; also to add to the anthropological data on children, normal and abnormal. The technique of measurements and examination is fully described, and records are arranged to show percentage of abnormalities in various groups (sex, color, race, family history) and comparison of normal physical characteristics in the different groups.

323 ——— Physical differences between white and colored children." *American Anthropologist* [Washington], vol. 11 (1898), pp. 347–350.

An abstract of a study of the more stable physical differences between white and negro children. The statistical data upon which the study is based are not given in this article.

324 ——— Physiological and Medical Observations among the Indians of the Southwestern United States and Northern Mexico. Smithsonian Institution, Bureau of American Ethnology, Bulletin 34. 460 pp. Washington, 1908.

Many tables and charts are presented and a summary given of observations of 54 Apache and 80 Pima children whose ages were known and of 392 Apache and 310 Pima children of unknown ages. Data include height, weight, pulse, respiration, dentition, principal head and face dimensions, manual strength, puberty, and appearance of beard.

325 **Illinois Department of Public Health:** "Illinois standard weights and measurements of normal children prepared by Illinois Department of Public Health; normals, with minimum and maximum allowances, based on measurements of 12,500 children; revised to Aug. 1, 1920." *Illinois Health News* [Springfield], vol. 7 (1921), pp. 154–157.

Tables only. No statements as to method of derivation.

326 **Ingerslev, E.:** "Om nyfödte Börns Vägtforhold" [Weight of newborn children]. *Nordiskt Medicinskt Arkiv* [Stockholm], vol. 7, no. 7 (1875), pp. 1–33.

In 17 tables the weights of 3,450 newborn children are studied and the results given in relation to age and poverty of mother, etc. Daily increases are also studied.

327 **Issmer, E.:** "Zwei Hauptmerkmale der Reife Neugeborener und deren physiologische Schwankungen" [Two main symptoms of the maturity of newborn infants and their physiologic fluctuations]. *Archiv für Gynäkologie* [Berlin], vol. 30 (1887), pp. 277–315.

An original study of records of length and weight of 12,303 newborn infants at a maternity hospital in Dresden, 61.8 per cent of whom were mature. The author considers length and weight as the most important characteristics of maturity. He discusses in detail his own findings (giving a small number of statistics) and those by a number of other writers. The weight and length are affected by the child's sex (boys are heavier than girls); mother's age (younger mothers have larger children); and number of previous births (first-born children are lighter than those of subsequent birth). Race affects the size; women of the taller northern races give birth to larger children than southerners, and large parents have larger children than small parents.

328 **Jaenicke, Dr.:** "Schulärztliche Untersuchungen in einer Thüringener Berufsschule" [Physical examinations of pupils in an industrial continuation school in Thuringen]. *Zeitschrift für Schulgesundheitspflege und soziale Hygiene* [Leipzig], vol. 38 (1925), pp. 303–311.

An account of a physical examination made by the author of 733 boys and 283 girls ranging in ages from 14 to 17 years and attending an industrial continuation school in a German city. The author gives the average weight and height for each year of age for both sexes, and for the boys correlates these data with occupation. He found that the figures so obtained were for both sexes one or two years below the average for the corresponding ages. He attributes this to the effect of the war.

329 **von Jaschke, Rud:** "Beitrag zur Frage nach dem Nahrungs- und Energiebedürfnis des vollkommen gedeihenden Brustkindes" [Contribution to the question of the food and energy requirement of the normally developing breast-fed child]. *Ztschr. f. Kinderh.* [Berlin], vol. 16 (1917), pp. 1–12.

A study of a normal breast-fed male infant weighing 3,820 grams at birth. Two weight curves and a table giving the amounts of milk consumed, with its caloric value and the energy quotient for the first 159 days of life are included. During the first month an increase in weight corresponded to an energy quotient of more than 100, usually 120. After that the quotient became lower, approaching Heubner's value of 100.

330 **Johnson, Buford J.:** Mental Growth of Children in Relation to the Rate of Growth in Bodily Development. E. P. Dutton and Co., New York, 1925. 160 pp.

The studies that appear in this monograph are based on records of the Bureau of Educational Experiments, New York, which had been established about seven years at the time of writing. All data were obtained at the bureau's own nursery school and city and country school, the physical measurements by the school physician. The data on physical growth include tables of monthly measurements of weight and height of several individuals from 1.4 to 9.8 years of age, and a table showing the relation of the weight-height index to chronological age, to pulse rate, and to blood pressure in boys and girls under 13 years of age. Repeated measurements at regular intervals of weight, height, pulse rate, and blood pressure of the same children showed wide variations from the established norms for certain groups. Although the ratio of weight to height increased with chronological age, small groups at each age showed wide variations from the norm. Blood pressure was influenced to a greater extent by weight-height index than by chronological age. Pulse rate decreased with increasing chronological age and with increasing weight-height index.

331 **Johnson, G. E.:** "Some facts of child development and their relation to school work and school grading." Report of the Andover, Mass., School Committee, 1900, pp. 10–24.

A superintendent's report suggesting changes in the school system to take more account of the physical condition of the children. A small series of measurements is included which bear out Porter's theory of the correlation between physical and mental development.

332 **Jona, E.:** "Sulla statura e circonferenza toracica degli scolari agiati in confronto dei poveri" [On the height and chest circumference of school children of well-to-do families as compared with poor children]. *L'Igiene della scuola* [Genoa], vol. 4 (1913), pp. 131–133.

An account of measurement by author of the height and chest circumference of school boys 6 to 11 years old in the city of Turin. The exact number of children is not given, but it was "over 600." The author gives the average height and chest circumference for each year of age in two groups—one for the well-to-do children, the other for the poor. He found that the children in the poor group were shorter than those in the well-to-do but had a larger chest circumference. This is attributed by the author to the fact that poor children are out of doors more, even in cold weather, than children in well-to-do families.

333 **Kakuschkin, N.:** "Zur Topographie des Nabels bei Frauen und Neugeborenen" [Position of the navel in women and newborn]. *Monatsschrift für Geburtshülfe und Gynäkologie* [Berlin], vol. 36 (1912), pp. 278–291.

A table for newborn infants gives weight, position of body at birth, sex, supraumbilical length, infraumbilical length, and proportionate relation of latter to former. The greater the weight of the infant the higher is the navel in relation to body length. It is higher in girls than boys and higher in infants with vertex than with breech presentation.

334 **Karnitzky, A. O.:** "Chto takoye zdorovi normalni rebenok?" [What is a normal healthy child?]. *Russki Vrach* [St. Petersburg], vol. 4 (1905), pp. 417–423.

After giving an account of the conditions required for the perfect development of a child in intrauterine and extrauterine life the author gives in tables average weights of children (number not given) from birth to the age of 17 years as found by several writers. To this he adds the weights and annual increase in weights of his own five children whom he studied regularly from birth until the oldest was about 17 years old. Greater variations were found by the author in the growth curves for his children than in the general growth curves of other investigators.

335 ——— "Individualiziruiushchi sposob pri izuchenii zakonov rosta cheloviecheskavo tiela" [Individualizing method of the study of the laws of growth of the human body]. *Russki Vrach* [St. Petersburg], vol. 3 (1904), pp. 238–241.

A discussion of the advantages of the individualizing method as compared with the generalizing method for obtaining information concerning laws of growth. The author gives a brief account of the study of his own five children which he carried on from their birth until the oldest was 16½ years old. In a table he gives their weight and annual and monthly increase in weight. He compares these data with corresponding average values obtained by other writers for groups of children and finds considerable differences between the two sets of figures. Several writers are quoted and references given.

336 ——— "K voprosu o rostie i razvitii dietskavo organisma" [On the question of the growth and development of the child's body]. *Universitetskiia Izvestiia* [Kiev], vol. 48 (1908), pp. 427–446.

A history of the physical development of the author's son from the time of his birth until his accidental death when 33 weeks old. The author gives consecutively for every day of the child's life his weight, average weight for each week, daily and weekly fluctuations, and for every week the length of the body, circumference of head and of chest, and general physical condition; also in a separate table the number of white blood corpuscles for each week from the seventh to the thirty-third. In a summary of his findings the author states that a child gains in weight slowly during the first month and more rapidly in the second month; the gain in length is greatest in the first month of life. The study of the blood of a breast-fed child is a sure sign of his normal growth and development.

337 ——— "Zakon periodichnosti v viesovikh narostanyakh u dietiey" [Law of periodicity in increase of weight of children]. *Vrachebnaya Gazeta* [St. Petersburg], vol. 10 (1903), pp. 617–620, 643–647.

The author reviews the literature on periodicity of growth of the young child and gives a brief account of the study of weight, height, and chest circumference of his own five children (ages not given) during several years. The children were weighed several times daily and the quantity and quality of their food noted. On the basis of his own findings and those obtained by other writers he concludes that there is a law of periodicity of growth, namely, that the rate of growth varies with the seasons. In his own children he found the increase in weight particularly rapid in the fall; it was slow in the winter. In the summer the weight decreased. No explanation is given. References.

338 ——— "Zur Physiologie des Wachstums und der Entwicklung des kindlichen Organismus" [The physiology of the growth and development of the child organism]. *Jahrb. f. Kinderh.* [Berlin], vol. 68 (1908), pp. 462–474.

The author describes in detail the development of his sixth child, a boy, who was breast fed to the age of 11 weeks; then in addition to mother's milk received a barley decoction, and at the age of 3 months and 9 days began wholly artificial nourishment. The infant progressed satisfactorily until the twenty-eighth week. The author insists that body weight is not a sufficient criterion of health; that to it must be added consideration of sleep, appetite, good spirits, and especially the objective examination of feces and blood. Three tables are given; the first contains data on weight, length, girth of head and chest, and general condition; the other two, data on white corpuscles, red corpuscles, hemoglobin, the iron and the specific gravity of the blood.

339 **Kassowitz, Karl:** "Zur Frage der Beeinflussung der Körperlänge und Körperfülle durch die Ernährung" [Influence of diet on height and nutrition]. *Ztschr. f. Kinderh.* [Berlin] vol. 30 (1921), pp. 275–280.

To show the effect of good nourishment in promoting the development of poor children the author gives tables showing how the children in a home in Vienna after a sufficiently long sojourn exceeded Camerer's figures for both height and weight. Their food was affected by the war in quality but not in quantity. Especially robust were 14 children who had stayed over five years in the home, and on these children the author gives many details. These children alone, the author believes, invalidate Schlesinger's theory of the irrelevance of external influences on height.

340 **Kastner, O.:** "Körpervolumen und spezifisches Gewicht von Säuglingen" [Volume and specific gravity of infants' bodies]. *Ztschr. f. Kinderh.* [Berlin], vol. 3 (1911–12), pp. 391–412.

A study of body volume and specific gravity of 154 infants under 1 year. Some of the infants were examined after death. The specific gravity at different ages is given, and comparisons are made of the author's findings with those of other workers. The effect of pathological conditions is noted. Several references are given.

341 **Katz, S. E., and Horace Gray:** "Health and growth of children in an institution." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 464–472.

The authors studied 156 children in a Jewish institution which receives both boys and girls, from 5 to 17 years of age, from the poorest classes of society. Observations were made on physical development and state of nutrition. Charts show height for age, and weight for height, of boys and girls; and tables, the state of nutrition with relation of weight to height, length of residence in the home, tuberculosis in the parents, and order of progeny.

342 **Kay, T.:** "Tables showing height, weight, mental capacity, condition of nutrition, teeth, etc. (of Glasgow school children)." *Journal of the Royal Sanitary Institute* [London], vol. 25 (1904–5), pp. 907–913.

Measurements of about 700 children, aged 6 to 14; details of method not given. Tables show relation of height to weight, and mean inspiration and expiration for each year of age; numbers differing more than 5 per cent from average, for each year; weight and height at each year in several schools, with comparisons; mental capacity, school attendance, care of teeth, personal cleanliness, housing conditions, etc. No conclusions.

343 **Kehrer, F. A.:** "Über die Ursachen der Gewichtsveränderungen Neugeborener" [The causes of variations in weight in the newborn]. *Archiv für Gynäkologie* [Berlin], vol. 1 (1870), pp. 124–125.

From a study of the weight loss after birth of 144 newborn infants and a comparison of weight losses in animals the author gives his theories as to how part of this weight loss in infants may be prevented.

344 **Kerr, J.:** "Standards of heights for school children." *School Hygiene* [London], vol. 8 (1917), pp. 101–115.

With many references to statistical work relative to height and weight of children the author illustrates his contention that statistics without a standard are valueless. He constructs a chart with a standard height curve from 119 centimeters at the age of 5 to 177 centimeters at the age of 19; plots on it for comparison curves from the statistical work of five investigators, and derives a table of percentage deficiency at each birthday for four of the groups. He concludes that without this or a corresponding method no benefit can be derived from further research.

345 **Kettner, Arthur H.:** "Das erste Kriegsjahr und die grössstädtischen Volksschulkinder" [First year of war and the city public-school children]. *Deutsche Med. Wchnschr.* [Berlin], vol. 41, (1915), pp. 1428–1429.

The author, a school physician in North Charlottenburg, had experience from 1907 to 1915 among 5,000 children of the laboring classes from their birth to the age of 14 years. He notices little injury of young children due to war, probably owing to Federal aid to nursing mothers, though he finds greater frequency of rachitis and tetanus. Moreover, in the spring of 1915 he gave an official report that according to observations other children, too, seemed to have suffered no adverse effects. A little later, however, school measurements of weight and height proved that the children had sensibly suffered during the war year of June, 1914, to June, 1915. He gives four graphs of weight and height of boys and girls, containing curves for peace years and the war year.

346 **Key, Axel:** "Läroverkskomitens Betänkande, Bilag E, 1 afd., Text" [Report of Educational Committee, Suppl. E, 1st part, Text]. Stockholm, 1885. 719 pp.

An exhaustive study of school hygiene in Sweden and other countries. Chapter 11 deals with growth and development. More than 14,000 children are studied. More than 20 tables and 1 graph give the findings as to height, weight, yearly increase in height and weight, etc.

347 **Keys, Noel, and Wm. W. Cadbury:** "An age-height-weight study of Cantonese school boys." *China Medical Journal* [Shanghai], vol. 40 (1926), pp. 14–24.

A study made by a class in statistical method of the Canton Christian College, designed to provide height-weight data applicable to Cantonese schoolboys and not open to question because of age inaccuracies. The records of the

annual measurements over a 10-year period of the nearly 1,000 boys enrolled in the college were the source of data. All statements of age were established by at least two authorities. The series used comprised a net total of 1,013 measurements, with from 50 to 100 individuals at each age level from 8 to 19 years, inclusive. Methods of calculation are given in detail. Tables and curves show the height-weight-age standard for Cantonese schoolboys and a comparison of the growth of Canton Christian College boys with that of American and of other Chinese. The Cantonese measurements fell, in general, above the Chinese, but below the American standards. The period of most rapid growth was the fourteenth year, as contrasted with the fifteenth year for Chinese elsewhere and the sixteenth year for Americans. References.

348 **Kézmárszky, Theodor:** Klinische Mittheilungen aus der ersten geburtshilflichgynäkologischen Universitäts-Klinik in Budapest (1869–82) [Clinical Communications from the First Lying-in and Gynecological University Clinic in Budapest (1869–82)]. F. Enke, Stuttgart, 1884. 239 pp.

In this book on physiological and pathological births the author devotes a section (pages 199 to 216) to infants born in the clinic of the University of Budapest during the years 1869–1872 and 1874–1882. Of 4,549 newborn, 3,506 came at term; 1,043 were premature; girls were in the ratio of 100 to 105.41; and the mortality was 15.36 per cent. Numerous tables give the length and weight of the above infants, their head girth, weight during the first nine days, initial loss and time of gain, etc., and the same measurements according to age and size of their mothers, and the number of the birth. The heaviest child was a boy, second birth, of 4,850 grams, and the longest, likewise a boy, first born, of 58 centimeters.

349 ——— "Über die Gewichtsveränderungen reifer Neugeborener" [Weight variations of full-term, newborn infants]. *Archiv für Gynäkologie* [Berlin], vol. 5 (1873), pp. 547–561.

In 1871–72 the author studied body weight in newborn infants in an obstetrical clinic of Budapest. He gives a mass of data on 73 normal breast-fed children (34 boys and 39 girls), of whom he weighed 41 once a day and 32 twice a day. He concludes that all infants lose weight after birth; that the increase, beginning usually on the second or third day, is far more gradual than the loss; that, in general, boys lose less weight and gain more than girls; and that first-born children show less favorable progress than others.

350 **Kimpflin, M. G.:** "Les lois de la croissance physique pendant l'enfance et l'adolescence" [The laws of physical growth during infancy and adolescence]. *Comptes rendus hebdomadaires des séances de l'Académie des sciences* [Paris], vol. 158 (1914), pp. 801–803.

Report of measurements of 200 school children, 11 to 16 years of age, in a French school where much attention is paid to physical condition. Height, weight, and chest expansion are recorded six times each year. Methods of measurement are not given. The figures tend to show improved physique, being in all cases higher than those of Quetelet, Godin, Mayet, and Marage.

351 **Kirkoff, N.:** "Recherches anthropologiques sur la croissance des élèves de l'école militaire de S. A. R. le prince de Bulgarie, à Sofia" [Anthropological researches in the growth of the pupils at the military school of the prince of Bulgaria, at Sofia]. *Bulletins et mémoires de la Société d'anthropologie de Paris*, ser. 5, vol. 7 (1906), pp. 226–233.

Report of measurements made every three months for three years on the same boys at military school, ages 11 to 20 years. Exact methods of measurement are not stated. Measures taken were stature, chest circumference, length of leg, weight of body in kilograms, vital capacity, strength of right hand, head measurements (3). Comparisons are made with Belgians, Russians, Germans, Italians, French, and English. Discussion.

352 **Kirstein, F.:** "Über die physiologische Gewichtsabnahme Neugeborener" [The physiological decrease in weight of the newborn]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 80 (1917–18), pp. 448–465.

A study of the nature of the physiological decrease in weight of 768 normal newborn infants at a maternity clinic in Marburg. The author divides his cases into 12 groups according to their initial weight. The average decrease amounted to 7.8 per cent of the initial weight for all groups combined. It was caused by the discharge of (1) meconium and later feces; (2) urine; (3) evaporation of water due to perspiration and respiration. The author concludes that (1) a decrease is present in every case; (2) the physiological decrease ends within two to four days after birth; (3) the quantity of urine discharged by the newborn infant in the first few days is very small, owing to the small amount of fluid taken by infant and to loss of water through perspiration.

353 **Kisskalt, Karl:** "Die Körperkonstitution der ostpreussischen Stadt- und Landschulkinder" [Physical constitution of East Prussian city and country school children]. *Deutsche Med. Wchnschr.* [Leipzig], vol. 42, pt. 1 (1916), pp. 757–759.

The author investigated height, weight, and strength (through girth of lower arm and by use of Collin's dynamometer) of Konigsberg school children be-

tween 6 and 14 or 18 years of age—289 in private schools and 571 in public schools. Measurements were taken with clothing (2 centimeters being taken off for shoes), during May and June of 1914. Tables contain, besides the author's data, those of Ascher and Camerer. The question of race complicates deductions. From his figures the author finds that private-school pupils are the best developed in all respects; next come public-school children living in the country. The worst developed are public-school children of the city, who, though of superior race to a large extent, are subjected to the worst social conditions.

354 **Kita, T.:** Hygiène scolaire au Japon [School Hygiene in Japan]. Pamphlet. (Date and place of publication not given).

A report by the chief of the Japanese Bureau of Child Hygiene to the "Congrès international de propagande d'hygiène sociale et d'éducation prophylactique," held at Paris in 1922. Contains table of height and weight of Japanese school children and students, aged 7 to 26, in 1910 and 1919, showing the increase due presumably to physical education. Methods of measurement and computation are not given.

355 **Kjolseth, Marie:** "Untersuchungen über die Reifezeichen des neugeborenen Kindes" [Investigations of the signs of maturity of the newborn infant]. *Monatsschrift für Geburtshülfe und Gynäkologie* [Berlin], vol. 38 (1913), pp. 216–298.

The author studied signs of maturity in 1,233 newborn infants, 156 of whom were dead. A table of weights in relation to duration of pregnancy is given, and the author studied in detail the various parts of the body and head, as well as the skin, hair, bones, nails, genitalia, and placentæ in relation to maturity. The effect upon birth weight of mother's food, parents' physical condition, race and nationality, infant's sex, mother's age, and number of previous pregnancies are also considered.

356 **Klautsch, A.:** "Über Körperwägungen bei Flaschenkindern in den beiden ersten Lebensjahren" [On the weighing of bottle-fed children in the first two years of life]. *Arch. f. Kinderh.* [Stuttgart], vol. 27 (1899), pp. 305–316.

Discussion of the development of bottle-fed children in the first two years of life observed by author in an institution at Halle, with histories and charts of eight cases. The gain in weight in the first two years is not regular; it is affected by digestive disturbances, dentition, particularly when the teeth appear at short intervals, and by such diseases as pneumonia, measles, pleurisy, and rickets. The growth during the second year is slower than during the first.

357 **Kleinschmidt, H.:** "Der Einfluss der Hitze auf den Säuglingsorganismus" [Influence of heat on the infant organism]. *Monatsschr. f. Kinderh.* [Leipzig], vol. 9 (1910–11), pp. 455–492.

In connection with a discussion of the influence of heat on infants the author gives case histories of 15 infants 2 to 10 months old who were kept in an atmosphere in which the heat and humidity were carefully regulated. Pulse, temperature, weight changes, color of skin, perspiration, and excretions were studied.

358 **Koch, Karl:** "Ein Beitrag zu den fortlaufenden Körperwägungen während der Dentitionsperiode" [Contribution to continuous weighing during dentition period]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 20 (1883), pp. 341–343.

The author presents for a boy born June 13, 1874, a table of age, weight, and illness between August, 1874, and February, 1876. The dates of the appearance of the first three canine teeth are omitted.

359 **Koch-Hesse, A.:** "Beiträge zur Wachstumsphysiologie des Menschen" [Physiology of human growth]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 18 (1905), pp. 293–319, 400–416, 457–492.

An authoritative treatise concerning height according to age, weight according to age and height, and annual growth of individuals, based on the author's elaborate statistics derived from measurements made 10 times a year of 300 boys, aged 8 to 20, in Stoy's Academy, Jena. The author criticizes many other investigations, gives numerous tables and graphs, and discusses in great detail the various mathematical methods of treating such material.

360 ——— "Wachstumsperioden beim Menschen" [Periods of growth in mankind]. *Politisch-Anthropologische Revue* [Eisenach and Leipzig], vol. 3 (1904–5), pp. 665–668.

The article is a theoretical discussion of the question whether in the life of the human being there is a gradual uniform growth or a periodic rise and fall of the growth energy. Without giving any definite answer the author takes up the various periods of the physical development of the human being and the changes in physiology and growth taking place in boys at the end of the seventh, the twelfth, and the fifteenth year, with particular reference to puberty. He shows that the changes taking place at these ages (change of teeth at the age of 7 and phenomena of puberty later) are only partial symptoms of a general modification of condition. This the author considers as an established fact proved by his researches. He is unable on account of lack of data to come to a similar conclusion with regard to the first years of child life.

361 **Körber:** "Die Durchschnittsmasse ausgetragener Neugeborener und ihre Lebensfähigkeit, berechnet aus den Jahresberichten der Findelhäuser in St. Petersburg und Moskau" [Average measurements of mature newborn infants and their vitality computed from the annual reports of foundling homes in St. Petersburg and Moscow]. *Vierteljahrsschrift für Gerichtliche Medicin und Öffentliches Sanitätswesen* [Berlin], new ser. vol. 40 (1884), p. 225.

The author studied records of 12,366 newborn infants at two infant asylums in St. Petersburg and Moscow and gives data showing the relation of weight, body length, and chest measurements to vitality.

362 **Kosmowski, W.:** "O wzróście i wadze dzieci klas biednych w Warszawie" [On the height and weight of the children of the poor in Warsaw]. *Medycyna* [Warsaw], vol. 22 (1894), pp. 105, 125, 153, 173.

The author studied 3,438 children (1,540 boys and 1,898 girls), aged 8 to 15 years, of the poor classes in Warsaw. He obtained the weight and height and annual gain in weight, and compared these data with similar information for children in Stockholm, Boston, Turin, and London, which he took from other writers. He concluded that the children of the poor in Warsaw are in general not much inferior in physical development to the children of the poor in Stockholm; they are better developed than the children in Turin but are considerably inferior to the children of Boston and London. A number of tables and charts on the height and weight of the children in these cities are included.

363 ——— "Über Gewicht und Wuchs der Kinder der Armen in Warschau" [Weight and growth of children of the poor in Warsaw]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 39 (1895), pp. 70–76.

The author presents data on height and weight for 1,540 boys and 1,898 girls, from 8 to 15 years old, from the poorest classes of Warsaw. He counted six months or more as one year. The measurements were taken by physicians, and mostly in April and May in the evening. On an average boys were larger than girls except when 13 or 14 years of age. Puberty usually began at 13 in the girl and 14 in the boy. Christian children were slightly larger than Hebrew. Many of the tables compare these Warsaw children with those of Stockholm (Axel Key), Boston (Bowditch), Turin (Pagliani), and London (Roberts). The poor children of Warsaw were better developed than the Italian, less developed than the Swedish, and very inferior to the American and the English.

364 **Kosorotov, D.:** "Zametka ob izmerenii grudi i rosta u rekrut" [Notes on measuring chest and height in recruits]. *Voyenno-Sanitarnoe Dielo* [St. Petersburg], vol. 7 (1887), pp. 201–203.

Discussion of the uncertainties involved in measuring height and chest circumference of recruits. On the basis of his experience as an army doctor the author concludes that great caution is necessary in estimating the height and chest circumference of recruits as an indication of their physical condition and that these measurements have little scientific or medico-legal value.

365 **Kotelmann, L.:** "Die Körperverhältnisse der Gelehrtenschüler des Johanneums in Hamburg" [Physical condition of pupils of Johanneum College in Hamburg]. *Zeitschrift des Königl. Preussischen Statistischen Bureaus* [Berlin], vol. 19 (1879), pp. 1–16.

Aided by the professors the author made a thorough physical examination of 515 boys of the Johanneum College of Hamburg in the summer of 1877. He discusses at length their previous illnesses, their height and weight measured without shoes, their muscular condition, their pad of subcutaneous fat measured over the biceps, their bony structure tested in the tibia and at the wrist, and their thoracic perimeter taken at the level of the nipples. Many tables are given. The author found that puberty is a period of great growth in all directions save that of the fat layer; as age increases, the lung capacity and fat layer, relatively, also increase, and the upper extremities become better developed than the lower.

366 **Krüger, G.:** "Über die zur Nahrung Neugeborener erforderlichen Milchmengen mit Rücksicht auf die Gewichtsveränderungen der Kinder" [The amounts of milk required for the nourishment of newborn children with regard to their changes in weight]. *Archiv für Gynäkologie* [Berlin], vol. 7 (1874–75), pp. 59–106.

The author reports 275 weighings of infants done by himself, and gives many details regarding 12 of his cases. He discusses the work of other writers on the nutrition and weight of children, and compiles a table giving the number of meals taken and the amount of milk drunk during the first 11 days of life by some of the healthy infants under his care.

367 **Kulka, Wilhelm:** "Studien zur Wachstumsphysiologie an den Zöglingen einer militärischen Erziehungsanstalt" [Studies on the physiology of growth in pupils of a military cadet school]. *Das Österreichische Sanitätswesen* [Vienna], vol. 24 (1912), pp. 1365–1383.

The author describes attention bestowed upon physique of students in a military school in the suburbs of Brunn, and presents long tables giving their

weight, height, and chest girth as measured every February and July from 1906 to 1912. The boys ranged from 14 to 21 years of age. These statistics are compared with similar ones compiled by Erismann, Weissenberg, Camerer, jr., Corstadt, Roberts, Koch, Hesse, Rietz, et al. The author also discusses the relation of mean chest girth to height and of weight to height.

368 **Ladd, Maynard:** "The results of substitute feeding in premature infants." *Arch. Pediat.* [New York], vol. 27 (1910), pp. 416–425.

A study of 125 premature infants treated without incubators and fed with modified cow's milk. Data were secured from hospital records. The author found that no infant weighing less than 1,200 grams at birth and none in the sixth month of gestation, survived. The total mortality compared unfavorably with cases recorded by Budin at the Clinique Tarnier.

369 **La Fétra, L. E.:** "The hospital care of premature infants." *Transactions of the American Pediatric Society*, vol. 28 (1916), pp. 90–101.

A résumé of the author's personal experience in the observation and treatment at Bellevue Hospital of many cases of premature birth, including a table of the average length of infants whose weights were 2 to 7½ pounds; a table of 23 cases giving gestation period, when known, weight in pounds and ounces, length in centimeters and length in inches, and a table of data of 14 infants successfully treated, giving initial weight, discharge weights, time in hospital, and method of treatment. Methods of obtaining statistical data are not given.

370 **Landois, Felix:** "Zur Physiologie des Neugeborenen" [Physiology of the newborn infant]. *Monatsschrift für Geburtshülfe und Gynäkologie* [Berlin], vol. 22 (1905), pp. 194–233.

The author personally observed 50 newborn infants during their first 10 days of life, measuring their weight and the amount of milk drunk. He recounts the history of such studies in the past and gives bibliography. He himself weighed the 50 infants five times daily, not excluding underweight or pathological cases. He divides them into three classes: (1) Cases in which the umbilical cord was severed late; (2) cases in which it was severed early; (3) icteric cases. The weights at birth fell between 1,290 and 4,330 grams. They averaged 3,327 for boys and 3,184 for girls. In recovering initial loss, etc., class 1 fared best and class 3 worst. The heaviest infants lost least and recovered loss most quickly. First-born children developed less favorably than others. Girls lost more than boys but recovered more quickly. The author discusses a second weight loss, which he observed in 76 per cent of his 50 infants.

371 **Landsberger:** "Das Wachstum im Alter der Schulpflicht" [Growth during period of compulsory school attendance]. *Archiv für Anthropologie* [Braunschweig], vol. 17 (1887–88), pp. 229–264.

The author discusses the importance of school hygiene and the anthropometrical work of many scholars. His own data were obtained from a group of German and Polish school children of Posen of different social classes. The number of children in the group decreased from 104 in 1889 to 37 in 1886. Measurements of 22 dimensions were made each May in the period between these two years.

372 **Lang, Gustave:** "Poids moyen des enfants nouveau-nés de primipares à terme, d'après les statistiques de la maternité de Nancy" [Average weight of newborn infants born of primiparae, at term, from statistics of the lying-in hospital at Nancy]. *Archives de tocologie et de gynécologie* [Paris], vol. 19 (1892), pp. 758–761.

From the hospital records of 13 years (1879–1891) the author selected 1,032 weighings of infants born of primiparæ, at term, finding an average weight of 3,165 grams. Removing from his series the weights of less than 2,000 and more than 4,000 grams, he found an average of 2,700 grams. By further examination of his graphic curve he arrived at a figure of 2,965 grams, which he considers the approximate average of his series.

373 **von Lange, Emil:** "Die Gesetzmässigkeit im Längenwachstum des Menschen" [The law governing increase in height in mankind]. *Jahrb. f. Kinderh.* [Berlin], vol. 57 (1903), pp. 261–324.

A comprehensive discussion, fortified by 17 tables and 7 figures, of investigations concerning the height of man from birth through adolescence, and the laws governing such growth. The fetal period is considered, and all stages of extrauterine life; the sexes are compared, and an ideal curve is constructed from a great number of curves; this curve is parabolic.

374 **Lange-Nielsen, Chr.:** "Om nyfødtes vegt og laengde i Norge" [Weight and length of the newborn in Norway]. *Norsk Magazin for Laegevidenskaben* [Christiania], ser. 5, vol. 16 (1918), pp. 1134–1145.

The author compares the findings of other investigators and shows in seven tables the variations in the size of the newborn as governed by the age and parity of the mother. His own data cover 7,190 infants in Christiania and Bergen. For his own investigations he found the average weight to be 3,484 grams and the average length 50.87 centimeters.

375 **Langstein, Leo:** "Ernährung und Wachstum der Frühgeborenen" [Nutrition and growth of premature infants]. *Berliner Klinische Wochenschrift*, vol. 52, pt. 1 (1915), pp. 631–634.

A discussion of the care and development of 250 premature infants in the Empress Augusta Victoria House. The author considers the utilization of fat by the premature infant and the weight of infants in relation to chances of living. Reference is made to others' work, especially to Reiche's findings.

376 ——— "Hunger und Unterernährung im Säuglingsalter" [Hunger and undernourishment in infancy]. *Jahreskurse für Ärztliche Fortbildung* [Munich], vol. 3 (June, 1912), pp. 5–37.

A detailed discussion of others' findings, with a small number of data and one curve and table on work done by the author.

377 ——— **and F. Edelstein:** "Die chemische Zusammensetzung frühgeborener Säuglinge und ihr Wachstumsansatz" [The chemical composition of premature infants and their growth]. *Ztschr. f. Kinderh.* [Berlin], vol. 15 (1916–17), pp. 49–70.

The authors studied the chemical make up of premature infants through dissecting two that died a few days after birth and determining the metabolism of two that were thriving at the age of 1 month. The two 7-month infants that died of asphyxia weighed 960 and 1,420 grams. The methods followed in the chemical analyses are given and also tables of the results, which are compared with those of other investigators. The composition of these two infants was almost identical. As compared with normal newborn infants, premature infants have very little fat and a very high water content; they have about the same amount of nitrogen and a much greater excess of sodium over potassium. The two infants born after eight months of pregnancy weighed 2,050 and 1,640 grams. The results of metabolism studies of these two infants are shown in tables. To double their birth weight these infants needed 18,800 and 14,000 calories; a normal full-term infant uses 28,800 calories.

378 **Lankes, Dr.:** "Vor- und Nachkriegsbeobachtungen über Grösse und Gewicht von Schulneulingen [Pre-war and post-war observations on the height and weight of school entrants]. *Zeitschrift für Schulgesundheitspflege und Soziale Hygiene* [Leipzig], vol. 38 (1925), pp. 317–319.

An original study of the height and weight of 516 school entrants, boys and girls in nearly equal numbers, for the purpose of deciding whether the height or weight is more easily affected by unfavorable living conditions. The author found that 78 per cent of the children studied by him had an average weight below that of pre-war times, and 54 per cent of the boys and 48 per cent of the girls were in height below the pre-war average. The author concludes that under unfavorable living conditions the weight is affected more frequently than the height.

379 **Larson, J. H.:** "Butter fat and the child's weight." *Arch. Pediat.* [New York], vol. 37 (1920), pp. 610–614.

A presentation of the weights of 10 children selected from a group of residents at an orphans' cottage at Rochester, N. Y., recorded at six-month intervals during 2½ years previous to the end of 1918. The record shows a loss of weight during a six-month period when oleomargarine replaced butter in the diet and recovery when the use of butter was resumed.

380 **Lascoux, Paul:** Étude sur l'accroissement du poids et de la taille des nourrissons [Study of the Growth in Weight and Height of Infants]. Paris, no. 276, 1908. 76 pp.

Thesis (University of Paris). Largely pathological, but containing one chapter on normal growth in which the author reports his results of measurements of 100 infants (foundlings) the day after birth, of 100 infants (foundlings) 10 days after birth, of 100 infants at a lying-in hospital at birth, of 20 infants at the Clinique Tarnier at birth and on the tenth day, and of 5 newborn infants observed for one month as to growth in height and weight. The dissociation between increase in weight and increase in height during the first 10 days of life is established by these observations.

381 **Laure, Georges:** Des résultats fournis par la pesée quotidienne des enfants à la mamelle [Results Obtained by the Daily Weighing of Breast-Fed Infants]. Paris, no. 237, 1889. 69 pp.

Thesis (University of Paris). The author reports his observations of a large number of infants and presents a chart showing, for an infant born at term, the daily increase in weight for 60 days, the quantity of milk ingested, the number and hour of daily nursings, and the weight of milk at each nursing. Among 429 infants he found 9 who had no initial loss in weight. Bibliography.

382 **Lebzelter, Viktor:** "Grösse und Gewicht der Wiener gewerblichen Jugend im Jahre 1923. Versuch einer einfachen Klassifizierung der jugendlichen Arbeiter" [Height and weight of young workers in Vienna in 1923. Attempt at a simple classification of young workers]. *Ztschr. f. Kinderh.* [Berlin], vol. 39 (1925), pp. 233–238.

The author, in the year 1923, weighed and measured 3,887 boy apprentices and 1,330 girl apprentices ranging in age from 14 to 18 years. He compares the data thus obtained with those obtained by him for the same age groups in 1919 and 1921, and concludes that in 1921 the average height and weight were greater than in 1919 and 1923. The number of girls above the average in height and weight was much smaller than that of boys; in the group called by the author "tall and undernourished" there were three times as many girls as boys.

383 **Lee, Alice, Marie A. Lewenz, and Karl Pearson:** "On the correlation of the mental and physical characters in man." *Proceedings of the Royal Society of London* [London], vol. 71 (1902–3), pp. 106–114.

Continuing the study of measurements of Cambridge undergraduates and of schoolboys (see Pearson's On the Correlation of Intellectual Ability with the Size and Shape of the Head) the authors work out the correlations between intelligence and stature, auricular height of head, strength of pull, strength of squeeze, sight, weight, weight per inch of stature, health, and athletic attainments.

384 **Lehmann, J. H. W.:** "Versuch, den Wachsthum junger Menschen männlichen Geschlechts nach Höhe und Statur auf mathematische Gesetze zurückzuführen [Attempt to explain by mathematical laws the growth of young persons of the male sex in height and size]. *Magazin für die Gesamte Heilkunde* [Berlin], vol. 60 (1843), pp. 3–95.

The author measured 122 boys varying in age from 3 to 23 years. He obtained age, height, length of the middle finger, and thickness of the arm. Each case was observed several times within one or more years. He claims to have found that the length of a boy's middle finger and the thickness of his arm increase with an increase in height.

385 **Lentz, Ernst:** "Physiologische Schwankungen im Jugendalter und ihr Einfluss auf die geistige Arbeit" [Physiological fluctuations in youth and their influence on mental work]. *Zeitschr. für Pädagogische Psychologie* [Leipzig], vol. 18 (1917), pp. 23–39.

Lentz discusses the relation between children's physical and mental health on the one hand, and on the other, seasons, school attendance, anthropometrical statistics, in the light of his own observations and the investigations of Malling-Hansen, Camerer, Schmidt-Monnard, Makower, Schuyten, Quetelet, Bowditch, Pagliani, Axel Key, Erismann, Lobsien, Schmidt, Hoesch, Ernst, Stratz, and Rietz. From the attendance of his 300 pupils of 9 to 14 years of age during the years 1912–13 and 1913–14 he concludes that spring and fall are the most healthful seasons and November and December the least. He discusses also the relative proportions of child and adult and the differences between the sexes, especially in the retarded growth and acceleration connected with puberty.

386 **Leshaft:** "Materiali dlia izuchenija shkolnago vosrasta" [Data on the study of children of school age]. *Zdorovie* [St. Petersburg], vol. 3 (1880), pp. 6, 26, 57, 103.

Account of an investigation made by the author in 1878 of the physical condition of 793 pupils ranging from 10 to 18 years in two St. Petersburg high schools for boys. In several tables he gives for each year of age the size of head and neck, chest circumference, length of arm, shoulder, wrist, leg, hip, and foot, and circumference of hip and thigh; also height and weight of body, quantity of air exhaled, measurement of muscular strength, and difference between half-height and chest circumference. He compares some of his data with those obtained by several other investigators for persons of the same ages. The author also describes the physical defects found in the boys and makes suggestions for their correction and prevention.

387 **Letournier, Louis:** De l'influence de la profession de la mère sur le poids de l'enfant [Influence of the Mother's Occupation on the Weight of the Child]. Paris, no. 502, 1897. 56 pp.

A thesis (University of Paris) on the influence of work during pregnancy upon the weight of the child at birth. Data for weights at birth in relation to mother's employment are given in 20 tables for 732 maternity cases in the Baudelocque Clinic in 1896. The average weight of a child whose mother did not rest from a fatiguing occupation was 3,082 grams, and that of a child whose mother did rest, 3,319 grams. The weight of a child whose mother had a lighter occupation and did not rest was 3,130 grams; for a child whose mother did rest from a lighter occupation it was 3,318 grams.

388 **von Liebig, G.:** "Gewichtsbestimmungen der Organe des menschlichen Körpers" [Weight determinations of organs of the human body]. *Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin* [Leipzig], 1874, pp. 96–117.

The author compares weights of organs of several adults, one boy 16 years old, two newborn infants, and one premature infant. Data are shown in 12 tables. In the newborn, muscles are relatively less developed and viscera more developed than in adults. Weight of the bones of the head and torso is about one-half the total weight of the skeleton in adults; in infants it is about two-thirds. Whereas the right side is heavier in adults, the left side is heavier in the newborn.

389 **Liharžik, Franz:** Das Gesetz des menschlichen Wachsthumes und der unter der Norm zurückgebliebene Brustkorb als die erste und wichtigste Ursache der Rachitis, Scrophulose und Tuberculose [The Law of Human Growth and the Subnormal Thorax as the First and Weightiest Cause of Rachitis, Scrofula, and Tuberculosis]. Vienna, 1858. 188 pp.

A study based on thousands of observations by the author and by such students as Habit, Goetz, and Bednar. Proportions of the human body, especially of the chest, during infancy and childhood, and pathological conditions, are considered. From his study of growth the author derives general laws. For instance, human development involves unities of 276—276 days of intrauterine life, 276 months of extrauterine growth. This time is also divided into two periods in the relation of 6 to 17, in the former of which most of the development takes place. More than 100 pages of tables are included.

390 ——— The Law of Increase and the Structure of Man. Vienna, 1862. 12 pp.

During nearly seven years the author measured the parts of the body of 300 individuals of both sexes and different ages. The whole frame of a human being, he contends, can be derived for any age from seven fundamental dimensions: Length of head, of neck, of sternum; distance from xiphoid cartilage to pubic symphysis, total length of leg, elevation of internal malleolus over sole of foot, and length of clavicle. With these dimensions is used a system of mutually intersecting and tangent circles, which remains the same for all ages. The whole increase of the body comprises 24 epochs covering 25 years. The first epoch occupies the first solar month; each following epoch is a month longer than the epoch preceding. There is a subdivision into three sections—the first embracing 21 months, the second the next 150 months, and the third the one hundred and seventy-first to the three hundredth month. A detailed table covering these 25 years gives measurements in centimeters for 25 important parts of the body. Two diagrams of a newborn child and of a young man, with the circles drawn, give further anatomical measurements.

391 **Lipiec, Melanie:** "Über das Wachstum der polnischen Jüdinnen" [Growth of Polish Jewesses]. *Mittheilungen der Anthropologischen Gesellschaft in Wien*, ser. 3, vol. 42 (1911–12), pp. 115–195, 281–284.

The author discusses her measurements of 340 Polish Jewesses, taken with the subjects stripped. Those from 10 to 18 years of age were in institutions for the poor in Warsaw; those 18 and 19 years old were students in Zurich and of a better class socially. Many graphs, 143 tables, and 7 pages of measurements of height, torso, and extremities. Repeated comparisons are made of the other Jews and of other races. The author concludes that growth between the ages of 10 and 19 is 20 per cent of total growth; that from 10 to 15 years of age the growth is more rapid than from 15 to 19; that from 15 to 19 growth in breadth is greater than growth in length; that modifications of indexes are not great; and that growth energy in the later years is greater in males than in females.

392 **Lips, Friedrich:** Über die Gewichtsverhältnisse der neugeborenen Kinder zu ihren Placenten [Relation of Weight of Newborn Children to their Placenta]. Erlangen, 1892. 41 pp.

This dissertation (University of Erlangen) contains a table covering 11 pages of data collected in Erlangen Lying-in Institute on 225 newborn infants and consisting of age of mother, sex of child, weight of child and of placenta, length of child, size of placenta, relation between child and placenta. Much space is given to information on all weight relations of newborn children derived from other students. The author finds from his own research that size of child and placenta correspond in a general way.

393 **Lissauer:** "Über Oberflächenmessungen an Säuglingen" [Measurement of the surface area of bodies of infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 58 (1903), pp. 392–411.

The author obtained measurements of the surface area of 12 dead children, only 1 of whom was over 1 year old at the time of death, to ascertain the relation of the surface area of the body to its food requirements. The values obtained are presented in several tables. The author concludes that the food requirements of children of equal weight increase with age and that they are proportionate not to the weight but to the surface area.

394 **Loeffler, Lotha:** "Über ärztliche Untersuchungen der Tübinger Studentenschaft im S.-S. 1923 und W.-S. 1923–1924" [On physical examinations of students of Tubingen in the summer semester of 1923 and winter semester 1923–24]. *Klinische Wochenschrift* [Berlin and Munich], vol. 3 (1924), pp. 892–894.

An account of physical examinations of 853 male and 90 female students at the University of Tubingen in the summer semester of 1923 and 1,129 male students and 111 female in the winter semester of 1923–24. A number of the students in the first group were reexamined in the second group. Ages are not given. The author gives in several tables the height and weight by sex and discusses the gain in height and weight found by him among the students reexamined in 1923–24. The failure of the students to gain in weight or their loss of weight he attributes to difficult economic conditions.

395 **Lommel, F.:** "Störungen des Reifewachstums" [Disorders in growth during the period preceding maturity]. *Münchener Medizinische Wochenschrift* [Munich], vol. 71 (1924), pp. 156–157.

In the author's opinion, there is no such thing as a "normal" human being in regard to size of the body, and the best method of judging the constitution of an individual is general inspection. He made a study of 681 boys, in the city of Jena, 14 to 18 years old, whom he kept under observation from three to four years, during which period he obtained several times their height, weight, chest circumference, degree of development of the genital organs, and general state of health. Fifty-six of these boys were found to be physically inferior. Since the purpose of his study was to compare the physically inferior boys with those in good condition, he divided his subjects into two groups. The height of the physically inferior boys varied from 142 to 160 centimeters, the weight from 31 to 40.5 kilograms; the height of the others varied from 155 centimeters to 172 centimeters, and the weight from 45 kilograms to 67 kilograms. The author discusses the general physical condition of these boys and concludes that the insufficient development of the above-mentioned 56 boys is due to inferior constitution.

396 ——— "Über den Einfluss des Krieges auf den Ernährungszustand der Bevölkerung in Jena" [Effect of war on nutrition of the people of Jena]. *Berliner Klinische Wochenschrift* [Berlin], vol. 53 (1916), p. 293. See also *Deutsche Med. Wchnschr.* [Leipzig], vol. 42, pt. 1 (1916), pp. 351–353.

To determine the effect of the war on the nutrition of the people of Jena, Lommel constructed weight curves of infants for the years 1913, 1914, and 1915 and of boys between 14 and 18 years of age for 1912 to 1915. Many classes were represented, and 3,500 weighings were taken. No unfavorable result was detected in the last year.

397 **Longridge, C. N.:** "The initial loss of weight in infants." *Brit. J. Child. Dis.* [London], vol. 2 (1905), pp. 403–407.

Data were obtained from the notes on 400 normal infants born in Queen Charlotte's Hospital, breast fed, weighed immediately after birth and on the evenings of the third, fifth, and eighth days and on the morning of the day the mother left the hospital (about the fourteenth day). Knife-edge balances were used, and weight recorded in pounds and ounces. The weighings are tabulated by sex and grouped under children of primiparæ and multiparæ.

398 **van der Loo, C. J.:** "Over Kinderen met minder goeden gesondheidstoestand, wisselend in lengte van 109–150 cm" [On children of delicate health varying in height from 109 to 150 centimeters]. *Nederlandsch Tijdschrift voor Geneeskunde* [Amsterdam], vol. 64, pt. 1 (1920), pp. 1689–1701.

An account of an original investigation of 330 school children of delicate health aged from 6 to 12 years and varying in height from 109 to 150 centimeters. The author gives weight, height, and chest circumference of every child and shows the relation between delicate health, small chest circumference, underweight, and low vital capacity.

399 **Lubinski, Herbert:** Über Körperbau und Wachstum von Stadt- und Landkindern [Bodily Build and Growth in City and Country Children]. Breslau, 1919. 17 pp.

Inaugural dissertation (University of Breslau). The author studied the height and weight of school boys 7 to 13 years old, measured stripped. Two hundred and twenty-three were in the village schools of Upper Silesia, 261 in city public schools, and 202 in Breslau private schools; that is, pure country stock, the proletariat, and the well-to-do classes of the city were represented. Slight illnesses were not deemed a reason for rejecting the boys. The thesis presents curves of the height and weight of the three groups indicated, and tables of height, weight, and Livi's index ponderalis, $\frac{100\sqrt{\text{wt.}}}{\text{ht.}}$. In height the private pupils came first, then the public-school pupils, and lastly the country children. Differences in weight were less marked; private pupils came first, country boys next, and public-school boys last.

400 **Lübben, K. H.:** "Die körperliche Entwicklung der Schulkinder" [The physical development of school children]. *Correspondenzblätter des Allgemeinen Ärtzlichen Vereins von Thüringen* [Weimar], vol. 22 (1893), pp. 53–59.

Results are given of 7,000 measurements of healthy boys from 7 to 15 years of age and a study made regarding periods of greatest increases in weight, and economic factors in relation to weight.

401 **Lübkert, Ernst:** "Eine Untersuchung über Grössen- und Gewichtsverhältnisse Hamburger Volksschüler während und nach der Kriegszeit" [A study of the height and weight of public-school children in Hamburg during and after the war]. *Zeitschrift für Schulgesundheitspflege und Soziale Hygiene* [Leipzig], vol. 38 (1925), pp. 319–323.

An account of an original study of the height and weight of all pupils in an eight-grade public school in Hamburg. (Neither number of pupils nor their ages are given). The study covered the war years, 1914–1918, and the

year 1924. The data were obtained twice every year. The author gives in two tables the children's average height and weight for each grade and year, and in two other tables the indexes of the height and weight arranged as above and computed with the data for 1914 as 100. The lowest figures were obtained for 1918; in 1924 the height was still in a number of cases below and the weight in many cases above the figures for 1914.

402 **Lutz, Rolf:** "Die körperliche Entwicklung des Neugeborenen" [The physical development of the newborn infant]. *Zentralblatt für Gynäkologie* [*Leipzig*], vol. 36 (1912), pp. 1577–1581.

The author collected data on the weight and length of the body and circumference of the head of 1,000 infants born in a maternity home in Berlin. The duration of pregnancy in each case is stated. Comparisons are made with the findings of six other writers and conclusions drawn regarding the relative size of children in different parts of Germany. For children born between the twenty-eighth and the forty-fourth week of pregnancy the weight varied from 1,120 to 3,820 grams, the length varied from 38 to 57 centimeters, and the circumference of the head from 28 to 38 centimeters.

403 **Macaulay, T. B.:** "Weight and longevity." *Publications of the American Statistical Association* [Boston], vol.. 2, nos. 9–16 (1891), pp. 287–296.

Discussion of the value of height-weight standards in estimating insurance risks. It deals largely with tuberculosis statistics but has tables of standard and average weight, for various ages and occupations, of normal individuals.

404 **Maccone, L:** "Influenza della cura climatica sullo sviluppo fisico dei fanciulli" [Effect of mountain air on the physical development of children]. *Giornale della reale Accademia di medicina di Torino*, ser. 4, vol. 7 (1901), pp. 791–796.

In connection with a study of the effects of a vacation in the mountains on 72 delicate children of both sexes, 6 to 12 years old, the author obtained their weight, height, chest circumference, chest expansion, muscular force, and hemoglobin content of the blood, just before their departure for the mountains, immediately after their return from a 2 months' vacation, and again 2½ months later. A similar study was made of 25 delicate children of both sexes, 6 to 12 years old, who had no vacation in the mountains.

405 **MacDonald, A:** "Beiträge zu der Entwicklung und den Entwicklungsfehlern der Kinder" [Children's development and defects of development]. *Jahrb. f. Kinderh.* [Berlin], vol. 71 (1910), pp. 180–188.

The author presents deductions from measurements and observations of 20,000 school children of Washington, D. C., including white and colored, native and foreign. After commenting on the significant connection between height and the development of the heart the author presents five detailed tables followed by a statement of conclusions to be drawn from the figures cited, on the relation between intelligence on the one hand and head girth or index on the other. Defects as related to sex, mentality, nationality, social status, and race, and mental power as related to sex, nationality, abnormality, and race are discussed. The statistics are taken from Man and Abnormal Man (U. S. Senate Document No. 187).

406 ——— "Growth of children in Germany." *Pediatrics* [New York and London], vol. 7 (1899), pp. 542–545.

The author quotes tables of (1) Kotelmann, showing relation of length of body to lung capacity, ages 9 to 20; (2) Wintrich, showing relation of weight of body to lung capacity, ages 9 to 20; (3) Carstadt, showing result of 427 measurements of height in half-year periods from 6 to 16½ years. He compiles a table from measurements of Weissenberg (method of measurement not given) of 132 Jewish subjects (three newborn, four 5 years old, twenty-five 10 years old, and one hundred adults) to show development of the head. The relation of head measurements to the other body measurements at various ages is discussed.

——— Experimental Studies of Children, Including Anthropometrical Psycho-physical Measurements of Washington School Children. *See* Education, Bureau of.

407 **McIlroy, A. Louise:** "The relative loss of heat and loss of weight, and the treatment of shock in the new-born." *Proceedings of the Royal Society of Medicine, Section of Obstetrics and Gynecology* [London], vol. 18 (1925), pp. 39–44.

A comparison of the loss of initial weight in infants bathed in accordance with the usual hospital procedure and in those wrapped immediately after birth in warmed blankets and oiled instead of bathed for the first eight or nine days. Less loss of weight occurred in the second group.

408 **Mackenzie, W. L., and A. Foster:** Report * * * on a Collection of Statistics as to the Physical Condition of Children Attending the Public Schools of the School Board for Glasgow, with Relative Tables and Diagrams. London, 1907. 57 pp.

Physical measurements of 72,857 children in 73 primary and higher grade schools. Data secured by the teachers on weight, height, and eyesight were

tabulated in groups representing four social classes. Living conditions (one, two, or three room houses) were also recorded. The data showed that the average weight was uniformly below the standard of the Anthropometric Committee of the British Association for the Advancement of Science, whereas the height in certain groups was above the standard; also that the average weight and height increased with improvement in living conditions. The tables are very extensive.

409 **Maclaren, Archibald:** A System of Physical Education. The Clarendon Press, Oxford, 1869. 518 pp.

Contains (1) an exposition of the principles of growth and development, with remarks on the value of physical education; (2) a practical system of gymnastic exercises; and (3) appendixes with tables of average measurements of boys at different ages showing the value of systematized physical training.

410 **McLeish, *Mrs.* A.:** "Observations on the development of a child during the first year." *Transactions of the Illinois Society for Child Study* [Chicago], vol. 3 (1898), pp. 109–124.

A mother's record of the mental and physical development of her child, beginning with the thirty-first day.

411 **Macy, Mary S.:** "The vegetative child; a biologic study of early child life." *The Child* [London], vol. 2 (1911–12), pp. 625–647.

An article dealing with the development of the child in the first three years of life. The statements as to physical growth are based on the figures of Rotch, Vierodt, Holt, and Forsyth, to which the author adds a table of weight, height, chest girth, head girth, and abdominal girth at birth and at 6, 12,18, and 24 months, averaged from her own notes on 500 infants; also a table of pulse and respiratory rate in relation to age.

412 **Makower, A. A.:** "Untersuchungen über Wachstum" [Investigations in growth]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 27 (1914), pp. 97–120.

The author examined 1,246 Hebrew boys in a private school in Vilna. Measurements as to height, weight, and chest girth were taken with shoes and upper garments removed. Maximum and minimum measurements are given, and tables and graphs show increases in height, weight, and chest girth.

413 **Malling-Hansen, R.:** "Perioden im Gewicht der Kinder und in der Sonnenwärme, Beobachtungen, Fragment III–A" [Periodicity in weight of children and heat of sun. Part III–A]. Kopenhagen, Vilhelm Tryde's Buchhandlung, 1886. *See also* Part III–B (Hoffenberg & Traps, 1886, 44 pp.)

Malling-Hansen treats periodicity in the height and weight of children according to day, week, year, and warmth of sun. A large appendix illustrates his ideas with 44 graphs. The subjects were 130 boys and girls, whose weight and height were taken daily for several years while they were living in the Royal Deaf and Dumb Institute at Copenhagen. One set of tables shows evening weight of about 70 boys every day from May, 1882, to July, 1885, and another set gives height from February, 1884, to February, 1886. Seasonal periods of maximum, minimum, and medium weight and height increases for boys between the ages of 9 and 15 years are also discussed.

414 **Martin:** "Biedert's Kindernahrung" [Biedert's baby food]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 18 (1882), pp. 239–253.

In connection with a discussion of the value of Biedert's baby food the author gives a table of changes in weight of one infant from birth to the twenty-eighth week.

415 **Martin, C.:** "Geburtshülfliche und gynäkologische Masse und Gewichte" [Obstetrical and gynecological measurements and weights]. *Monatsschrift für Geburtskunde und Frauenkrankheiten* [Berlin], vol. 30 (1867), pp. 415–430.

In connection with data on pregnant women the author gives data on 1,000 newborn mature infants—boys and girls in equal numbers. The average weight of the boys was 3,330 grams and of the girls 3,220 grams; the average length for both sexes (310 cases) was 35 centimeters from head to buttocks and 50 centimeters to heels. The width of the body at the trochanters was on the average 9 centimeters in the case of 150 boys and 4.1 centimeters for 140 girls. The average head circumferences amounted to 35 centimeters and 34 centimeters, respectively.

416 **Martin, G.:** "Stillvermögen" [Ability to nurse]. *Archiv für Gynäkologie* [Berlin], vol. 74 (1904–5), pp. 513–535.

The author made a study of 10,718 births, between January 1, 1884, and December 31, 1903, at a midwives' school in Stuttgart, and discusses in connection with the advantages of breast feeding the effect of nursing on the initial loss of weight of infants.

417 **Martin, Rudolf:** "Die Körperentwicklung Münchener Volksschulkinder in den Jahren 1921, 1922 und 1923" [The physical development of school children in Munich in 1921, 1922, and 1923]. *Anthropologischer Anzeiger* [Stuttgart], vol. 1 (1924), pp. 76–95.

Several tables and diagrams show the height and weight of boys and girls from 6½ to 13 years old for each six months of age before the war, and in 1921, 1922, and 1923. The pre-war figures were taken by the author from other writers and apply to nearly 10,000 children in three German cities; the 1921–23 figures were obtained by the author himself from 3,989 children of Munich. The postwar figures show lower averages than those obtained before the war. The author compares the children of Munich with those of Chicago using the figures from Baldwin's report. For this purpose he gives the weight and height by sex and by city for each six months of life in 15 age groups. He found that in each age group the children of Chicago were taller and heavier than those of Munich. The German figures for 1921–23 were lower in the case of children born in 1914 and 1915 than in the case of those born in 1917. This is attributed by the author to the fact that the former children spent a longer period under unfavorable food conditions than the latter group.

418 **Mathis, C.:** "Le développement physique chez les mousses du vaisseau-école "La Bretagne" [Physical development of apprentice marines of school ship *La Bretagne*]. *Archives de médecine navale* [Paris], vol. 78 (1902), pp. 241–254.

The physical development of 713 apprentice marines from 14 to 17 years old on the school ship *La Bretagne*. These lads are examined every six months and record made of height, weight, and circumference of chest and arm. The apprentices are of poor physique when they arrive. Tables give measurements of four age groups from arrival through four semesters, and the actual gain is also tabulated. The boys are compared in development with children cited by Pagliani and Carlier, with normal children according to Pignet's formula, and with pupils at the military school of "Montreuil sur Mer."

419 **Matiegha, Heinrich:** "Über die Beziehungen zwischen Körperbeschaffenheit und geistiger Thätigkeit bei Schulkindern" [On the relationship between physical condition and intelligence in school children]. *Mittheilungen der Anthropologischen Gesellschaft in Wien* [Vienna], new ser. vol. 18 (1898), pp. 122–126.

Data were obtained in the schools of Prague, where 7,000 boys were made the subjects of investigation. The relationships between intelligence as indicated by school standing (class and teacher's estimate) and height, hair color, eye color, and head circumference were worked out in tables, leading the author to the following conclusions: The indirect influence of physical condition upon school standing is evident, as poor health interferes with regular work and attendance; the direct relationship is not so evident. The most evident relationship is between head circumference and intelligence, the more intelligent boys having a larger average measure.

420 **Matveyeva, V. G.:** "Fizicheskoye razvitie dietei Peterburgskikh gorodskikh shkol" [Physical development of the children of the public schools in St. Petersburg]. *Vrach* [St. Petersburg], vol. 16 (1895), pp. 918–920, 941–943.

Account of 3,333 weighings and measurings of 2,134 pupils—boys and girls in nearly equal numbers—of public schools in St. Petersburg. The author gives in 10 tables the average height, weight, and chest circumference for each year of age of the children, more than half of whom were weighed and measured two or three times at intervals of one year. In four additional tables the author gives similar data obtained by other writers and concludes, contrary to other investigators, that the public schools of St. Petersburg do not affect adversely the physical development and nutrition of the pupils. References.

421 **Mayet, Lucien:** "Le développement normal moyen du corps de l'enfant" [Mean normal development of the child's body]. *Enfance* [Paris], vol. 1 (1913), pp. 104–123.

From a study of previous works on the subject as well as from personal observations the author constructs graphs of the normal weight of a child in his first year, in his first 2 years, and in his first 13 years; also of the normal height in the first 13 years; of the thoracic perimeter during 13 years, and of the coefficient of robustness from 1 to 21 years. For this coefficient he uses Pirquet's formula: Height in centimeters, weight in kilograms, and thoracic perimeter in centimeters. In 1906 he made 1,250 observations of children between 7 and 13 years of age, and after that time many other series of measurements. In addition to the above factors in normal development the author discusses dentition, walking, changing proportions in a child's form, and secondary sexual characteristics.

422 ——— "Le développement physique de l'enfant" [The physical development of the child]. *Journal médical français* [Paris], vol. 6 (1912), pp. 366–374.

Increases in weight, height, thoracic perimeter, coefficient of robustness, etc., up to 13 years are discussed. Original observations are summarized in curves and comparison made with the work of previous investigators.

423 **Mead, Cyrus D.:** "Height and weight of children in relation to general intelligence." *Pedagogical Seminary* [Worcester], vol. 21 (1914), pp. 394–406.

Norms for comparison of normal and mentally defective children were established by measurements taken by the author in May, 1912, of 236 normal boys and 245 normal girls of the Caldwell, N. J., public schools. Height with shoes; weight with ordinary clothing; ages in years and months. With these measurements were compared measurements of 288 boys and 141 girls of the Indiana School for Feeble-Minded Youth, examined in February and March, 1910. Results are shown in five graphs and one table. The author found mental defect reflected in height and weight, more evidently in the former than in the latter. Feeble-minded girls more nearly approximated normal girls than feeble-minded boys, normal boys; the physical superiority of girls in the early adolescent period showed itself also with mental defectives; defectives were more variable in height than normal boys and girls. Bibliography.

424 **Meeh, Carl:** "Volummessungen des menschlichen Körpers und seiner einzelnen Theile in den verschiedenen Altersstufen" [Measurements of the volume of the human body and its separate parts at various ages]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 31 (1894), pp. 125–147.

Original volume measurements of 4 cadavers of infants and 10 living subjects varying in age from 11 to 55 years. The author gives a large number of statistics obtained by him on the weight of the homologous parts of the 14 subjects, including volume and length of fingers, hand, arm, toes, instep, tarsus, leg, thigh, neck, lower jaw, upper jaw, cranium, chest, abdomen, and pelvis. The proportion of the volume of every part of the body to the total volume of the body is also given. In addition to his own figures and author gives those obtained by Harless.

425 **Ménard, Saint-Yves:** Contribution à l'étude de la croissance chez l'homme et les animaux (Physiologie et hygiène comparés) [Study of Growth in Men and Animals]. Paris, no. 122, 1885. 119 pp.

A detailed comparison of the laws of growth and growth curves in human beings and animals. Data on animals are based upon author's observations; data on human beings are from the findings of others. The growth of various tissues and portions of the body as well as general increases in height and weight are considered; also the relation of sex, climate, and season to growth.

426 **Mendel, L. B.:** "Das Wachstum" [Growth]. *Ergebnisse der Physiologie* [Wiesbaden], vol. 15 (1916), pp. 102–184.

A detailed discussion of the growth of human beings and animals. The author gives a definition of growth, describes its phenomena and characteristics, its abnormalities, processes connected with it, causes of growth and its laws. He concludes with an account of certain problems relating to growth such as feeding, duration of growth, effect of age, checking of growth, infantilism. Bibliography.

427 **Merrick, Sara Newcombe:** "The weight of newborn infants.' *New York M. J.*, vol. 66 (1897), pp. 809–810.

A brief discussion of the development attained by infants of unusually low weight at birth.

428 **Merrins, Edward:** "Anthropometry of Chinese students." *China Medical Journal* [Shanghai], vol. 24 (1910), pp. 318–324.

The author measured the height and weight of 219 Chinese boys and 69 Chinese girls in the Wuchang schools and length of feet of the girls as well. Height is given in inches without shoes; weight of clothing is deducted from total weight. Methods are not accurately described. Various comparisons are made with favored classes in England and America. The Chinese girls' feet, allowed to develop normally, show no diminution in size on account of continued foot binding.

429 **Mettenheimer, H.:** Ein Beitrag zur topographischen Anatomie der Brust-, Bauch- und Beckenhöhle des neugeborenen Kindes [Topographical Anatomy of Thoracic, Abdominal, and Pelvic Cavities of the Newborn Child]. Strassburg, 1893. 98 pp.

Inaugural dissertation (University of Strassburg). The author considers in turn each organ in the thoracic, abdominal, and pelvic cavities of the infant up to 10 days old, compares relative positions with those in the adult, using constantly data of other investigators and sometimes adding his own. Bibliography.

430 **Metz, August:** Über die Gewichtsveränderungen der Neugeborenen [Variations in Weight of Newborn]. Marburg, 1873. 21 pp.

In a lying-in hospital at Hadamar (Nassau) the author weighed 26 infant boys and girls every morning after their bath during the first 12 days of life. They were all breast fed. The resultant data are shown in a table and four curves. The author concludes that the initial loss extends from birth to the third day. Girls lose less weight than boys, recover their birth weight sooner, and in the 12 days gain more. The children of mothers over 25 lose less and gain more than children of younger mothers. First born lose more than others and gain less.

431 **Meyer, Paul:** Über Ursachen, welche das Stillen verbieten, insbesondere das Stillen nach schweren Blutverlusten in der Geburt [Causes Prohibiting Nursing, Especially after Heavy Losses of Blood during the Birth]. Marburg, 1901. 41 pp.

Inaugural dissertation (University of Marburg). The author gives weights at birth and amounts of milk drunk for about 500 infants of mothers who lost over 1,000 grams of blood at childbirth and yet nursed their children. Data are arranged according to amount of loss of blood, number of the pregnancy, and time in which infant recovered birth weight. The author compares amounts of milk drunk by infants here studied with normal amounts as stated by Biedert. He concludes that breast-fed infants whose birth caused a loss of 1,000 to 2,500 grams of blood to the mother thrive as well as other breast-fed infants.

432 **Michailoff, N. F.:** Materiali k opredieleniu fizicheskavo razvitia i bolezniennosti v selskikh shkolakh Ruzskavo uiezda Moscowskoi gubernii [Data on the Study of the Physical Development and Sickness in the Rural Schools of Ruzski District of Moscow Government]. Moscow, Islenev, 1887. 42 pp.

To determine the physical development of school children and the prevalence of sickness among them, the author obtained height, weight, chest circumference, condition of spine and shoulders, and data on sickness of 892 pupils from 7 to 13 years old in several rural schools; one-fourth of them were girls. The author gives his data in numerous tables, compares his results with those obtained by other investigators, and concludes that the physical development of boys is superior to that of the girls, that the annual rate of gain in height between 8 and 13 years of age decreases gradually, and that the gain in weight and chest circumference is fluctuating. The girls at the age of 13 show accelerated growth of the body. Bibliography.

433 **Mies, J.:** "Über die Höhe und die Höhenzahl des Gewichts und des Volumens von Menschen und Tieren" [On the height and height value of the weight and volume of human beings and animals]. *Virchow's Archiv für die Pathologische Anatomie und Physiologie* [Berlin], vol. 123 (1891), pp. 188–193.

Figures are given for weight and height of 2,107 cases of newborn infants observed by other workers. The author correlates the dimensions of animals, adults, and children with the height of a column of water with cross section 10 centimeters square.

434 **Misawa, Tadasu:** "A few statistical facts from Japan." *Pedagogical Seminary* [Worcester], vol. 16 (1909), pp. 104–112.

An abstract of material in the Japanese "Child Study" magazine, apparently published in various numbers for 1908, including quotations from the annual report of the department of education (Japanese) for 1901, with table showing average height, weight, and chest girth of 869,014 school children, aged 7 to 16; a table from work of Dr. M. Mishima's examination of 9,609 boys and 7,466 girls from birth to 15 years of age, giving height, weight, chest girth, head circumference, and length of leg; a table of average values (height, weight, chest girth) for ages 13 to 17. The author concludes that physical development is as much dependent on social and historical circumstances as on geographical and other physical environment and is therefore largely subject to human control.

435 **Mishnevsky, V.:** "K izsliedovaniu rosta, obioma grudi i viesa" [The study of height, chest circumference, and weight]. *Voyenno-Sanitarnoe Dielo* [St. Petersburg], vol. 9 (1889), pp. 281–282.

On the basis of studies made by several writers of about 30,000 cases and his own 285 cases the author compiles tables giving the formulas for height, chest circumference, and weight which he worked out according to a method called by him "method of minimum squares." The author uses this formula to show the percentage of deviation from the average of the height, chest circumference, and weight which were obtained by the several writers.

436 **Miwa, N.:** "On the body-weight and stature of new-born infants." *Sei-i-Kwai Medical Journal* [Tokyo], vol. 11 (1892), pp. 67–72.

The author studied 24 male infants and 18 female, born at full term, from 1 to 5 days old, for body weight, stature, and circumference of head. He combined his results with those of Doctor Sakaki, who measured 13 male infants and 15 female to discover approximately the stature and body weight of newborn infants in Japan. By comparing his figures with those for European infants, determined by Quetelet, Elsässer, Casper, Liman, Robert, Veit, Haake, and Hecker he found a difference of about 1 centimeter in stature and 300 to 500 grams in body weight in favor of European infants.

437 **Möhring, P.:** Über die Veränderungen des Gewichts, der Temperatur und des Haemoglobingehaltes bei Neugeborenen [Changes of Weight, Temperature, and Hemoglobin Content in Newborn Infants]. Heidelberg, 1891. 49 pp.

An inaugural dissertation (University of Heidelberg). The author gives résumés of previous works on changes in weight, in temperature, and in blood of newborn infants. He devotes a page each to 30 carefully constructed graphs

on weight, temperature, and hemoglobin of as many infants during the first two weeks of life studied in a clinic at Heidelberg. Measurements were made daily of weight, of temperature in the rectum, and of hemoglobin by Fleischl's hemometer. The hemoglobin content of the newborn is extremely high (average for boys 140.71 and for girls 144.27) and can be almost double the average for adults. In 65.5 per cent of cases it reaches its maximum in the first days. Little correspondence can be noted between hemoglobin content and temperature and weight. In a general way rise in hemoglobin content and decrease in weight are negatively correlated.

438 **Moggi, Dino:** "L'accrescimento del lattante normale in Firenze" [The growth of the normal infant in Florence]. *Rivista di clinica pediatrica* [Florence], vol. 23 (1925), pp. 577–615.

The author measured 400 infants under 1 year old and obtained for each of them 17 either actual or calculated measurements. Instead of presenting the measurements as he obtained them the author gives in a number of tables the increase in weight, height, chest, and skull circumference for each month of the first year of life, the ponderal index, sitting height, circumference of the abdomen, thoraco-cranial index (proportion between circumference of chest and that of cranium) and vital index (proportion between the chest circumference and height). In almost all of the above tables the author gives in addition to his own data those quoted from several other writers. The main purpose of the study was to compare the figures on the growth of children in Florence with similar ones for cities in Germany, France, and Russia, and to trace, if possible, the first signs of racial difference. This difference, as expressed in figures, was very small for the children studied. References.

439 **Molinari, Pio:** "Ricerche sullo sviluppo degli alunni nelle scuole elementari di Brescia" [Investigations of the physical development of public-school children in the city of Brescia]. *Igiene della Scuola* [Genoa], vol. 15 (1924), pp. 99–100.

The author obtained in 1923–24 the height, weight, and length of outstretched arms for 6,360 public-school pupils 6 to 14 years old, boys and girls in nearly equal numbers, in the city of Brescia. The data are given in a table by sex for each year of age. The author concludes from his table that girls between the ages of 10 and 14 years are better developed than boys of these ages. After the age of 14 their growth becomes slower and soon the boys become taller and heavier than the girls. The author agrees with other writers that conditions of living affect to a great extent the physical development of children within the same race and the same city.

440 **Moll, Leopold:** "Beitrag zur Aufzucht frühgeborener Kinder" [Rearing premature children]. *Ztschr. f. Kinderh.* [Berlin], vol. 21 (1919), pp. 329–348.

Besides describing apparatus for keeping a premature infant warm the author gives eight case histories and curves relating to the nutrition of premature infants. Bibliography.

441 **Montague, Helen, and L. Hollingsworth:** "The comparative variability of the sexes at birth." *American Journal of Sociology* [Chicago], vol. 20 (1914), pp. 335–370.

The data were obtained from the obstetrical case histories of the New York Infirmary for Women and Children. One thousand infants of each sex were studied and the analysis of their measurements given in tables. The authors conclude that there is no inherent anatomical variability in the sexes at birth.

442 **Montessori, Maria:** "Sui caratteri antropometrici in relazione alle gerarchie intellettuali dei fanciulli nelle scuole" [On anthropometrical characteristics in relation to mental development of school children]. *Archivio per l'antropologia e la etnologia* [Florence], vol. 34 (1904), pp. 243–300.

The author studied 105 normal boys 9 to 11 years old, pupils in public schools in Rome. The boys were selected among three groups: Most intelligent, average, and backward. For each child the author gives weight, height, chest circumference, cerebral craniums (maximum circumference, length, height, sum of the three diameters, minimum diameter of forehead, height of forehead, sum of frontal diameters), facial cranium (total height of face, nasofrontal inner height, subnasal height, bizygomatic diameter, bigonial diameter), length and width of nose, cephalic and nasal indexes. Like other writers she found in the more intelligent children not only larger heads but also wider faces and higher foreheads.

443 **Monti, A.:** "Das Wachstum des Kindes von der Geburt bis einschliesslich der Pubertät" [Growth of the child from birth to puberty, inclusive]. *Wiener Klinik* [Vienna], vol. 24 (1898), pp. 287–316.

A compilation of data obtained from other writers on the weight and length of the body and its separate parts, size of head, chest measurement, relation of volume of body to surface, and mutual relation between weight of body, its length, size of head, and chest measurement. These data refer to individuals of all ages from newborn infants to persons over 20 years old.

444 **Monti, A:** "Übersichtliche Zusammenstellung der Wachsthumsverhältnisse der Kinder" [Comprehensive survey of growth of children]. *Arch. f. Kinderh.* [Stuttgart], vol. 10 (1888–89), pp. 401–429.

The author has here attempted a careful testing and grouping of data of other observers on children's body weight, height, girth of head and of chest, and relation of these factors of growth to one another. Among the authors considered are Quetelet, Zeising, Liharžik, Bouchard, Bowditch, Russow, Froebelius, Fleischmann, Schöpf, and Merei. The article contains many tables.

445 **Moon, S. B.:** "The growth of boys." Report of the Tenth Annual Meeting of the American Association for the Advancement of Physical Education, 1895, pp. 19–23. Concord, 1896.

From annual measurements for a period of eight years of about 150 private-school boys, aged 11 to 16, tables are compiled, which are compared with Doctor Seaver's tables giving measurements of Yale University students.

446 **Moss, R. E.:** "Height and weight table compiled by a committee of the medical section of the National Fraternal Congress, 1900." *Medical Examiner and Practitioner* [New York], vol. 10 (1900), pp. 299–302.

Report of a committee appointed to formulate a table of height and weight for determining insurance risks. Height and weight were taken for 133,940 male applicants between the ages of 18 and 55; the method is not stated. Nationality, occupation, and locality are not given. The author found that the greatest number of applicants were 5 feet 7 inches, 5 feet 8 inches, and 5 feet 9 inches tall and that the nearer the medium standard the better the risk; also that a young man at 20 increases in weight in proportion to increase in age, and that the taller the man the greater the percentage of increase.

447 **Mourlot, Camille:** Des variations de poids chez les nouveau-nés nourris par leurs mères, pendant les dix premiers jours [Variations in Weight of Breast-fed Newborn Infants during the First Ten Days]. Paris, no. 261, 1892. 76 pp.

Thesis for medical degree (University of Paris). The original work includes: Observations of initial loss of weight in 125 infants born at term; 15 observations of weight changes of infants reported as individual cases; discussion of these and of other illustrative cases. The author found that there was an initial loss of 150 to 200 grams, of which 100 to 120 grams was lost the first day; that in a few cases there was no initial loss; that the gain began ordinarily on the third day; that large infants regain their initial weight less quickly than small; that the initial loss was less in girls than in boys and in infants of multiparæ than in those of primiparæ. Bibliography.

448 **Mühlmann, M.:** "Das Wachstum und das Alter" [Growth and age]. *Biologisches Centralblatt* [Berlin], vol. 21 [1901), pp. 814–828.

The original data upon which the author's conclusions as to bodily changes are based do not appear in his article, which includes, however, tables of the weight of the body and its organs, in 10-year periods from birth to 90 years and of the relative weights worked out in per cents.

449 ——— "Über das Gewicht einiger menschlicher Organe" [Weight of certain human organs]. *Virchow's Archiv* [Berlin], vol. 163 (1901), pp. 75–83.

A discussion and 4 tables of the weights of organs in 48 bodies dissected in 1899 and 1900 in the City Hospital, Odessa. Each table gives name, age, weight, height, weight of lungs, weight and length of alimentary canal, and weight of heart, brain, liver, kidneys, pancreas, spleen, thymus, etc. The weights are given separately for the two sexes, first as absolute figures, and then as percentages of body weight. Eight of the males and nine of the females were below 21 years of age. The author believes that the alimentary canal, lungs, and heart continue growing into old age.

450 ——— Über Wachstumserkrankungen" [Disorders of growth]. *Jahrb. f. Kinderh.* [Berlin], vol. 70 (1909), pp. 174–208.

From a careful consideration of the daily weights of 12 newborn infants and of 6 from 3 to 8 months old, all normal, for which the author presents curves, he comes to the conclusion that growth consists not only of progress but of progressive phenomena. He discusses dentition, puberty, the patho logical affections of growth, and the so-called "fever of growth."

451 **Muffang, H.:** "Écoliers et étudiants de Liverpool" [School children and students of Liverpool]. *Anthropologie* [Paris], vol. 10 (1899), pp. 21–41.

The author had measured, according to his direction, 148 English boys and 79 English girls 9 to 14 years of age in a public school; 485 pupils in the Liverpool Institute (commercial and Latin school), aged 7 to 17; 86 students in University College; 27 professors; and 74 subjects engaged in commerce or industry. Data are given for height taken in shoes without allowing for heels; color of hair and eyes; shape of the nose; cephalic index. He found the average cephalic index 78 or 78.5. The social classes varied more in stature than in cephalic index. His observations confirmed those of other scientists as to variations in growth at the age of puberty.

452 **Murray, M. Bruce:** Child Life Investigations: The Effect of Maternal Social Conditions and Nutrition upon Birth-Weight and Birth-Length. Medical Research Council. Special Report Series, No. 81. London, His Majesty's Stationery Office, 1924. 34 pp.

Data were obtained from the medical and social-case records for 1914, 1915, and 1918 of two maternity hospitals, covering more than 1,000 cases, and from the records of two private maternity homes 185 cases. No data were obtained from a definitely wealthy class. Social grouping was made on the basis of expenditure. No evidence was found that poverty, lack of proper nourishment, and other unfavorable social conditions during pregnancy affect the development of the child in regard to weight and length. Tables. References.

453 **Nagorski, V.:** "Ob otnoshenii zhiznennoy emkosti lekhkikh k rostu i wiesu" [The relation between vital capacity of the lungs and height and weight]. *Vrach* [St. Petersburg], vol. 2 (1881), pp. 669–670.

The author weighed and measured 630 boys and 314 girls ranging from 6 to 15 years of age, pupils in the public schools of St. Petersburg, to study the relation between the vital capacity of the lungs and the height and weight of the bodies. He found that this relation is fairly constant. In the boys he obtained an average of 65 centimeters of vital capacity for each kilogram of weight and in the girls 57 centimeters. He gives in several tables the height, weight, and vital capacity of lungs separately for the sexes and quotes from Quetelet and Hutchinson.

454 **Nassau, Erick:** "Zur Frage des Eiweissnährschadens beim Säugling" [The question of protein as an injurious food for children]. *Ztschr. f. Kinderh.* [Berlin], vol. 26–27 (1920–21), pp. 270–289.

In connection with a study of the effect upon infants of an increase in protein the author presents nine tables and many case histories.

455 **Nesbit, O. B.:** "Malnutrition of school children." *Journal of the Indiana State Medical Association* [Fort Wayne], vol. 14 (1921), pp. 108–110.

In connection with a discussion of malnutrition the author gives the average gains in weight of pupils of two schools and the percentage of pupils underweight in various schools. Four charts are given.

456 **Neubauer, K.:** "Einfluss der Ernährung auf das Wachstum und die Entwickelung frühgeborener Kinder" [Effect of food on the growth and development of premature children]. *Monatschr. f. Kinderh.* [Berlin], vol. 21 (1921), pp. 21–31.

An account of experiments in feeding 100 premature infants in a hospital in Vienna. Some were fed on human milk, others on cow's milk, still others on protein milk, several on alkaline Joghurt milk, and some on alkaline whey. The average weight of these premature infants at birth was 1,500 grams; in a number of cases later investigations (exact time not given) were made as to the child's physical and mental development. The author found that the physical development was accelerated by the addition of whey salts. This was proved by the rapid growth and physical development of the child, not only in the first year but also in later years, as was shown by follow-up examinations several years later. Bibliography.

457 **Neumann, H.:** "Körpergewicht der Säuglinge nach socialer Gruppierung" [Body weight of infants according to social groupings]. *Jahrb. f. Kinderh.* [Berlin], vol. 56 (1902), pp. 719–724.

From the records of the Berlin Society for the Protection of Children for the years 1888 to 1901 the author took the weights of 665 illegitimate children—318 boys and 347 girls. In general their fathers were laborers, their mothers servants; they seldom were long breast-fed. In the society they were weighed every six months; at the end of the third year they were put out in foster care. The author believes the average weights of this class of children are 2,000 to 4,000 grams for the second half of the first month; 2,500 to 5,000 grams for the second month; 3,000 to 5,500 grams for the third month; 3,500 to 6,000 grams for the fourth month; 4,000 to 7,000 grams for the fifth month; 4,500 to 7,000 grams for the sixth month; 5,000 to 7,500 grams for the seventh month; 5,000 to 8,000 grams for the eighth month; 6,000 to 8,500 grams for the ninth month; 6,000 to 8,500 grams for the tenth to twelfth month; 7,000 to 10,000 grams for the thirteenth to fifteenth month. Their condition grows worse as they grow older.

458 **New South Wales, Department of Public Instruction.** Report upon the Physical Condition of Children Attending Public Schools in New South Wales (with Special Reference to Height, Weight, and Vision) based upon Statistics Obtained as a Result of the Introduction of a Scheme of Medical Inspection of Public School Children, 1907–1908, with Anthropometric Tables and Diagrams. Sydney, 1908. 66 pp.

An exhaustive study based upon measurements of height and weight of 36,850 school children. The tables and graphs show average height and weight at each year of school age; comparison of physical development with mental progress; comparison of measurements of city and country children; comparison of measurements in well-to-do and in poor districts; and comparison of children in New South Wales with those in various other parts of the world.

459 **Niceforo, Alfredo:** "Note préliminaire d'anthropologie sur 3,147 enfants des écoles de Lausanne, étudiés en rapport à leur condition sociale" [Preliminary anthropological note on 3,147 children of the schools of Lausanne studied in relation to social condition]. *Scuola positiva nella giurisprudenza civile e penale e nella vita sociale* [Rome], ser. 2, vol. 1 (anno 13), pp. 257–298, 412–440.

In ascertaining the relation between physical characteristics and social condition the author recorded the height, weight, thoracic perimeter, respiratory index, force of muscular contraction, cephalic circumference, height of forehead, cephalic index, probable cranial capacity, color of eyes, color of hair, and some facial anomalies of 2,451 boys and 726 girls from 7 to 14 years of age, all French Swiss, in the elementary schools and first two classes of industrial College or high school of Lausanne. The data collected are shown in 27 tables in 22 pages of figures at the conclusion of the article. In general, the author decides that, other things being equal, the children of well-to-do families are superior to poor children in height, absolute and relative weight, thoracic strength, cephalic circumference, height of forehead, and cranial capacity; the same superiority holds, too, in the brachycephalic and dolichocephalic types of the rich over the poor.

460 **Nobécourt, P.:** "Considérations pratiques sur la croissance et l'alimentation du nourrisson" [Practical hints on growth and nutrition of the infant]. *Clinique* [Paris], vol. 3 (1908), pp. 600–602.

Weights and lengths are given for infants of different ages, together with the amount of nourishment they require. Rules for calculating normal weights at different ages are suggested.

461 **Norinder, I.:** "Bidrag till kännedomen om folkskolebarnens kroppsutveckling och hälsotillstånd" [Contribution to knowledge of development and health condition of common-school children]. *Hygiea, medicinsk och farmaceutisk Månadsskrift* [Stockholm], vol. 69, pts. 1–2 (1907), pp. 1199–1205.

The author examined 224 boys and 198 girls 7 to 13 years of age to ascertain their height, weight, and chest measurements. The findings are given in two tables and two curves.

462 **Oakland School Report:** "Physical development of Oakland children." Oakland, California School Report, 1892–93, pp. 38–44.

Report of measurements of about 6,000 children in the schools of Oakland, Calif., in the fall of 1892 for the anthropological exhibit at the World's Fair. Measurements were taken under the direction of the University of California and Stanford University. Technique is not given. Tables show the average height standing, height sitting, weight, and finger reach. Lists are also given of occupations of parents and nationality.

463 **Odier, Louis:** Recherches sur la loi d'accroissement des nouveau-nés constaté par le système des pesées régulières et sur les conditions du bon alealtement [Researches on the Law of Growth of the Newborn, as Determined by a System of Regular Weighings; and on the Conditions of Good Nourishment]. Paris, no. 28, 1868. 56 pp.

Thesis for medical degree (University of Paris). General and historical. No original observations but six curves of the development of the newborn under different conditions, derived from the author's original work, are included.

464 **Ogston, Alexander:** "Table of cases with weights of the bodies and lungs of live and stillborn children." *British and Foreign Medical and Chirurgical Review* [London], vol. 42 (1868), pp. 472–475.

A table of 61 cases gives sex, whether live or stillborn, conditions of lungs when examined, body weight, and weight of lungs. The weight of the lungs in relation to the body weight was found to be greater in stillborn than in live-born children.

465 **Ogston, F.:** "On the average length and weight of mature newborn Scotch children." *Edinburgh Medical Journal*, vol. 27, no. 2 (1881), pp. 603–615.

A study of the lengths and weights of 200 newborn children in Scotland, 100 cases from the medico-legal practice of Aberdeen and 100 from private practice in Aberdeen and Peterheads. The author finds averages for these children to be 19 to 22 inches in length and 6 to 9 pounds in weight. A table gives the average lengths and weights of children in different parts of Europe, with authority for data.

466 **Oker-Blom, Max:** "Om längd- och viktförhållanden hos eleverna vid Helsingfors stads folkskolor" [Length and weight of pupils in Helsingfors public schools]. *Finska Läkaresällskapets Handlingar* [Helsingfors], vol. 54, no. 10 (1912), pp. 353–373.

Observations were made of 1,582 boys and 1,642 girls, 7 to 15 years of age, to ascertain their height and weight, and yearly increase in stature. The data are given in 12 tables.

467 **Opitz, Hans:** "Über Wachstum und Entwicklung untergewichtiger ausgetragener Neugeborener" [Growth and development of the full-term but underweight newborn]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 13, no. 3 (1914), pp. 145–164.

In the Women's Clinic at Breslau University the author studied the causes of underweight in 73 newborn infants, including no twins nor premature births. Forty-four weighed 2,750 to 2,550 grams; 20 weighed 2,550 to 2,350 grams; and 9 weighed 2,350 grams or less. Many were firstborn, many illegitimate, and all from the lower classes. In only a few cases of round, healthy infants was the underweight due to hypoplasia. In four cases it was due to syphilis and in three cases to tuberculosis of the mother. In all other cases the parents seemed normal. In general the infants studied were like normal children in mortality and growth curve. They were no more liable to infection but were more liable to chronic nutritional disturbances and exudative diathesis. The article contains 11 curves.

468 **Oppenheimer, Carl:** "Über die Wachstumsverhältnisse des Körpers und der Organe" [Relations in growth of body and its organs]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 25 (1888), pp. 328–357.

The author studied 943 bodies from 1882 to 1887 at the pathological institute of the University of Munich. Tables of results fill 10 pages, showing age, weight, and height of person, and weight of his brain, lungs, heart, liver, kidneys, and spleen. A man has attained most of his height at 18, a woman at 15. The lungs grow more rapidly than the body; the heart, spleen, and kidneys at about the same rate as the body; and the liver and brain, much less rapidly than the body.

469 **Orgler, Arnold:** "Das Längenwachstum der Zwillinge" [Growth in length of twins]. *Monatschr. f. Kinderh.* Originalien [Leipzig and Vienna], vol. 12 (1913–14), pp. 490–501.

The author discusses comparative growth in length of 22 sets of twins observed by him, for five months. In 13 cases he gives parallel tables of height and weight. He concludes that the growth curve differs in twins even in intrauterine life.

470 **Ørum, H. P. T.:** "Vaegtsvingninger hos det spaede Barn" [Weight fluctuations in the newborn]. *Nordisk Tidsskrift for Terapi* [Copenhagen], vol. 12 (1913–14), pp. 397–406.

Six hundred and twenty-five children were weighed daily from 2 weeks to 1 year of age to determine the effect of season on growth. Breast-fed children seemed to gain most rapidly from June to November. The maximum increase was from September to November.

471 **Oschmann:** "Der Einfluss der Kriegskost auf die Schulkinder" [Effect of war food on school children]. *Zeitschrift für Schulgesundheitspflege* [Leipzig], vol. 30 (1917), pp. 49–59.

To test the effect of war diet on school children the author examined the height and weight of two groups—one consisting of 161 girls and 169 boys from 6 to 11 years old, belonging to the middle class, measured under like conditions during the school years 1913–14, 1914–15, and 1915–16, and the other consisting of 164 boys and girls, 5½ to 6½, beginning school in 1915, and 148 beginning in 1916. For the former group the average increase in height and weight was smaller in 1915–16 than in preceding years, but the children were all healthy and strong. For the second group, too, there was a slight inferiority in weight and height for the year 1916. But the fatality from diseases was due, says the author, not to malnutrition but to the carelessness of parents.

472 **Ostravidoff, N. I.:** Razvitie, zabolievaiemost i smertnost dietie S. Peterburgskavo hospitatelnavo doma v zavisimosti ot vskarmlivania ikh grudiu materi i kormilitz. [Physical Development Morbidity, and Mortality of Children at the Infant Asylum at St. Petersburg as Related to Their Being Fed at the Mother's or Nurse's Breast]. St. Petersburg, 1895. 141 pp.

The author divides the children into two groups: (1) Those who during the stay at the asylum were fed by their mothers and (2) those fed by paid nurses. For each of the groups he discusses weight, morbidity, and mortality. He concludes that weight and increase in weight are greater, and morbidity and mortality lower, in the first group than in the second. Numerous tables are given.

473 **Pagliani, L.:** "Lo sviluppo umano per età, sesso, condizione sociale ed etnica studiato nel peso, statura, circonferenza toracica, capacita vitale e forza muscolare" [Development of the human body according to age, sex, social and ethnographical condition as shown by weight, height, chest circumference, vital capacity, and muscular force]. *Giornale della società italiana d'igiene* [Milan], vol. 1 (1879), pp. 357–376, 453–491, 589–608.

The report is based on works of several writers and on the author's own study of 1,048 boys and 968 girls ranging in age from 3 to 19 years. The author discusses the physical development (weight, height, chest circumference, vital

capacity, and muscular force) of the human being from the beginning of fetal life until the end of the growth period; also the effect of various kinds of living conditions on the physical development of children. Numerous tables and quotations from other writers are given.

474 **Pagliani, L.:** Sopra alcuni fattori dello sviluppo umano [On Some Factors of Human Development]. Turin, 1876. 71 pp.

The author studied the 234 inmates of an agricultural colony near Turin for orphans and abandoned boys aged 10 to 19 years to find the effect of living conditions on physical development. In several tables he gives the average weight, height, chest circumference, vital capacity, and muscular force for each year of age. The boys were measured shortly after their admission and about 200 once a year in the three succeeding years. The author found that the boys grew very rapidly while in the colony, which he attributes to the favorable living conditions in the institution as compared with the boys' previous surroundings. For the purpose of comparison author also studied over 200 (exact number not given) girls in a high-class boarding school. In several tables he gives their age, weight, height, vital capacity, and muscular force, measured once a year for three years. He found the values far above the average for girls of the same ages, and the height and weight of the girls greater than those of the boys of the same age, which is contrary to the usual findings. This he attributes to the unusually good living conditions in the girls' school.

475 **Pakhomov, D. A.:** "Nabliudenia nad fizicheskim razvitiiem vospitannikov S. Peterburgskoi Dukhovnoi Seminarii" [Observations on the physical development of students of the theological seminary of St. Petersburg]. *Zhurnal Russkago Obshchestva Okhranenya Narodnago Zdravia* [St. Petersburg], vol. 9 (1899), pp. 689–700.

The author investigated the physical development of 24 boys, pupils in a theological seminary in St. Petersburg, continuously during the six years of their stay in that school. At the time of entrance their ages varied from 14 to 17 years. The purpose of the study was to find the effect of boarding schools on the pupils' health. The author gives the height, weight, vital capacity of lungs, and chest expansion for each pupil and each year of the investigation; also the gain in each case at the end of the sixth year.

476 **Paschal, Franklin C., and Louis R. Sullivan:** Racial Influences in the Mental and Physical Development of Mexican Children. Comparative Psychology Monographs, Vol. III. The Williams & Wilkins Co., Baltimore, 1925. 76 pp.

A study of all of the 9 and 12 year-old Mexican boys and girls in the Tucson public-school system at the time of the investigation. The anthropometric work was done by L. R. Sullivan, in accordance with the technique described in his Essentials of Anthropometry (American Museum of Natural History, New York, 1923). A table (p. 51) summarizes the anthropometric findings of the study.

477 **Paull, H.:** "Über den Parallelismus von körperlicher und geistiger Entwicklung der Volksschulkinder" [On the relation between physical and mental development of public-school children]. *Münchener Medizinische Wochenschrift* [Munich], vol. 71 (1924), pp. 526–527.

The author studied 15,000 children 5 to 14½ years old, pupils in the public schools of Karlsruhe. He gives their average height and weight by sex for each six months of age, distinguishing the following groups: Special classes of backward children, backward children in general classes, children who were always promoted, and all pupils; also the average difference between the first three groups. The author found that the backward children were inferior in height and weight to those who never failed to be promoted.

478 **Pearson, Karl:** "On the magnitude of certain coefficients of correlation in man." *Proceedings of the Royal Society of London*, vol. 66 (1900), pp. 23–32.

In this study (pp. to 26) is included a section on the correlation between weight and length of infants at birth, the data being taken from records of 1,000 male and 1,000 female infants born at term. Tables are given.

479 ——— **and L. H. C. Tippett:** "On stability of the cephalic indices within the race." *Biometrika* [Cambridge], vol. 16 (1924), pp. 118–138.

A study based upon measurements of about 4,500 school children from the English professional class, ages 4 to 19, made between 1895 and 1900, and upon a series of measurements taken by and for Galton in his anthropometric laboratory, about the year 1884. These subjects ranged from 5 to 80 years of age and were of mixed English classes. Methods of analysis of the data are shown by 15 tables and 3 diagrams. The authors found no significant change in cephalic indices for children from 5 to 20 years of age, and no evidence of continuous change in the series of subjects from 6 to 80 years of age. Stability of the cephalic index was not shown to be disturbed by change in environment. The author does not accept the view of Professor Boas as to the change in head shape of Jewish immigrants, nor of Miss Fleming (Man, London, vol. 22, 1922, pp. 69–75), as to a change of cephalic index with growth.

480 **Peckham, G. W.:** "The growth of children." Sixth Annual Report of State Board of Health of Wisconsin, 1881, pp. 28–73. Madison, 1882.

Report of a study undertaken under the auspices of the Wisconsin State Board of Health. Several thousand children in the Milwaukee schools were measured, largely by teachers or school principals. Heights (sitting, and standing without shoes) were taken to hundredths of an inch; weights to the nearest quarter pound, in indoor clothing; color of hair and eyes, nationality, and age at last birthday were recorded. Much emphasis is placed upon the influence of race and climate on height and weight, and several pages are devoted to a study of density of population as affecting growth. References.

481 ——— "Various observations on growth." Seventh Annual Report of State Board of Health, Wisconsin, 1882, pp. 185–188. Madison, 1883.

A portion of the extended study of the author on the growth of children. This paper contains a table showing the average height without shoes of 539 students at Beloit College, aged 14 to 25; average heights, without shoes, of 95 boys and girls, 1, 2, and 3 years old; and average weights of 107 boys and girls, 1, 2, and 3 years old. Also a table showing the actual increase in heights from year to year of 7 brothers and sisters 2 to 19 years of age. Methods of measurement are not given, and practically no discussion is included.

482 **Peiper, Albrecht:** "Über Längenwachstum und Ernährung beim Säugling" [Growth in length and nourishment of the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 90 (1919), pp. 341–346.

In connection with a study of diet and its effect on development the author gives data on the changes in weight and length of 71 infants over a period of several weeks.

483 **Peiper, Erich:** "Die körperliche Entwicklung der Schuljugend in Pommern" [Physical development of school boys in Pomerania]. *Archiv für Soziale Hygiene* [Leipzig], vol. 7 (1911–12), pp. 109–137.

As one means of studying deterioration in the German rural population the author collected measurements of the height, weight, and chest girth of 42,528 school boys from 6 to 14 years of age. Deductions were made for clothing. Detailed tables are given, and his results compared with those of Quetelet, Beneke, Landois, Landsberger, Seitz, Camerer, Schmid-Monnard, and others.

484 **Peller, Sigismund:** "Das Gewicht der Neugeborenen nach der sozialen Lage und dem Ernährungszustande der Mutter" [Weight of newborn according to social position and nutritional condition of mother]. *Wiener Klinische Wochenschrift* [Vienna], vol. 27 (1914), pp. 327–329.

On the basis of a statistical investigation embracing 5,487 newborn infants from the Piskavek Clinic and Sanatorium the author arrived at the conclusion that the social conditions of pregnant mothers have an even stronger influence on weight and length of infants than have sex, age, number of previous births, etc. Summarized tables give weights of boys and of girls of different classes and according to age of mother. This article is principally a defense of the foregoing theory and a discussion of Bondi's attack upon it.

485 ——— "Das intrauterine Wachstum und soziale Einflüsse" [Intrauterine growth and effects of social conditions]. *Zeitschrift für Konstitutionslehre* [Berlin], vol. 10 (1924), pp. 308–320.

The author studied the records of 5,784 newborn infants in a maternity home in Vienna in 1912–13 and 1920–22. He gives in several tables the length and weight of the infants who weighed at least 2,500 grams at birth. The cases are arranged by year of birth, sex, and legitimacy, and divided into two groups: (1) Children of mothers who stayed at the maternity home before the birth of the child, and (2) those who did not stay there. Several tables give the relation between length and weight as expressed by the so-called Rohrer's index. The author found that in the cases where the expectant mothers stayed at the maternity home from 2 to 8 weeks before confinement, heavier and larger children were born. From this he concludes that the rest and good food provided at the maternity home had a favorable effect on the child's condition. Illegitimate children are not inferior constitutionally, but during their intrauterine life are unfavorably affected by the bad living conditions of the mother.

486 ——— "Der Einfluss sozialer Momente auf den körperlichen Entwicklungszustand der Neugeborenen" [The influence of social factors on the physical development of newborn infants]. *Wiener Arbeiten aus dem Gebiete der Socialen Medizin* [Vienna and Leipzig], sec. 5 (1913), pp. 1–47.

The author studied the records of 5,487 newborn infants, obtained from two maternity institutions in Vienna, to determine the effect of social conditions on the physical development (especially the weight) of newborn infants. The data used were for 5,026 full-term infants whose mothers were of various social classes and economic conditions. The average weight of the first-born boys in one institution was 3,255 grams, girls 3,145 grams; the figures increased with each successive birth until they reached for the fifth to seventh birth 3,515 grams for the boys and 3,361 grams for the girls. In the other institution the figures were 3,376 grams and 3,237 grams for the first-born boys and girls, respectively, and 3,608 grams and 3,452 grams for the boys and girls of the fifth

to seventh birth. No definite relation between age of mother and child's weight was noted. Many tables show the weight of the infants in relation to sex, number of mother's previous pregnancies, her age, marital status, duration of prenatal rest in a maternity home, and her economic condition. The author concludes: (1) The average weight increases with the number of pregnancies, but the difference becomes constantly smaller. (2) Children of well-to-do parents are born heavier than those of poor parents; the difference is still greater when the mothers are unmarried or when they spend their entire pregnancy period outside of an institution. (3) The differences in weight caused by social factors are as great as, and even greater than, those caused by the sex of the child or the number of previous pregnancies. (4) The length of the newborn infant is affected by social conditions in the same way as the weight.

487 **Peller, Sigismund, and Friedrich Bass:** "Die Bedeutung der Vitamine für das Wachstum des Fötus [The significance of vitamins for the growth of the fetus]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 88 (1924), pp. 127–133.

Study of the weight of 2,360 newborn infants in Vienna, according to season and the kind of prenatal care received by the mother. The authors found that the children born in the summer were about 80 to 87 grams heavier than those born in the winter; also they were heavier when the mothers stayed at a maternity home. The authors are unable to find any definite explanation for these two facts, but they tentatively attribute them to the greater amount of vitamins present in the summer food and to the good prenatal care at the maternity homes.

488 ——— ——— "Die Rolle exogener Faktoren in der intrauterinen Entwicklung des Menschen mit besonderer Berücksichtung der Kriegs- und Nachkriegsverhältnisse" [The part played by exogenic factors in the intrauterine development of the human being with special reference to war-time and post-war conditions]. *Archiv für Gynäkologie* [Berlin], vol. 122 (1924), pp. 208–238.

Original study of the part played by exogenic factors in the intrauterine development of the human being. The authors studied 14,500 newborn infants in Vienna from 1912 to 1922, inclusive. The cases are divided into four groups according to the mother's marital condition and according to the care she received in the antenatal period. The authors found that a decrease in weight amounting to about 350 grams took place since the war in all the above-mentioned groups. This is attributed by the authors to the shortage in food, particularly fats and proteins, due to the war. They conclude that a reduction in the calories, proteins, vitamins, and other elements in the mother's food checks the growth of the fetus. Numerous references to other writers. Tables and diagrams.

489 **Perret and Planchon:** "Établissement de la courbe de poids des nourrissons pendant la seconde année" [The establishment of the curve of weight of infants during the second year]. *Obstétrique* [Paris], vol. 9 (1904), pp. 193–203.

Data for this study were obtained at the Clinique Tarnier where 72 normal infants were weighed, some every week and some every 15 days, and records made of age, sex, weight at birth, weight at the end of the first year, and weight at the end of each week of the second year. The curve of weight constructed from these figures is reproduced, the method of its derivation being carefully explained.

490 **Pershin, A. V.:** "Ob izmĭenienii vĭesa i temperaturi tiela u novorozhdennĭkh dietie v pervie niedieli ikh zhizni" [Fluctuation of weight and temperature of the body of newborn infants during the first week of life]. *Dnevnik obshchestva vrachei pri imperatorskom Kazanskom Universitiete* [Kazan], no. 1 (1891), pp. 27–123.

The purpose of the study is to ascertain the extent and nature of physiological loss. The author investigated the weight of 29 newborn infants at the university clinic at Kazan, Russia, the children being weighed nine times a day for six days. The author gives in tables the results of each weighing separately for each case, and after a detailed discussion of his results he presents 18 conclusions. He found a decrease of weight in every case. It took 65 hours in the case of boys and 70 in the case of girls, to make up the loss. More than one-half of the loss was due to the discharge of meconium. In the first few days metabolism takes place at a higher rate in boys than in girls.

491 **Peterson, O. V.:** "Ytterligare om vigtsförhållandena hos späda barn under första lefnadsåret" [Weight of young children in the first year of life]. *Upsala Läkareförenings Förhandlingar*, vol. 23 (1887–88), pp. 399–411.

A study of the daily weight increase of a child born June 2, 1886, weighing 4,800 grams. The daily gain is given in a long table. The child gained 5,700 grams during its first year of life.

492 **Pfannkuch, Wilhelm:** "Über die Körperform der Neugeborenen" [Bodily form of newborn children]. *Archiv für Gynäkologie* [Berlin], vol. 4 (1872), pp. 297–310.

The author compiles tables from the weight, length of body, and size of head of 372 newborn boys, 155 of them first-born, and of 342 girls, 140 of them first-born, and gives the following conclusions: Weight varies directly as length and mass of head but increases more rapidly. Development is advanced according to amount of muscle and fat. Girls are plumper than boys, but boys are usually heavier. Boys have relatively greater length and larger skulls. The latter fact probably accounts for their greater mortality at birth. By studying 400 newborn children the author found that the heads of the first born are not so long as those of other infants.

493 **Pfaundler, M.:** "Körpermassstudien an Kindern" [Studies of bodily measurements in children]. *Ztschr. f. Kinderh.* [Berlin], vol. 14 (1916), pp. 1–148.

The author discusses the possibility of bringing variations in size of children under mathematical laws. After considering Galton's accidental curve he treats at length Gauss's curve based on general law of probability and concludes that height does actually follow Galton's law. Besides height he discusses body measurements in various classes, discards the parabola as a growth curve, and detects a relation between weight and conception time. He perfected a device for directly determining surface and tested the Vierordt-Meeh coefficient as an index of stature. He discusses the "law of surface area" and body volume and body thickness. He refers to investigations on children conducted under his supervision by Riedel, Skibinski, Diskanski, Matusiewicz, and analyses the work done by Weissenberg and others. In the same periodical, 1917, vol. 16, Bernstein criticises this study and Pfaundler replies to him.

494 ——— "Über Körpermasse von Münchener Schulkindern während des Krieges" [Bodily measurements of Munich school children during the war]. *Münchener Medizinische Wochenschrift*, vol. 66, pt. 2 (1919), pp. 859–862.

Mayerhoefer and Miss Schiller made 2,500 measurements in 1917–18 of the height and weight of Munich school boys and girls 6 and 7 years of age. Livi's index was calculated. Results were shown in one graph and eight tables. Pfaundler, after comparing the data with those of Riedel and Skibinski on the same schools before the war, concludes that a leveling process has taken place, that the rich children show the effects of the war more than the poor and the extremely well-developed children more than the mediocre.

495 **Pfeiffer, Emil:** "Bemerkungen betreffend Wachsthum und Körperwägungen der Säuglinge" [Observations on growth and body weights of infants]. *Jahrb f. Kinderh.* [Leipzig], new ser. vol. 19 (1882–83), pp. 142–147.

The author does not agree with Fleischmann's observation that the normal infant at the end of the fifth month weighs 550 grams more than twice its birth weight and at the end of the year weighs 900 grams less than three times its birth weight. The author's own experience agrees much better with Vierordt's and Bouchaud's curves. A diagram gives increase in weight of a heavy and a small infant when 5 months and 1 year old. Another gives the monthly increase throughout the first year, of nine infants reared at first on the breast and then on mixed feeding. The author weighed the infants himself every three or four days.

496 **Pfitzner, W.:** "Social-anthropologische Studien. I. Der Einfluss des Lebensalters auf die anthropologischen Charaktere" [Social-anthropological studies. I. The influence of age on anthropological characteristics]. *Zeitschrift für Morphologie und Anthropologie* [Stuttgart], vol. 1 (1899), pp. 325–377.

The author observed in a large number of individuals the hair and eye color, body length, stem length (trunk and head), arm length, leg length; length, breadth, height, and circumference of head; and breadth and height of face. The observations are grouped in age periods of varying length, from birth to 100 years, for each of the sexes, and many tables of relationships are derived. The author finds but three absolute and permanent characteristics by which an individual may be described: Sex, age, and length-breadth index of the head (found to be constant from birth to death).

497 **Piering, Oscar:** "Über die Grenzen des Körpergewichtes Neugeborener" [The limits of body weight of newborn infants]. *Monatsschrift für Geburtshülfe und Gynäkologie* [Berlin], vol. 10 (1899), pp. 303–314.

A mass of information on variations in the weight of newborn infants, with sources cited. The least weight, 717 grams, is recorded by Ritter; the heaviest stillborn child weighed 11,300 grams, according to Ortega, and the heaviest surviving one 6,133 grams, according to Wright. The author also describes the development of full-term twins born in April, 1898, who thrived without the use of the incubator and were normal at time of writing, though at birth the boy weighed only 1,455 grams and the girl only 1,095.

498 **Pies, W.:** "Zur Physiologie des Neugeborenen, Über die Dauer, die Grösse, und den Verlauf der physiologischen Abnahme" [Physiology of newborn infant. Duration, extent, and course of physiological loss in weight]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 9 (1910–11), pp. 514–543.

A study of weight gains and losses of 150 infants born at the lying-in department of the Empress Augusta Victoria House. Of these, 96 per cent attained initial weight on an average on the twenty-second day. This retarded gain was attributed to hard labor and nervous strain of the mothers, who belonged to the very poor classes. The greatest initial loss was found in first-born infants. Weight fluctuations are discussed in detail. Article includes nine graphs.

499 **Pinard, A.:** "À propos du développement de l'enfant" [The development of the child]. *Revue scientifique* [Paris], ser. 4, vol. 5 (1896), pp. 109–111.

To demonstrate the value of rest preceding delivery the author ascertained the average weight (3,010 grams) of 500 children born of mothers working till time of delivery, of 500 children born of mothers who rested at least 10 days before delivery in a refuge (3,290 grams), and of 500 children born of mothers who sojourned at the Clinic Baudelocque (3,366 grams).

500 **von Pirquet, C.:** "Eine enfache Tafel zur Bestimmung von Wachstum und Ernährungszustand bei Kindern" [A simple table for determining growth and nutrition in children]. *Ztschr. f. Kinderh.* [Berlin], vol. 6 (1913), pp. 253–262.

The author points out how proportions in a growing human being change according to age and also how individuals of given age may differ. He gives graphs of the average child in Russia according to Gundobin and in Germany according to Camerer. On the basis of Camerer's investigation he gives tables of boys' and girls' height and weight up to about 18 years, and curves where the ages form the abscissas and the relations $\frac{\text{Ht.}^3}{\text{Wt.}}$, the ordinates. The greatest growth in length takes place in the first three years of life; there is little in the sixth year.

501 **Pismenny, N. N.:** "Sravnenie fizicheskago razvitiia uchenikov fabrichnikh i zemskikh shkol Serpukhovskago uezda v zavisimosti ot niekotorikh uslovii zhizni fabrichnago nasielieniia" [A comparison of the physical development of the pupils of the factory and rural schools of Serpukhov County with reference to certain living conditions of factory workers]. *Vestnik obshtshestvennoy higieni, sudebnoy i prakticheskoy meditzini* [St. Petersburg], 1905, pp. 506–524.

A study of 642 school boys and 254 school girls 8 to 13 years old. The author obtained weight, height, chest circumference, and details as to living conditions of the parents. About one-half of the children belonged to families of factory workers; the others were peasants. The purpose of the investigation was to ascertain the differences in the physical development of the children of these two groups. The author found that as regards height, chest circumference, and annual gain in both, the advantage, other things being equal, was on the side of the peasant children; and in each of the groups families with the higher income had the better-developed children. Numerous tables give the author's findings and those of other writers.

502 **Poetter:** "Messungen und Wägungen von Leipziger Schulkindern im Kriege, verglichen mit der Friedenszeit" [Measurements and weights of Leipzig school children in war times as compared with peace times], *Zeitschrift für Schulgesundheitspflege* [Leipzig], vol. 32 (1919), pp. 49–57.

In February, 1914, all the public-school children of Leipzig were measured and weighed systematically. By the same system the boys and girls of the fifteenth and thirty-first district schools, between 7 and 14 years of age, were weighed and measured in March, 1917, and February, 1918. Thus the author had data on more than 1,200 children in one of the schools and on 1,200 to 1,500 children in the other school for each of the years, 1914, 1917, and 1918. The system of measurements is described, and the results are presented in six tables. The more prosperous children of the one school showed better values than those of the other. Girls showed superiority over boys from the eleventh or twelfth year on. Measurements in 1917 and 1918 showed a reduction in weight, a very slight decrease in height, and a decided increase in girth of chest.

503 **Porter, W. T.:** "The growth of St. Louis children." *Transactions of the Academy of Science of St. Louis*, vol. 6, no. 12 (1894), pp. 263–380.

An exhaustive study based on measurements of 33,500 children in St. Louis schools, each individual measured but once. Measurements of head and face were made by medical students; other data were collected by teachers in accordance with printed instructions, here reproduced. A list of the apparatus used and schedule of the survey are also given. Statistical methods employed are explained at length, and the comparison of median and average values is

discussed, also influence of occupation and nationality of parents. There are chapters on percentile grades, sexual differences in growth, rate of growth, relation between physical development and mental capacity, and the application to individuals of mean values derived by the generalizing method. Many tables and diagrams and a bibliography are included.

504 **Porter, W. T.:** "The physical basis of precocity and dullness." *Transactions of the Academy of Science* [St. Louis], vol. 6, no. 7 (1893), pp. 161–181. See also *Zeitschrift für Ethnologie* [Berlin]; vol. 25 (1893), pp. 337–356.

From measurements of 33,500 St. Louis school children (for method *see* No. 503 this section) the author derives tables and graphs based upon distribution by school grades, from which he concludes: (1) Precocious children are heavier, taller, have larger chest girths and wider heads than either the mean or average child of same age, and dull children, vice versa. (2) The comparative rate of growth of dull, mediocre, and precocious children of the same sex is the same at all ages from 7 to 16, inclusive; the acceleration in weight preceding puberty takes place at the same age, and the point at which girls become heavier than boys is the same. (3) No child whose weight is below the average for his age should be promoted beyond the average grade for his age without physical examination.

505 ——— "The relations between the growth of children and their deviation from the physical type of their sex and age." *Transactions of the Academy of Science of St. Louis*, vol. 6 (1893–1894), pp. 243–250.

The author discusses work of Quetelet in arriving at a law of probable deviation of individual measurements from the median value, and of Geissler and Uhlitzsch on deviations from the average value, of an anthropometric series, and selects the average as the basis of his own conclusions. From measurements of 33,500 St. Louis school children (for method *see* No. 503 this section) he derives tables showing number of observations (in groups), average, probable deviation, relative annual increase of average, and relation of probable deviation to average, and concludes that the physiological difference between the individual children in an anthropometric series and the physical type of the series is directly related to the quickness of growth.

506 ——— "The relative growth of individual Boston school boys." *American Journal of Physiology* [Baltimore], vol. 61 (1922), pp. 311–325. See also *Bost. M. & S. J.*, vol. 188 (1923), pp. 639–644.

An investigation to determine how the growth of the individual boy is related to the growth of the average. Data were secured by monthly measurements for nine years of 2,421 boys and 2,380 girls born in 1904, 1905, and 1906. The numerical chance that a child will remain in his initial percentile grade throughout the period of growth is determined from these data; also the degree of such deviation as may occur. Many individual records are compared with general results. The author feels that by means of these data retarded growth may be detected and disease prevented or checked.

507 ——— "The seasonal variation in the growth of Boston school children." *Am. J. Physiol.* [Baltimore], vol. 52 (1920), pp. 121–131.

A study to demonstrate seasonal variation in growth. Several thousand school children in Boston were measured as to height and weight in 1909, and measurements were repeated monthly with same children through June, 1919. Work was done by school nurses under physicians; methods of measurement are not given. Results are tabulated by months of age; by gain in weight from September to January and from February to June; by weights distributed by months and by monthly percental increase. Graphic curves are derived. Seasonal growth indicated by these curves was further demonstrated by comparison of two series of 12 consecutive weights taken from month-age and growth-by-month tables, respectively.

508 **Potel, Maurice:** De l'accroissement en poids des enfants nés avant terme [Growth in Weight of Premature Children]. Paris, no. 471, 1895. 40 pp.

Thesis (University of Paris). Weights are given for several hundred premature infants in the Crèche des Enfants Débiles. The increases in weight are grouped according to the time of gestation.

509 **Powys, A. O.:** "Data for the problem of evolution in man. Anthropometric data from Australia." *Biometrika* [Cambridge], vol. 1 (1902), pp. 30–49.

With material irrelevant to the subject of growth the author includes observations on the heights of male and female criminals in Australia. Methods of measurement are not given. Ages are from 15 up. The article includes comparative curves of male and female stature, plotted by heights and frequency per 1,000 cases; table of means, modes, standard deviation, and skewness of 5-year age groups; tables of heights and ages of about 50,000 male and 8,000 female criminals in New South Wales. The author concludes that man is more variable than woman in stature; that after the age of 27 in man and of 25 in woman there is a loss in height of approximately one-third inch per 10 years.

510 **Puig y Roig, Pedro:** "Croissance pondérale et staturale des enfants espagnols" [Growth in weight and height of Spanish children]. *Archives de médecine des enfants* [Paris], vol. 22 (1919), pp. 449–465.

Data consist of statistics compiled in the Lying-in Hospital and Orphanage at Barcelona for the years 1910 to 1918; full measurements were taken every three months. Most of the children were between 3 and 9 years of age. The author used the generalizing method. Spanish children seemed to be inferior in development to Anglo-Saxon children.

511 **Putilov, P.:** Materiali k izucheniu rosta cheloviecheskavo tiela [Data on the Growth of the Human Body]. Omsk, 1886. 90 pp.

The author studied cadavers of human adults and that of one child for the purpose of determining (1) the surface of various parts of these bodies and their mutual relation and (2) the difference between the surfaces of the various parts of the body of an infant and an adult. After a discussion of the history of anthropology the author gives a number of tables showing for the infant and for the adult the surfaces in square centimeters of the various parts of the head, neck, chest, abdominal region, pubic region, upper and lower extremities; the surfaces of all the muscles and the joints and of the membranes of the head, neck, chest, and abdomen. In conclusion he summarizes all his findings in one table and shows how much the skin of each part of the body grows from birth to adult age.

512 **Putnam, Jas. J.:** "The ideal weight of children." *Arch. Pediat.* [New York], vol. 39 (1922), pp. 71–85.

A discussion of factors influencing growth and nutrition. There are included the data obtained by the U. S. Children's Bureau from the weighing and measuring of 4,626 Gary children, aged 2 weeks to 7 years, and of 687 private-school children near Boston.

513 **Putzig, H., and H. Vollmer:** "Die physiologischen Tagenschwankungen des Körpergewichtes und der Körpertemperatur im Säuglingsalter" [The physiological daily fluctuations in the weight and temperature of infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 37 (1924), pp. 269–270.

The purpose of this study was to ascertain whether there is a relation between the increase in weight and the decrease in body temperature in infants. The infants (number not given) were fed five times a day every four hours; the food was in all cases equal in amount and composition; the infants were weighed and their temperature taken every four hours. The author found that the daily weight of infants over 3 months old varies from 150 to 500 grams. It increases in the afternoon, reaches its maximum at midnight, decreases in the early morning and undergoes very little change throughout the forenoon. The temperature runs a course very similar to that of the weight. These fluctuations in weight and temperature, the authors think, are produced by the transition from sleep to wakefulness and by the accompanying variations in the intensity of metabolism. They found no direct causal connection between the fluctuations in weight and those in temperature. References.

514 **Pye, W.:** "Three lectures on the growth rates of the body and especially of the limbs in their relation to the processes of rectification of deformity." *Lancet* [London], 1890, vol. 2, pp. 163, 329, 431.

Tables are given of the annual increment of stature for various ages and various social strata; also of the rate of growth of the limbs.

515 **Pyle, W. H.:** A Manual for the Mental and Physical Examination of School Children (revised). *University of Missouri Bulletin* [Columbia], vol. 21, no. 12 (1920). 39 pp.

Tables of physical measurements for city and country children.

516 ——— "A study of the mental and physical characteristics of the Chinese." *School and Society* [New York], vol. 8 (1918), pp. 264–269.

Data for this study were collected by Dr. J. W. Creighton under the direction of the author. About 500 Chinese from 10 to 18 years of age were measured as to standing and sitting height and weight, lung capacity, strength of grip, muscular speed of hands, length and breadth of head. A comparison with American standards showed the Chinese in general physically inferior to Americans.

517 ——— and **P. E. Collins:** "The mental and physical development of rural children." *School and Society* [New York], vol. 8 (1918), pp. 534–539.

A study of the entire school population of a Missouri county, over 2,000 children in all, the physical measurements, which were made in the fall of 1917, including height standing, height sitting, weight, lung capacity, strength of grip, and muscular speed. Absolute and relative measurements for country and city children are shown in tabular form. In general there was little difference in physical development between country and city children, with the balance slightly in favor of city children. City boys made a better showing than city girls.

518 **Quest, Robert:** "Über extreme Körpergewichtsabnahmen bei Kindern der ersten zwei Lebensjahre" [Extreme losses of body weight in children during the first two years of life]. *Monatschr. f. Kinderh.* [Leipzig], vol. 3 (1904–5), pp. 453–464.

After discussing the works of Bouchaud (1864) and Woronoff (1882) on extreme losses of weight in children the author considers the question how great such a loss of weight may be and still permit recovery. Sifting material in the Breslau Children's Clinic covering 10 years he selects 38 cases of children 2 years old or younger who lost more than one-fourth of their weight. Thirteen cases belonged to the first and second months; 17 were from the third to the sixth, 8 from the sixth to the twenty-fourth. The smaller the total weight, the larger the relative loss. The most frequent causes of decrease in weight were tuberculosis and nutritional disturbances. Among the 38 there were 8 cases of the former, 23 of the latter. From the 23 the author selected 7, for which he gives long case histories and weight curves. The greatest loss in an infant that recovered amounted to 34.8 per cent of its weight.

519 **Quetelet, L. A. J.:** Anthropométrie [Anthropometry]. Baillière et fils, Paris, 1871. 479 pp.

A comprehensive work including tables of measurements, a discussion of the relation of various factors such as climate, age, profession, economic status, etc., to body measurements, and a study of the laws of physical growth.

520 ——— "Recherches sur la loi de la croissance de l'homme" [Researches on the law of growth in man]. *Annales d'hygiène publique et de médecine légale* [Paris], vol. 6 (1831), pp. 88–113.

Contains a careful study of data concerning the growth of man from which the author derives a formula for the law of growth. He finds that woman is shorter than man because she is smaller at birth, reaches maturity sooner, and has a slower rate of growth. At the age of 19 years men in the city are taller than men in the country. The growth of man terminates at about the twenty-fifth year.

521 ——— "Recherches sur le poids de l'homme aux différents âges" [Researches in the weight of man at different ages]. *Annales d'hygiène publique et de médecine légale* [Paris], vol. 10, pt. 1 (1833), pp. 5–27.

An article that does not include the tables upon which the author's conclusions are based but reports a small number of observations upon the newborn and children under 5 years of age. One of the earliest researches to establish the fact of loss in weight immediately after birth and the variation in the relative weight and height of the sexes at the period of puberty.

522 ——— Sur l'homme et le développement de ses facultés [On Man and the Development of His Faculties]. Bachelier, Paris, 1835. Vol. 1, 327 pp.; vol. 2, 327 pp.

In the second volume of this important work (pp. 1 to 96) the author gives the results of his studies on the bodily development of man from the fetal stage to dissolution. The article is interesting as pioneer work in the science of physical measurements and the mathematical treatment of physical data and establishes some of the fundamental facts which have been verified by later investigations. Many tables show increase in weight, height, and strength compared for the sexes and for different classes of society.

523 ——— "Taille de l'homme à Venise pour l'âge de vingt ans" [Stature of Venetian men at the age of 20 years]. *Bulletin de l'Académie royale des sciences, des lettres et des beaux-arts de Belgique* [Brussels], ser. 2, vol. 27, no. 3 (1869), pp. 196–200.

The author briefly reviews the progress of anthropometry since the publication of his "Physique Sociale" in 1835 and quotes the observations of M. Bodio, who measured a large number of young soldiers in Venice and found in his results a verification of Quetelet's theories as to the laws of growth.

524 **Quirsfeld, Eduard:** "Untersuchungsergebnisse der physischen und geistigen Entwicklung bei 1,014 Kindern vom 1. bis 8. Schuljahre" [Results of investigations of the physical and mental development of 1,014 children from the first to the eighth school year]. *Prager Medicinische Wochenschrift*, vol. 32 (1907), pp. 653–656.

From observations on the physical and mental development of the same 1,014 children through the first eight years of their schooling the author presents statistics and suggestions on hygiene. During the eight years boys increased in height 30.02 centimeters and girls 36.6 centimeters; boys increased in chest girth 12.3 centimeters and girls 13.21 centimeters; boys increased in weight 16.5 kilograms and girls 23 kilograms; and in strength boys improved from 52.61 per cent to 70.21 per cent and girls from 55.71 per cent to 70.12 per cent. Mental and physical fitness were parallel. At entrance 39.2 per cent and 42.1 per cent of the girls were healthy and without defect; at the end of eight years these percentages had fallen to 25.1 and 32.5, respectively.

525 **Quirsfeld, Eduard:** "Zur physischen und geistigen Entwicklung des Kindes während der ersten Schuljahre" [Physical and mental development of the child during the first school years]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 18 (1905), pp. 103–185.

This article, containing a great mass of statistics, discusses examinations of about 8,000 boys and girls made every July during the first four years of school, as to height, chest girth, lung capacity, weight, muscular tissue, and nutrition, vision, hearing, comprehension, memory, etc. The material is worked into tables of measurements, percentages, curves, and diagrams. Physical and mental development varied directly with material prosperity. Girls evidenced better comprehension and memory than boys and during the four years improve more therein.

526 **Radlauer, Curt:** "Anthropometrische Studien an Somali (Häschîa)" [Anthropometrical studies of the Somali]. *Archiv für Anthropologie* [Braunschweig], new ser. vol. 13 (1914), pp. 451–473.

In the summer of 1910 the author obtained measurements of 35 Somali, among whom there were 22 adult males, 1 adult female, 6 girls (5 to 8 years old), and 6 boys (8 to 12 years old). Following a résumé of previous anthropological studies of these people he reports the results of these measurements in numerous tables of absolute and relative values, based upon the arithmetical averages of his observations. The individual measurements are also given for each of the 35 subjects. Bibliography.

527 **Radosavljevich, P. R.:** "Physical measurements of pupils in Mostar, Herzegovina (Austria)." *Translations of the Fourth International Congress on School Hygiene* [Buffalo], vol. 5 (1914), pp. 541–550.

The original purpose of this study was to investigate thoroughly the relation between bodily development and intellectual activity of school children. A total of 4,634 persons between the ages of birth and 65 years were measured, but this paper relates only to pupils from the high gymnasium for boys, the elementary and secondary public schools of Mostar. All were Serbs or Croats. Measurements were made of standing height, sitting height, circumference, length, width, and height of head, length, width of right and left ear, and body weight. Technique is described, and results are tabulated. From tables of average values the author found very slight correlation between measurements and mental capacity. Since average values studied and evaluated with reference to the distribution of cases, maxima and minima, and so forth, give a variety of results, the author concludes that school anthropology has not yet reached the stage of definite conclusions.

528 **Ramsey, W. R., and A. G. Alley:** "Observations on the nutrition and growth of newborn infants." *Am. J. Dis. Child.* [Chicago], vol. 15 (1918), pp. 408–412.

A comparison of data from charts in the ward for newborn in the hospital connected with the University of Minnesota, with certain generally accepted standards of nutrition and growth. Some of the points considered are average birth weight, average initial loss, average time when recovery of weight begins, daily number of stools, gain in weight during the first 10 days.

529 **Ranke, J.:** "Über Körpermessung an Lebenden" [Body measurements on living subjects]. *Correspondenzblatt der Deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* [Munich], 1884, 15th year, pp. 171–177.

A study of the laws of growth as applied to the fetus, the infant, and the adult, with spécial reference to the relative proportions of the body and limbs.

530 **Ranke, O.:** "Anthropometrische Untersuchungen an gesunden und kranken Kindern mit besonderer Berücksichtigung des schulpflichtigen Alters" [Anthropometrical investigations on healthy and sick children with special reference to school age]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 18 (1905), pp. 719–745, 816–837.

This article is prefaced with a discussion of former work on the subject, especially that done by Liharžik. The author's research rests on measurements made in the summer and fall of 1902 on 2,509 healthy and 298 sick children, from birth to 15 years of age, in schools, clinics, and other institutions, of Kiel, Lubeck, and Alsterdorf. Of the healthy children 1,468 were boys, 1,041 girls. The investigation involved details of body length, size of head, and family history. In addition to giving comprehensive tables of figures the author discusses many individual cases, being especially interested in incipient hydrocephalus. He finds that boys are larger than girls, except between the ages of 6 and 14, and that the head has assumed its definitive form by the seventh year. The children were almost all brachycephalic, the girls showing slightly lower averages than the boys. Especially intelligent children had mean values, for their ages, of head measurements and indexes.

531 ——— "Beiträge zur Frage des kindlichen Wachstums" [Data on the question of children's growth]. *Archiv für Anthropologie* [Braunschweig], new ser. vol. 3 (1905), pp. 161–180.

Measurements of 2,509 children varying in age from a few hours to 15 years. The investigation was made in a gynecological clinic and in day nurseries and

schools of the cities of Kiel and Lubeck. The author gives for each year of age and each sex the height, length of trunk, length of legs, horizontal, sagittal and transverse head circumference, and head diameters, body-head index, trunk-head index, auricular height and index, stating the differences noted at the end of the 15 years. Quotations are given from several investigators for purposes of comparison.

532 **Raynaud, L.:** "Détermination de l'âge" [The determination of age]. *Journal de médecine de Paris*, 2 ser. vol. 19 (1907), pp. 32–33.

Medico-legal. The author reports in detail his method of determining the age, by physical examination, of an Algerian prisoner, apparently between 17 and 21 years old.

533 **Reiche, Adalbert:** "Das Wachstum der Frühgeburten in den ersten Lebensmonaten" [The growth of the premature child in the first months of life]. *Zeitschr. f. Kinderh.* [Berlin], vol. 12 (1915), pp. 369–401.

A study of the growth and development of 100 premature infants weighing 840 grams to 2,500 grams, at the Empress Augusta Victoria House. They were measured every 8 to 14 days in weight, height, and girth of head and chest. The article contains many tables and curves. Bibliography.

534 **Reid, John:** Physiological, Anatomical and Pathological Researches. Sutherland & Knox, Edinburgh, 1848. 659 pp.

In chapter 13 (pp. 376–388) the author gives tables of the weights of some of the organs of the body at different periods of life. The information was collected at the Edinburgh Royal Infirmary and includes a limited number of observations of the organs of children. Methods used are described in detail.

535 **Reiter, H., and H. Ihlefeldt:** "Einfluss von Alter der Mutter und Gebürtigkeit des Kindes auf dessen Entwicklung" [Effect of mother's age and number of pregnancies on the development of the child]. *Klinische Wochenschrift* [Berlin], vol. 1 (1922), pp. 2524–2525.

Investigation of 634 legitimate children born in Rostock, Prussia, to determine the effect of the mother's age and number of pregnancies on the physical mental condition of the child. At the time of the investigation the children were about 10 years old. The authors find that first-born children and those born to younger mothers are superior to children of multiparæ and older mothers in weight at birth, and in weight and size, state of nutrition, and physical and mental condition at the time of the investigation. This is contrary to the findings of many other authors. Four tables are given.

536 **von Reuss, A.:** "Über die Bedeutung der Unterernährung in der ersten Lebenszeit" [The significance of undernourishment in early infancy]. *Ztschr. f. Kinderh.* [Berlin], vol. 4 (1912), pp. 499–525.

Weight curves and case histories for infants are given in connection with a study of malnutrition.

537 **Reuter, F.:** "Beiträge zur Anthropologie Hinterpommerns. Eine Schulkinderuntersuchung in Pollnow" [Data on the anthropology of lower Pomerania; an investigation of the school children in Pollnow]. *Archiv für Anthropologie* ([Braunschweig], vol. 28 (1903), pp. 288–338.

Measurements were made of 189 boys and 184 girls, from 6 to 14 years of age. Each child's record gave age; birthplace of child and of parents; father's occupation; color of skin, eyes, and hair; head form; shape of forehead, nose, and ears; state of nutrition; and 19 body measurements. Methods and instruments are described. Many tables give the results of the measurements, comparison with Worcester children, and various correlations.

538 ——— "Kopfform und Körperbau" [Form of head and structure of body]. *Archiv für Rassen- und Gesellschafts-Biologie* [Munich], vol. 5 (1908), pp. 449–477.

The author claims to prove that there are constant relations between body structure and form of head. People with short torso and long legs have a long head; those with short legs and long torso have a broad, massive head. If the back of the head is long, the eye cavity is small and round; if short, this cavity is broad and long. These conclusions are based on a mass of material presented in five curves and many tables. Besides many adults the material includes 383 Pomeranian school children, measured in 1901, and 53 pupils of an Osterburg polytechnic, measured in 1903; the first group comprises boys and girls from 6 to 14, the second boys from 9 to 16.

539 **Riccardi, P.:** "Di alcune correlazioni di sviluppo fra la statura umana e l'altezza del corpo seduto" [Relations between standing and sitting heights in the human being]. *Memorie della Reggia Accademia di Scienza, Lettere ed Arti* [Modena], vol. 8, ser. 2 (1892), pp. 231–309.

The author studied the relation between standing height and sitting height in 1,185 persons from 3 to 35 years old, men and women in nearly equal numbers. In a number of tables the author gives by sex and age the standing height, sitting height, annual increase in each, and proportion in both heights in percentages, and fluctuations in this proportion for each year of age in the first 20 years of life. He concludes that in both sexes the sitting height is

somewhat greater than half the standing height; the proportion between the two increases with advancing age; in women this disproportion is a little greater than in men, particularly between the ages of 12 and 35 years.

540 **Riccardi, P.:** "Note antropologiche fatte intorno ad alcuni giovani della R. Casa di Custodia in Bologna" [Anthropological notes about some boys at the royal house of detention in Bologna]. *Archivio di psichiatria, scienze penali ed antropologia criminale* [Turin], vol. 3 (1882), pp. 151–156.

The author gives a description of the physical characteristics of each of 20 boys; also, in a table, the age, height, span of arms, antero-posterior, transverse, and minimum frontal diameters, height of face, bizygomatic diameter, facial angle, cephalic index, and horizontal circumference of head. This is followed by a discussion of the values so obtained and an enumeration of the abnormal physical characteristics found, such as asymmetry of skull and face, low forehead, hydrocephalic characteristics of skull, prognathism, and mongoloid, negroid, and cretin types.

541 **Riedel, Eduard:** Die Körperlänge von Münchner Schulkindern [Height of Munich School Children]. Munich, 1913. 34 pp.

Inaugural dissertation (University of Munich). The author discusses the height of 1,862 school boys and 1,854 girls 5½ to 7½ years old, attending three public schools in Munich in 1912–13. Shoes were not reckoned in the height. The girls were measured by the author himself. The arithmetical mean height was 110.9030 centimeters and 114.0468 centimeters for boys of 6 and 7 years; 109.7146 centimeters and 113.3098 centimeters for girls of these ages. For each case the author has calculated, also, the oscillation exponent, mean deviation from the arithmetical mean, mean deviation from the single value, and probable deviation from the same, probable deviation from the arithmetical mean, parameter of the Gauss curve, etc.; all of which he discusses in the opening section of his thesis. In nine graphs he compares his results with theoretical data or with the figures of Geissler-Uhlitzsch.

542 **Rietz, E.:** "Das Wachstum Berliner Kinder während der Schuljahre" [Growth of Berlin children during school years]. *Archiv für Anthropologie* [Braunschweig], new ser. vol. 1 (1903–4), pp. 30–42.

This article concerns the height, weight, and chest measure of 5,134 school children of Berlin, divided according to sex and material prosperity. The measurements are taken in summer clothing, shoes excluded; chest measurements according to Frölich's methods. Tables and graphs give height, weight, and annual growth of boys and girls; other tables give variations in height and mass, chest measurements, the quotient of weight in grams divided by height in centimeters, and comparison of boys and girls of richer and poorer classes in Berlin and other German cities with those, respectively, of Sweden, Denmark, England, Boston, Turin, and Warsaw. The author comments on a retardation in growth of boys from the age of 9 or 10 to 13 or 14, and on earlier pubertal acceleration in girls at 11 to 14. The more prosperous class is better developed than the poor class, the chest averaging 3 centimeters greater in circumference. The Berlin children showed superiority in height to all others except the English.

543 **Ripley, W. Z.:** "The form of the head as influenced by growth." *Science* [New York and Lancaster, Pa.], new ser. vol. 3 (1896), pp. 888–889.

The author measured length and breadth of heads of 485 students at the Massachusetts Institute of Technology, grouped as follows: First year, 215; second, 69; third, 66; fourth, 136. Measurements apparently were taken but once, and the method is not given. Results are compared with observations of several investigators in the United States and Europe.

544 **Roberts, C.:** "The physical development and the proportions of the human body." *St. George's Hospital Reports*, 1874–1876 [London], vol. 8 (1877), pp. 1–48.

An investigation suggested by the work of Quetelet to determine the typical forms of man for each age as they existed at that date in England. The measurements considered were height, chest girth, weight of body, and size and proportions of head, trunk, and limbs. Data were collected from the work of many investigators and arranged in eight tables and two diagrams showing average and mean proportions of the body at each year from birth to 30 years of age.

545 ——— "The physical requirements of factory children." *Journal of the Royal Statistical Society* [London], vol. 39 (1876), pp. 681–733.

An attempt to formulate standard tables of physical measurements to assist factory surgeons in determining whether children should be certified as fit for employment. The tables show actual, average, and mean height, chest girth, and weight of about 10,000 factory and other children, and the relation which these physical qualities bear to one another; the relations between heights and weights of 1,000 boys of the exact age of 14; the mean rate of growth between 8 and 14 years for determining the typical proportions of any child of the laboring class; the height, chest girth, and weight of 1,000 children of each age (last birthday) and both sexes, from which are deduced minimum standards of physical capacity for factory work.

546 **Robertson, T. Brailsford:** "A comparison of the weights at birth of British infants born in the British Isles, the United States, and Australia." *University of California Publications on Physiology* [Berkeley], vol. 4, no. 20 (1915), pp. 207–210.

From the work of various investigators in the three countries mentioned the author discovered that Australian newborn infants weigh more than those born in the eastern United States, and the latter than those born in the British Isles. He discusses social and economic conditions in the three countries and concludes that birth weight of infants of same race is a sensitive criterion of social and economic environment.

547 ——— "Studies on the growth of man: I. Pre- and post-natal growth of infants. II. The postnatal loss of weight in infants and the compensatory overgrowth which succeeds it." *Am. J. Physiol.* [Baltimore], vol. 37 (1915), pp. 1–42, 74–85.

I. A curve for the latter part of intrauterine growth is plotted by mathematical processes, the basic data being the weight of premature infants in South Australia. This curve is a continuation of the postnatal weight curve with an indentation at birth. There is no indication of more than one growth cycle in utero after the implantation of the embryo. The human growth periods are (1) to the implantation of the embryo; (2) to the age of 1 year; (3) to the age of 5.5; (4) to adult weight. The maximum velocity of growth is at 12.5 years in the female and at 14.5 years in the male. II. The infants were weighed one week after birth. A comparison is made between the observed loss and gain in early infancy and the presumptive weight if the curve of growth were not depressed by birth.

548 ——— "Studies on the growth of man. III. The growth of British infants during the first year succeeding birth." *Am. J. Physiol.* [Baltimore], vol. 41 (1916), pp. 535–545.

From data supplied by infant-welfare associations in London and Leeds on about 2,000 infants a curve is derived by indicated statistical methods, showing increase of weight in males and females of British parentage during the first year. Comparisons are made with data on South Australian infants of British descent. The author finds that though the absolute amplitude of the first growth cycle in man is affected by environment the specific velocity of the growth process is affected very little; that the period of half completion of the cycle is later in females than in males and in Australia than in England. Bibliography.

549 ——— "Studies on the growth of man. IV. The variability of the weight and stature of school children and its relation to their physical welfare." *Am. J. Physiol.* [Baltimore], vol. 41 (1916), pp. 547–554.

An investigation to determine (*a*) the relative variability of weights and stature in school children and (*b*) the influence of environment upon the variabilities of these dimensions. The study is based on the records of 50 children of each sex and age, from 6 to 14 years, inclusive, selected from the statistics of the Oakland, Calif., School Department. Curves are derived in the usual manner for each sex. The author finds that rate of growth in weight and variability in weight increase from the seventh to the fifteenth year; that stature and variability of stature increase at an almost uniform rate during this period; that the variability of stature is less than the variability of weight; that, at 8 years of age, increasingly unfavorable environment and lack of medical care result in deficiency of weight and stature, decreased variability of weight, and increased variability of stature.

550 ——— The Chemical Basis of Growth and Senescence. J. B. Lippincott Co., Philadelphia, 1923. 389 pp.

In Chapter II, "The Physical Manifestations of Growth in Man," the author assembles the results of many studies to demonstrate the existence of three growth cycles in man—the infantile, the juvenile, and the adolescent.

551 **Rogers, B. M. H.:** "The physique of boys." *Bristol Medico-Chirurgical Journal* [Bristol], vol. 27 (1909), pp. 27–31.

A comparative study of the heights, weights, and chest measurements of boys 13, 14, and 15 years of age in industrial schools and in public schools, reported by the medical officer of the Clifton Wood Industrial School. Methods of obtaining data and the number of measurements are not definitely stated.

552 **Rokhlin, L. L.:** "Rabochie podrostki shkol fabrzavucha po metalu" [Apprentices attending the industrial schools in the metal industries]. *Vrachebnoie Dielo* [Kharkov], vol. 8 (1925), columns 391–398.

The author studied the physical condition of 540 boys between 14 and 18 years of age, apprentices attending trade schools in the metal industries. He gives for each year of age the average standing and sitting height, annual increase in millimeters of chest circumference at inspiration, expiration, and in repose; weight in kilograms; average and annual gain in pectoral index, i. e., difference between chest circumference and half height. In several tables he compares the state of nutrition, and the type and incidence of diseases among his cases, with those of apprentices from other parts of Russia, quoting several Russian writers. References.

553 **Rosenstern, Iwan:** "Zur Wirkung der Kohlehydrate auf den Anwuchs im Säuglingsalter" [Effect of carbohydrates on growth in infancy]. *Zeitschr. f. Kinderh.* [Berlin], vol. 18 (1918), pp. 333–352.

In connection with a study of the effect of various diets on growth the author gives for two healthy infants many tables and eight curves relating to weight and metabolism.

554 **Rotch, T. M.:** "A comparison in boys and girls of height, weight, and epiphyseal development." *Transactions of the American Pediatric Society* [New York], vol. 22 (1911), pp. 36–38.

In studying a table made up from over 500 cases examined by Röntgen rays, together with other material, the author found a decided difference between the epiphyseal growth and that of height and weight. He also found that epiphyseal growth seemed to have a definite relationship to mental growth and suggests the state of the epiphyses as a sound basis for educational grading.

555 ——— **and A. W. George:** "A study of normal living anatomy in early life." *Transactions of the Association of American Physicians* [Philadelphia], vol. 22 (1907), pp. 67–75. See also *American Journal of Medical Sciences* [Philadelphia and New York], vol. 134 (1907), pp. 417–424.

The authors advocate studying growth and development by a series of X rays for all ages and illustrate by five röntgenograms showing the normal foot of a child, the vital organs, and centers of ossification of the hand at 2½ and 6 years of age. Data were collected at the Children's Hospital, Boston.

556 **Rott:** "Zur Ernährungstechnik frühgeborener Säuglinge" [Feeding technique for premature infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 5 (1912–13), pp. 134–174.

The article contains a case history, growth curve, and table of body weights and amounts of milk imbibed, for each of 13 infants.

557 **Rott, Fritz:** "Beitrag zur Wesenerklärung der physiologischen Gewichtsabnahme des Neugeborenen" [Contribution to the explanation of the physiological loss of weight in the newborn]. *Ztschr. f. Kinderh.* [Berlin], vol. 1 (1910-11), pp. 43–61.

To investigate the initial loss of weight of the newborn the author used Strubell's refractometric method of determining the breaking exponent (n d) of the blood serum. He examined four healthy breast-fed infants in a private clinic for almost two weeks after birth and gives in this article their case histories, and for each day the body weight, n d, amount of food taken, and a curve of refraction, of weight, and of nourishment. There is an obvious parallel between the weight curve and the refraction curve. The author believes that the initial loss is due primarily to a loss of water. Infants drink nothing their first day, little on the second day. Their weight falls lowest on the third day and equals weight at birth on the sixth day or later.

558 **Rowe, Olin W.:** "Routine examination and management of the newborn." *Minnesota Medicine* [St. Paul], vol. 8 (1925), pp. 24–30.

Records of 638 newborn infants at the Duluth Clinic, Minnesota, showed the average weight of 327 boys as 3,374 grams; of 311 girls as 3,161 grams.

559 **Ruma, R.:** "Antropometricheskiia materiali dlia opredelienia fizicheskavo razvitiia uchashchikhsia" [Anthropometrical data on physical development of school children]. *Sbornik sochinienii po sudebuoy meditsinie* [St. Petersburg], vol. 3, pt. 2 (1880), pp. 95–131.

Previous literature on the physical development of children, Russian and foreign, is discussed. The author obtained for each year of age the average height, weight, and chest circumference of 1,706 pupils in elementary and secondary schools; they varied in ages from 7 to 18 years; one-third of them were girls. The weight he was able to obtain for only 411 of the children. He compares his data with those of other investigators and finds that his children were physically inferior to those studied by the other writers. He attributes this not only to the effect of school but to living conditions.

560 **Runeburg, Einar:** "Till kännedomen om kroppsvickten hos nyfödda främst med hänsyn till förhållandena i Finland" [Weight of the newborn with special reference to conditions in Finland]. *Finska Läkaresällskapets Handlingar* [Helsingfors], vol. 57 (1915), pp. 894–906.

In a table are given the weights of 19,124 infants born of 12,498 married and 6,626 unmarried mothers from 1866 to 1905 in a lying-in hospital in Helsingfors. The average weight for all infants studied was 3,378 grams. For infants of unmarried mothers the average weight was 3,342 grams, and for infants of married mothers, 3,413 grams.

561 **Russow, A.:** "Vergleichende Beobachtungen über den Einfluss der Ernährung mit der Brust und der künstlichen Ernährung auf das Gewicht und den Wuchs (Länge) der Kinder" [Comparative observations on the effect of breast feeding and artificial feeding on the weight and height of children]. *Jahrb. f. Kinderh.* [Leipzig], vol. 16 (1880–81), pp. 86–132.

The effect of breast feeding as compared with artificial feeding, based on 5,000 weights and measurements of children (number of children not given) obtained in St. Petersburg. Of these 4,100 refer to infants 15 days to 1 year old; 900 to those over 1 year but under 8 years old. The author presents in a number of tables the weight and length of the infants for each month of age according to the method of feeding. The breast-fed infants of the same ages were heavier and longer than the others; of the children 1 to 8 years old those that were breast fed in infancy were heavier and taller than the others, especially in the first years of life.

562 **Sack, N.:** "Materiali k kharakteristikie fizicheskavo razvitya dietie" [Data on physical development of children]. *Vestnik obshtshestvennoy higieni, sudebnoy i prakticheskoy meditzini* [St. Petersburg], January, 1898, pp. 1–34.

A study based on the examination by the author of 6,678 pupils in Moscow schools between the ages of 8 and 22 years. A large number of tables give age, height, weight, and chest circumference for each year of age of the children examined, relation between these measurements and their annual increase, and weight of the children according to the economic situation of the parents. In conclusion the author states that in the school life of Moscow there were apparently factors favoring the children's growth in height but tending to check the satisfactory development of their chest circumference and weight.

563 ——— "Über die körperliche Entwicklung der Knaben in den Mittelschulen Moskaus" [The physical development of boys in the intermediate schools of Moscow]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 6 (1893), pp. 649–663.

This article has to do with 6,800 observations made September to December, 1889–1890, on boys 8 to 22 years of age in 12 high schools and polytechnics of Moscow. The six tables and discussion concern particularly the height and chest girth and their relation to each other, the annual growth, and comparison with boys of like ages in lower classes. The physique of the boys studied, though inferior to that of boys in other countries, is superior to that of their fellow-countrymen in the lower schools, in factories, etc. Their "spurt" is from 12 to 16, whereas that of the latter is from 14 to 18. The Jews are relatively small and have a "spurt" of only 2 years.

Safford, M. Victor: Influence of Occupation on Health during Adolescence. *See* U. S. Public Health Service.

564 **Sakuragi, J.:** Gewichtsverhältnisse von Säuglingen proletarischer Bevölkerung bei natürlicher und künstlicher Ernährung [Weight of Breast-Fed and Artificially-Fed Infants of the Working Classes]. Kastner & Callwey, Munich, 1908. 99 pp.

Weights and heights of 200 breast-fed and 180 artificially-fed infants—boys and girls in equal numbers—are given for different age periods under 1 year. These children were brought to a milk station and consultation center in Munich. Weights of Japanese infants from Mishima's book on the growth of Japanese children are also given.

565 **Salomon, Gustav:** Über Messung und Wägung von Schulkindern und deren praktische Konsequenzen für die Lösung einiger hygienischer Schulfragen [Measuring and Weighing School Children and Their Practical Results in Solving Some Problems of School Hygiene]. Jena, 1898. 63 pp.

Inaugural dissertation (University of Jena). A résumé of the work of Quetelet, Zeising, Liharžik, Vierordt, Russow, Albu, Roberts, Wretlind, Bowditch, Kotelmann, Landsberger, Malling-Hansen, Vahl, Hertel, Karstädt, Axel Key, Wiener, Dovertie, Camerer, Janke, Schmid-Monnard, Kosmowski, and Gilbert to collect and summarize their work for the benefit of future investigators. No original observations. Bibliography.

566 **Salvetti, G., and S. Segagni:** "Quelques remarques sur les enfants élevés au biberon" [Remarks on bottle-fed infants]. *Nourrisson* [Paris], vol. 10 (1922), pp. 29–37.

The authors record from their experience at a dispensary the results of repeated weighings of a considerable number of infants nourished at the breast, with mixed feeding, and with artificial feeding. A series of 7,568 weighings, continuing over one year, showed the superiority of breast feeding. Tables.

567 **Samosch:** "Einige bemerkenswerte Ergebnisse von Schulkindermessungen und Wägungen" [Some noteworthy results from measuring and weighing children]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 17 (1904), pp. 389–403.

Eleven tables give height and weight measurements for 1,969 Breslau children for half-yearly periods, the data for boys and girls being given separately. The author intends that his study shall simply supplement the work of Schmidt and Lessenich on the children of Bonn. He believes that among children of a given age usually the best developed physically are the most advanced in school.

568 **Santori, S.:** "Studio su alcuni indici dello sviluppo fisico e sui rapporti esistenti fra essi, l'agiatezza, l'intelligenza e la condotta; richerche eseguite sugli alunni delle scuole elementari del Comune di Roma negli anni scolastici, 1903–1906" [Study of certain indications of the physical development of children and of the relations existing between physical development, economic conditions, intelligence, and conduct; investigations of pupils of elementary schools of the municipality of Rome in the school years 1903–1906]. *Internationales Archiv für Schulhygiene* [Leipzig], vol. 3 (1907), pp. 225–242.

An original investigation of 1,400 school children from 6 to 18 years old in the city of Rome. The author discusses height, weight, physical strength, chest circumference, size of head, cephalic index, and visual acuity of the children with reference to their age, economic condition, and degree of intelligence. The physical condition of the children was found in general to be normal. The children of the well to do were taller but had a smaller chest circumference than the children of the poor. In other respects there was little difference between them. There is a relation between physical and mental development, and attention and conduct in school, varying at the different stages of development.

569 **Sargent, D. A.:** "On the relation of the cephalic index to height, weight, strength, and mental ability." *Journal of the Boston Society of Medical Sciences* [Boston], vol. 4 (1899–1900), pp. 135–143.

To discover whether dolichocephalic and brachycephalic young men belong to distinct types, mentally and physically, the author took record cards of 1,100 Harvard students who had been recently examined and grouped them according to cephalic indices. The dolichocephalic group were found superior in height, weight, strength, and athletics; the brachycephalic in college rank.

570 ——— "The physical development of women." *Scribner's Magazine* [New York], vol. 5, February, 1889, pp. 172–185.

A semipopular article based on comparative measurements of 1,200 boys and girls, aged 13 to 16, and about 4,000 men and women, aged 17 to 35, with charts illustrating the differences in the sexes, relating to about 50 body measurements. Technique is not given.

571 ——— "The physical proportions of the typical man." *Scribner's Magazine* [New York], vol. 2 (1887), pp. 3–17.

The author measured by his own methods, which are fully described, a large number of persons of various ages and constructed charts of normal development upon which might be plotted the line of an individual's measurements showing his deviations from the average. A popular article explaining the writer's objectives in physical training.

572 ——— "The physique of scholars, athletes, and the average student." *Popular Science Monthly* [New York], vol. 73 (1908), pp. 248–256.

To ascertain whether students who rank highest in scholarship are also superior in height and weight the author tabulated for study the medium measurements of 15 groups of men including men from the University crews, from the football teams, from the Lawrence Scientific School, honor scholarship men in various groups, stipend scholarship men in various groups, the first 50 athletes from 1893 to 1900, 1,000 University students in 1880, and 500,000 Americans in 1860 (Army standard). His study of this material led to many interesting observations but no definite answer to his inquiry.

573 **Sauermann:** "Zur Physiologie der Milchsekretion und der Ernährung der Neugeborenen in den ersten Lebenstagen" [Physiology of milk secretion and of nutrition of newborn in first days]. *Medizinische Klinik* [Berlin], vol. 8, pt. 1 (1912), pp. 280–281.

The author gives data relating to his own daughter born July 3, 1903, in 2 tables of weight from July, 1903, to January, 1905, and in tables giving size of meals from August, 1903, to September, 1903. The child did not recover birth weight till her sixth week.

574 **Scammon, Richard E.:** "On the weight increments of premature infants as compared with those of fetuses of the same gestation age and those of full-term children." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 19 (1921–22), pp. 133–136.

Curves of per cent increment in weight of 78 premature infants were kept for nine months and compared with similar curves for full-term infants and the calculated rate of increment of fetuses of the same size and age. A table and a graph of the per cent increment for the age is shown. The author concludes that premature infants, after the initial retardation incident to birth, grow at the fetal rate until the latter part of the first year.

575 **Schaeffer, O.:** "Über die Schwankungsbreite der Gewichtsverhältnisse von Säuglingen in den ersten 14 Lebenstagen und die Ursachen dieser Schwankungen" [The variation of weight in infants during the first 14 days of life and the causes thereof]. *Archiv für Gynäkologie* [Berlin], vol. 52 (1896), pp. 282–313.

From an examination of 592 healthy children in clinics at Munich and Heidelberg the author found that only 14.5 per cent had attained their initial weight by the seventh day, and only 41 per cent by the fourteenth day. Girls showed greater variation than boys. The heavier the infant the greater was its initial loss. The weight was least where the mother was small, under 20 years of age, hard-working, tuberculous, etc. The curve of the total N elimination was parallel to the curves of weight and temperature. Premature children showed a greater elimination of N in the urine and more icterus, as well as greater loss of temperature.

576 **von Schaetzel, Peter:** Über den Einfluss des Alters der Mutter und der Zahl der vorausgegangenen Schwangerschaften auf Länge und Gewicht der Neugeborenen [On the Effect of the Mother's Age and the Number of Previous Pregnancies on the Length and Weight of the Newborn]. Julius Abel, Greifswald, 1893. 22 pp.

Figures are given for the weight and length of 1,520 newborn infants according to mother's age and number of pregnancies. Quotations from Hecker's study of 4,449 cases are included. The author found that the infant's weight increases with the mother's age, the maximum being reached at 30 to 34 years, after which there is a decrease, with again a slight increase for women over 39 years old. The weight was also found to increase with the number of previous pregnancies. Length was not affected by either the mother's age or the number of previous pregnancies. A large amount of statistical data on the author's cases is included.

577 **Schick, B.:** "Die physiologische Nagellinie des Säuglings" [The physiological nail line of the young infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 67 (1908), pp. 146–160.

The author presents seven pages of tables containing 250 measurements of the transverse line on the nail on the thumb, middle finger, and little finger of young infants, as well as graphs and diagrams of the same. He explains that such lines are not due to syphilis; they may arise from any disturbance of health, and also regularly appear from about the fifth week to the thirteenth week as a physiological phenomenon. He therefore traces the development of the normal infant nail from birth on. This line, since it has a definite progress, possesses value as a sign of age. It appears also on the toenails. He concludes that the vicissitudes of the birth act affect the matrix of the nail; four to five weeks afterwards the line on the nail appears and grows slowly out.

578 ——— Ernährungsstudien beim Neugeborenen [Studies in feeding of the newborn]. *Ztschr. f. Kinderh.* [Berlin], vol. 17 (1918), pp. 1–113.

The author is of the opinion that the physiological decrease in the infant's weight taking place within the first days after birth is due to insufficient intake of food and can be avoided to a considerable extent by proper feeding. The article contains a detailed account of the methods of feeding used for this purpose under the author's direction in 751 cases.

579 —— —— "Zur Frage der physiologischen Körpergewichtsabnahme des Neugeborenen" [Question of physiological loss of body weight in the newborn]. *Ztschr. f. Kinderh.* [Berlin], vol. 13 (1915–16), pp. 257–281.

The author gives weight curves and amounts of nourishment for 12 infants who were given forced feedings of human milk in order to prevent the usual physiological loss of weight after birth. Theories and work of others along this line are discussed. To a certain extent the forced feedings succeeded in their object of preventing the physiological loss of weight.

580 **Schiff, Fritz:** "Anthropologische Untersuchungen an jüdischen Kindern in Jerusalem" [Anthropological investigations concerning Jewish children in Jerusalem]. *Archiv für Anthropologie* [Braunschweig], new ser. vol. 13 (1914–15), pp. 348–357.

The author presents data collected by him in 1913 on height, cephalic index, color of hair and eyes, etc., of 604 boys and girls from 4 to 16 years old, from schools organized in Jerusalem by German Jews. The discussion is illustrated by seven figures and five tables.

581 **Schiøtz, Carl:** "Aldrene 12 til 17 aar" [Ages 12 to 17 years]. *Medicinsk Revue* [Bergen], vol. 36 (1919), pp. 149–181.

In 13 tables and 4 graphs observations are given as to social status, number of children in family, height, weight, age at onset of puberty, head and face dimensions, and color of hair and eyes of 231 boys and 177 girls. Bibliography.

582 ——— "En undersøkelse av 10,000 Norske skolebarn, saerlig med hensyn til vekstforhold" [A study of 10,000 Norwegian school children with special reference to growth]. *Medicinsk Revue* [Bergen], vol. 34 (1917), pp. 673–707, 751–832.

Following a short review of work in this field a detailed report is given on all phases of growth, together with 30 graphs, 17 tables, and 8 diagrams. Data are arranged to show the number of children of ordinary height, fair height, tall and very tall stature, and of small, very small, and dwarf stature; the relation of eye, hair color, and disease to growth; the difference of growth in the sexes; and the difference in the various social groups. A long bibliography is included.

583 **Schiøtz, Carl:** Physical Development of Children and Young People during the Age of 7 to 18–20 Years. G. W. Brøggers boktrykkeri, Christiania, 1923. 54 pp.

A detailed study of the development of 28,700 pupils attending elementary and secondary schools in Christiania. The four parts of the study deal with (1) weight, (2) height, (3) the relation between weight and height, (4) periods of development and puberty. Great care was taken to have all measurements made in a uniform manner with uniform instruments. Careful comparisons are made as to the age periods when the greatest increases in weight and height occur for the two sexes and for children from different types of schools and in different environments. Statistical laws are followed strictly, the probable error, standard deviations, etc., being worked out. Rohrer's index $\left(\frac{\text{weight} \times 100}{\text{height}}\right)$ is used in studying weight-height relations. As a means of studying the ages at which the characteristic signs of puberity appear 2,999 children, all of average development for their ages, were photographed without clothing, and the facts brought out by such procedure are discussed. Twenty-seven of these photographs are reproduced, together with 31 tables and curves.

584 ——— "Utviklingsforhold hos barn i 2 til 6 aars alder" [Developmental conditions in children from 2 to 6]. *Norsk Magazin for Laegevidenskaben* [Christiania], ser. 5, vol. 18 (1920), pp. 425–459.

In five detailed tables with accompanying remarks the development of 264 boys and 249 girls is set forth. Several cuts show proportional development Bibliography.

585 **Schlake, Friedrich:** Körpermessungen von Landkindern an der Südküste des Kurischen Haffs [Body Measurements of Country Children on the South Coast of the Kurisches Haff]. Konigsberg, 1916. 28 pp.

Inaugural dissertation (University of Konigsberg). The author in December, 1915, measured 400 boys and girls 1 to 13 years old as to height, weight, chest measurements, girth of lower arm, and force by Collin's dynamometer. The children were in Schaaksvitte and Kirche-Schaaken, Konigsberg, of Lithuanian-Prussian stock, poor folk, living in unfavorable hygienic and social conditions but sturdy from their active life. Infants were regularly nursed by their mothers. The data are placed in tables and compared with those of Camerer, Quetelet, Schmid-Monnard, et al. Boys were in general larger than girls, but the latter showed an extraordinary increase from 11 to 13 years of age. In chest measurements (expiration) boys from 6 to 13 years showed an average annual increase of 1.15 centimeters and girls of like age 1.3 centimeters, whereas most authors report an increase of 2 centimeters. The military fitness of this population was 90 per cent. The soldiers were invariably taller than the average for the whole German Empire.

586 **Schlesinger, Eugen:** "Das Wachstum der Knaben und Jünglinge vom 6 bis 20 Lebensjahr" [Growth of boys and youths between 6 and 20]. *Ztschr. f. Kinderh.* [Berlin], vol. 16 (1917), pp. 265–304.

A careful study made of about 10,000 Strassburg youths 6 to 20 years of age. The author groups his material according to social plane and further according to development and constitution of the individual. All measurements were made by the author himself. To avoid variations due to season and hour he made the examinations in the morning and for the most part in the spring. He counted the second half year as a whole year and allowed for weight of clothing. His conclusions are expressed in numerous curves and tables, and long discussions He discerns four periods of growth: 6 to 9, 9 to 10 or 11, 10 to 15 or 16, 15 to 20. Throughout childhood growth in height is greater than in weight. The variation among individuals of a given age increases as boys grow older. The best class presents a greater height and relatively lighter weight than the others. Inferior children form at first 4 per cent of the whole number, then 2 per cent. Inferiority among apprentices is 8 per cent. Inferior boys are three to four years behind others. They are peculiar also for periods of growth cessation. Anemic, neuropathic, or rachitic children show no inferiority in height. Chest girth shows little relation to height but has a much closer connection with weight. Bibliography.

587 ——— "Das Wachstum des Kindes" [The child's growth]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 28 (1925), pp. 456–580.

Beginning with an account of the early studies of growth, namely, those by Quetelet, Camerer, Pirquet, and Pfaundler, the author proceeds to discuss in detail the methods of examination, laws of growth, differences in growth due to sex, race, and individual constitution, periodical fluctuations in the process of growth caused by changes in seasons, periods of accelerated and retarded growth, the conditions affecting growth, such as environment, general state of development, underfeeding, school work, illness, disorders in the functioning of the endocrine glands. He quotes in detail figures of the weight and height of children obtained by various persons in 23 cities of Germany after the war, also by Camerer, Baldwin, and several other investigators. He gives no new statistical data of his own, but quotes those he published in reports of his studies made in 1911–1918 on the height, weight, and ponderal index of school children. Twenty-five tables and a list of over 300 references.

588 **Schlesinger, Eugen:** "Unterschiede im Wachstum bei Schulkindern und jungen Leuten von verschiedener Konstitution und aus verschiedenen Bevölkerungsschichten" [Differences in growth among school children and young men of varied constitution and varied classes of society]. *Deutsche Med. Wchnschr.* [Leipzig], vol. 43 (1917), pp. 1607–1608.

From observations on 10,000 boys between the ages of 6 and 20, in private schools, polytechnic schools, public schools, etc., the author derives four periods of growth: The first from 6 to 9, fairly rapid, more in height than in weight or in girth of chest; the second from 9 to 10; the third from 10 to 15 or 16, of rapid growth, that in height being greatest at 14 and in weight at 15; and the last period of slight increase in height and lively increase in weight. Differences in classes are due to heredity more than to environment. Thin, anemic, and nervous children show no inferiority in height. Defective children show long periods of stagnation in growth. The chest development is related rather to weight than height. A retarding effect in growth can be detected at 6, due to the beginning of school; at 14, among boys beginning to work; among the upper classes at 16, the age for matriculation examinations.

588[a] ——— "Wachstum, Ernährungszustand und Entwicklungsstörungen der Kinder nach dem Kriege bis 1923" [Growth, state of nutrition, and disorders of development of children between the end of the war and 1923]. *Ztschr. f. Kinderh.* [Berlin], vol. 37 (1924), pp. 311–324.

This article, which is a sequel to a previous study, is a general discussion of the weight and height of about 3,100 school children and 300 infants and kindergarten children who were weighed and measured many times every year between 1919 and 1923. The author gives no tables; for the method of his investigation he refers the reader to his previous articles. He found that the retardation in the children's growth first became noticeable in 1917 and was greatest in 1920, when height was 4.3 per cent below normal; weight in the period from 1917 to 1920 was from 4 to 12 per cent below normal. In the years 1921 and 1922 both height and weight reached pre-war standards; in 1923 they again went below normal.

589 ——— "Wachstum, Gewicht, und Konstitution der Kinder und der herangewachsenen Jugend während des Krieges" [Growth, weight, and constitution of children and youths during the war]. *Ztschr. f. Kinderh.* [Berlin], vol. 22 (1919), pp. 79–123.

A detailed study of the effects of the war upon 5,000 boys from infancy to 18 years, representing every class of society. For the most part the author used the generalizing method, but he employed the individualizing method in studying 300 boys between 6 and 14. He studied the weight-height relation at various ages and for the different years of the war.

590 ——— "Wachstum und Gewicht der Kinder und der herangewachsenen Jugend während des Krieges" [Growth and weight of children and adolescents during the war]. *Münchener Medizinische Wochenschrift*, vol. 66, pt. 1 (1919), pp. 662–664.

Besides pupils of public schools and vocational schools in the second and third years of war, treated in preceding works, the author here considers in the fourth year of the war infants and small children from two large infant homes and boys from six private and polytechnic schools. For comparison he had his own data on the same schools for 1911 and 1913.

591 **Schloss, Ernst:** "Über den Wert vierstündlicher Wägungen für die Beurteilung des Zustandes junger Säuglinge" [Value of weighing young infants every four hours in judging their condition]. *Monatschr. f. Kinderh.* [Leipzig], vol. 8 (1909–10), pp. 674–677.

The author advocates weighing an infant four times a day if its exact condition is to be ascertained. Six curves show weight changes in three healthy and three sick infants in first or second month of life. One of the three normal infants was fed on extracted human milk, another on whey-reduced milk. The graph of the third illustrates how misleading would be only one daily weighing. Variations are caused by urination, differences in amounts of milk taken, etc.

592 ——— **and Frank Leonhard:** "Tricalciumphosphat als Knochenbildner beim menschlichen Säugling" [Tricalcium phosphate as a bone-builder in the human infant]. *Biochemische Zeitschrift* [Berlin], vol. 60 (1914), pp. 378–394.

In connection with a discussion of the treatment of rickets this article includes weight curves and data on excretions for two infants over periods of three and five months.

593 **Schlossmann, Arthur:** "Die Arbeitsleistung des Säuglings" [The energy production of the infant]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 12 (1913–14), pp. 47–53.

The author discusses the energy expended by infants in motion. In a table he compares weight, work, duration thereof, etc. of four children that figured in experiments by Rubner-Heubner, Niesmann, and Mengler.

594 **Schlossmann, Arthur:** "Weiteres zur Frage der natürlichen Säuglingsernährung" [More on the question of the breast feeding of infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 33 (1902), pp. 338–371.

The author's experiments with human milk pressed from the breasts of two to five excellent nurses cover 192 days in the case of one child and 72 days in the case of the other. Both infants were premature, the first syphilitic, the second frail but not diseased. The tables of results, covering 12 and 5 pages respectively, give weights of the infants, amounts of milk consumed, and chemical analyses of the milk, with calorimetric values.

595 **Schmid-Monnard:** "Gewichts- und Längenzunahme bei Kindern" [Increase of children's weight and height]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 9 (1896), pp. 317–323.

In his tables and discussion the author explains that except in early infancy children increase in weight most in August, September, October, least in January to July, and in height most in July and August, least in September to January. The differences are more marked in boys than in girls; they appear in children attending and those not attending school.

596 ——— "Über den Einfluss der Jahreszeit und der Schule auf das Wachsthum der Kinder" [Effect of season and school upon the growth of children]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 10–11 (1893–94), pp. 250–251.

In order to determine whether school exerts a retarding effect upon growth the author measured 190 boys and girls from 1 to 13 years of age at intervals for a year. Seasonal variations are discussed in connection with periods of school attendance.

597 ——— "Über den Einfluss der Jahreszeit und der Schule auf das Wachsthum der Kinder" [The effect of season and school on the growth of children]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 40 (1895), pp. 84–106.

The author conducted investigations on 20 boys and 44 girls between the ages of 2½ and 7, and 14 boys between the ages of 7 and 14, children of the lower class in Halle, to ascertain whether Malling-Hansen's results are true of German children. The measurements were taken from 4 to 6 p. m. at intervals of three to six weeks between June 22, 1893, and August 6, 1894. The author found that height increased from February to August and very little from September to January, and that weight increased not at all from February to June and decidedly from July to January. Illness and mortality are most frequent early in the year, least frequent in the fall. Camerer found the best metabolism from September to November. Vacations had no noteworthy effect on growth. The article contains five curves.

598 ——— "Über den Einfluss des Militärdienstes der Väter auf die körperliche Entwicklung ihrer Nachkommenschaft" [On the effect of the fathers' military service on the physical development of their progeny]. *Jahrb. f. Kinderh.* [Leipzig], vol. 33 (1892), pp. 327–350.

Original study of 2,700 well children in Frankfort-on-the-Main, Halle, and vicinity. The ages varied from 1 day to 30 months. All the children had been breast fed for at least nine months. The author found that the children whose fathers had been in the military service were 600 to 800 grams heavier than those of fathers who did not serve in the army. This difference became still greater when the order of the child's birth was considered. It is known that children of young primiparæ are at birth lighter than children of older pluriparæ, but beginning with the second year they gain in weight more rapidly than the latter. This gain was particularly great in the children whose fathers had been in the military service. Several writers are quoted and nine charts and eight tables given showing the average weight, chest and head circumferences of his cases by sex and city for each month of age.

599 ——— "Über den Werth von Körpermaassen zur Beurtheilung des Körperzustandes von Kindern" [The value of physical measurements in determining the physical condition of children]. *Archiv für Anthropologie* [Braunschweig], vol. 27 (1900–1902), pp. 130–133.

After reporting the measuring and weighing of 2,000 children of preschool age and of 3,200 between the ages of 6 and 14 the author discusses the methods of Percy Boulton and others of estimating health from bodily proportions. He agrees that if weight corresponds to height according to average values, one can assume a normal constitution. The article contains five tables and two graphs.

600 ——— "Über die körperliche Entwicklung der Feriencolonie-Kinder" [The physical development of children in vacation colonies]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 37 (1894), pp. 297–318.

To ascertain the advantages of vacation colonies for poor children the author took measurements of height, weight, and chest girth of 563 boys and 446 girls of Halle, before and after they were sent for three weeks to vacation colonies; also of 677 boys and 697 girls not sufficiently subnormal physically to be sent to said colonies; and for control purposes, of about 1,400 normal boys and girls of Halle. The material is presented in seven tables and three curves. The children were weighed in their underclothes. Age was determined at the half year. The author discusses his observations in detail.

601 **Schmidt, Alexander:** "Über die Pflege kleiner Frühgeburten" [Care of small premature children]. *Jahrb. f. Kinderh.* [Leipzig], vol. 42 (1896), pp. 301–332.

The article contains data on weight, milk consumption, stools, physical and mental development, etc., during the first year of life of the author's son, a premature child born with a weight of 1,490 grams. The child developed perfectly.

602 **Schmidt, F. A.:** "Körperliche Ertüchtigung der schulentlassenen Jugend in den Entwicklungsjahren von 14–19" [Physical fitness of youths out of school in the development years from 14 to 19.] *Berliner Klinische Wochenschrift* [Berlin], vol. 55 (1918), p. 150.

After discussing in general the growth of boys between 15 and 20 years and the greater inclination to tuberculosis, as discovered in the army, of individuals late in developing, the author considers in particular the examinations made by Matthias in Zurich in 1913–14 of 750 young men 18 to 19 years old and by Godin of 100 boys 14½ to 18 years old, and the general effect of exercise in increasing chest girth and weight.

603 ——— "Massen- und Gewichtsverhältnisse der 6–14 Jährlingen an den Volks- wie an den höheren Schulen der Stadt Bonn" [Measure and weight relationships of 6 to 14 years old children in elementary and higher schools at Bonn]. *Zeitschrift für Gesundheitsfürsorge und Schulgesundheitspflege* [Leipzig], vol. 36 (1923), pp. 9–10.

Measurements (method not given) of 4,491 boys and 3,992 girls in height and weight, tabulated to show comparisons of figures for the different schools.

604 ——— and **H. H. Lessenich:** "Über die Beziehungen zwischen körperlicher Entwicklung und Schulerfolg" [The relations between physical development and success in school]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 16 (1903), pp. 1–7.

Measurements of height and weight were taken at the instance of the school physicians, of 2,089 boys and 2,153 girls in the public schools of Bonn during May, 1902. The authors present tables by sex according to the distribution of the ages 5 to 15 in the different school classes and according to the average height and weight of various ages in the said classes. They conclude that their investigations, like those of Porter on the public-school pupils of St. Louis, prove that usually, the best-developed children physically are also the brightest in school.

605 **Schroeder:** "Über die Verschiedenheiten in der Grösse der Köpfe neugeborener Kinder" [Variation in size of head of newborn children]. *Beiträge zur Geburtskunde* [Wurzburg], vol. 5 (1868–69), pp. 401–421.

Author presents various tables on length, weight, and head measurements of 383 normal infants. A table on boys and girls shows that the former are heavier than the latter by 66.4 grams and longer by 0.45 centimeter; they are also more brachycephalic. Other tables, arranged according to order of birth, show that first-born children are lighter and shorter than others; head measurements differ very little. A long table contains data on the effect of mother's age on weight, length, and head measurements of infants. The author's findings are compared with Hecker's. The author differs from Frankenhäuser, who ascribes lighter weight of first-born children to shorter pregnancy.

606 **Schroeder, Karl:** Lehrbuch der Geburtshülfe [Textbook on Obstetrics]. Max Cohen, Bonn, 1886, 9th ed. 845 pp.

Brief remark (page 60) concerning the investigation made by the author in the city of Bonn of the weight and length of 364 newborn infants. The former averaged 3,179 grams; the latter 49 centimeters. His figures differ, though not much, from those obtained by Hecker, which circumstance he attributes to the physical differences between the people living in various parts of Germany.

607 **Schroeder, Wilhelm:** "Über die Ernährung 8 to 15 jähriger Kinder" [Nourishment of children 8 to 15 years old]. *Archiv für Hygiene* [Munich and Leipzig], vol. 4 (1886), pp. 39–67.

In a study of the nourishment of 38 boys from 8 to 15 years old in a house of correction at Gehlsdorf the author gives height, weight, chest girth, and measurements of strength taken with Collin's dynamometer. Comparisons are made with the figures of Quetelet, Kotelmann, Pagliani, and others. These boys were found to be well developed in weight, chest, and strength measurements but poorly developed in height.

608 **Schuckink, Kool A.:** "Gewicht en lengte van schoolkinderen in verband met gebrekkige voeding" [Weight and height of school children in relation to diet]. *Nederlandsch Tijdschrift voor Geneeskunde* [Amsterdam], vol. 61, pt. 2 (1917), pp. 337–345.

The author gives in several charts the average weight, height, and state of nutrition of school children in Utrecht as obtained by an investigator in 1905 and by the author himself in 1916. The number of children is not given in either case. Increases found in the average weight and height of children in 1916 over 1905 are probably due to school feeding.

609 **Schulz, Fritz:** Über die Gewichtsverhältnisse der Säuglinge am 10 Lebenstage gegenüber dem Gewicht bei der Geburt [Weight of Infant on the Tenth Day as Compared with Their Weight at Birth]. Greifswald, 1903. 28 pp.

Inaugural dissertation (University of Greifswald). The author discusse the weight of 600 infants, healthy and sick, born 1901 to 1903 at the Uni versity of Greifswald hospital. By the tenth day, 48 per cent had recovere their birth weight, many of them much more than their birth weight. H examines at length the reasons that may have prevented the other 312 fro regaining their initial loss in weight.

610 **Schuster, E.:** "First results from the Oxford anthropometric laboratory." *Biometrika* [Cambridge], vol. 8 (1911–12), pp. 40–51.

Detailed physical and anthropological data obtained from Sheffield student Over 800 students, 18 to 23 years old, were examined. Craniometry an visual acuity were included in the examinations. Many tables are given.

611 **Schute:** "Natürliche Ernährung und Gewichtsverhältnisse von 100 Säug lingen der Osnabrücker Hebammenlehranstalt" [Breast feeding an weight of 100 infants in the Osnabruck School for Midwives] *Deutsche Med. Wchnschr.* [Berlin], vol. 41 (1915), pp. 618–620.

The author studied 100 infants (56 boys and 44 girls) born in the Osna bruck School for Midwives, most of whom remained there 12 days. Withi that time 45 per cent regained their birth weight, on an average upon the nint day. The infants were weighed daily. The weight curves were little affecte by sex by operations upon the mother, by her loss of blood, or by her tempera ture. The average weight at birth was 3,357 grams. Ninety-four of th mothers had abundant milk.

612 **Schwarz, Herman, and Jerome L. Kohn:** "The infant of low birt weight; its growth and development." *Am. J. Dis. Child.* [Chicago] vol. 21 (1921), pp. 296–306.

The authors followed the case histories of 272 children with low birt weights (2,500 grams or less)—166 for 3 months, 130 for 6 months, 100 fo 12 months, and 26 a greater length of time. Gains in length and weight wer noted and summarized in tables. They found the gain in weight during th first 12 months to be at the same rate as that of the normal child, so that th deficiency was not made up at the end of the first year. Normal length wa attained sooner than normal weight.

613 **Schwerz, Franz:** "Untersuchungen über das Wachstum des Menschen" [Investigations on growth of mankind]. *Archiv für Anthropologi* [Braunschweig], new ser. vol. 10 (1911), pp. 1–38.

In the agricultural population of the Canton of Schaffhausen, Switzerland the author measured the height and weight of 1,778 persons and the tors and limbs of 1,245 persons—males from 7 years to maturity, females from to 15 or 17 years. His own results he compared with those of many othe investigators. In addition to careful and detailed discussion the article con tains 47 tables, 19 figures, a bibliography, and a list of 42 general result according to sex, race, and social status, arranged in series on height, weight torso (upper edge of breastbone to that of os pubis), relations between tors and limbs, head, face, and relations between head and face.

614 **Schwiening, Heinrich:** "Körpergrösse und Körpergewicht des Men schen" [Height and weight of man]. *Deutsche Med. Wchnschr* [Leipzig], vol. 40, pt. 1 (1914), pp. 498–500, 556–558.

Many case histories are given, together with 36 pages of tables and 13 page of curves, for infants who were fed upon special diets designed to test suga tolerance effect of water limitation, effect of diets lacking in fat, etc.

615 ——— "Über Körpergrösse und Brustumfang bei tuberkulösen und nichttuberkulösen Soldaten" [Height and chest girth of tuberculous and nontuberculous soldiers]. *Deutsche Militärärztliche Zeitschrif* [Berlin], vol. 35 (1906), pp. 273–291.

Statistics and conclusions here given rest on measurements of height, ches girth, difference between deepest inspiration and expiration, and percentage o chest girth to height, of 4,707 nontuberculosis and 4,540 tuberculous soldier from records between October, 1898, and September, 1904. Ages are not given Like Grimm in 1863, author was unable to establish a satisfactory correlatio between chest measurement and health. Bibliography.

616 **Secretary of National Medical Institute of Mexico:** "Investigación d los promedios anatomicos y funcionales de los niños mexicanos, segú sus diversas edades" (Anatomical and physiological study of Mexica children of various ages). [Part of National Medical Institute's an nual report for 1908–9 to the Secretary of Public Instruction.] *Boletí de Instrucción Pública, Mexico*, vol. 13 (1909), pp. 541–549.

Account of anatomical and physiological study of 14 children, inmates of a orphan asylum in Mexico, ranging from 6 to 14 years. The study was mad in partial response to a request by the Secretary of Public Instruction o Mexico for an investigation of the anatomy and physiology of Mexican childre from birth to the age of 14.

617 **Seggel:** "Brustbau und Körpergewicht im Verhältnis zur Körperlänge" [Chest build and weight as related to height]. *Verhandlungen des Internationalen Medicinischen Congresses* [Berlin], 10th Session, vol. 5 (1890), pp. 162–174.

As an army doctor in the Third Field Artillery Regiment of Bavaria the author from 1885 to 1889 exactly measured 1,643 soldiers between 19 and 23 years of age, in height, weight, chest girth, shoulder breadth, and sagittal diameter of breast. He found that the younger men were superior to the older in height, weight, and breadth of shoulder, but inferior in girth of chest. The last measurement was greatest in heavy laborers. Tall people were relatively heavier than short. Comprehensive statistics are derived from this material on the various measurements and their relations to one another.

618 ——— "Über das Verhältnis von Schädel- und Gehirnentwickelung zum Längenwachstum des Körpers" [Relation of development of skull and brain to height]. *Archiv für Anthropologie* [Braunschweig], new ser. vol. 1 (1903–4), pp. 1–29.

Seven hundred Munich school boys ranging from 10 to 21 years of age and belonging to various classes of society were measured at annual intervals. Each boy was measured from one to nine times, according to his term at the school. The author obtained in this way 3,608 measurements from which he compiled tables of height according to age, differences between maximum and minimum height, and increase in height for each year, and graphs based on the first and the third table, the latter of which he prefers. A table of types of growth shows that the greatest increase occurs in the fourteenth year. Similar tables give the distance between the pupils of the eyes. The minimum is 48 millimeters in a boy of 11 and the maximum 69 in a boy of 16. There follow tables of such distance between the pupils as compared with height; of skull measurements of dolichocephalic and brachycephalic human beings; of men, women, Japanese, and various apes, and of 20 Togo young women; and graphs of curves representing height, distance between eyes, and increase in weight of brain. Since the distance between the pupils of the eyes, the breadth of the skull, and the weight of the brain increase uniformly, the growth of the first named relative to the size of the body constitutes, other things being equal, a reliable standard of intellectual capacity. But the distance between the pupils need not be great when the forehead is high and full. The best brains accompany a forehead high, full, and broad.

619 **Segond, Paul:** "Du poids des nouveau-nés" [The weight of the newborn]. *Annales de gynécologie* [Paris], vol. 2 (1874), pp. 298–308, 366–375.

In an article largely based on the work of other investigators the author records his own observations of the increase in weight of one infant, weighed daily from 7 days to four months of age. References.

620 **Sharp, J. Gordon:** "The food value required by growing girls, aged four to fifteen. Results of investigations carried on for seventeen years, with analyses and comments." *British Journal of Children's Diseases* [London], vol. 11 (1914), pp. 202–214, 246–251.

The author records his experiences with the dietary of an institution housing 30 children of the neglected classes. Tables of gross week's food supply, menus, and many sample height and weight charts are reproduced. The article concludes with a comparison of the author's observations with British, Jewish, and Quetelet tables, apparently showing that later care, however excellent, can not compensate for growth losses in the earliest years of life.

621 **Shinn, Millicent W.:** "Notes on the development of a child." *University of California Publications in Education* [Berkeley], vol. 1 (1893–1899), pp. 5–424.

The author made careful observations of the development of one child (her niece) throughout the first three years of life. She records development in weight and height, sight, hearing, dermal senses, taste, smell, sensations of muscular activity, motion and position, organic sensations, well-being and discomfort, sleep, and spontaneous, reflex, and instinctive movements. She compares observations with those of Preyer and quotes briefly from other sources. *See also* author's "Development of the Senses in the First Three Years of Childhood."

622 ——— The Biography of a Baby. Houghton Mifflin Co., Boston, 1900. 247 pp.

Minute observations of the mental and physical development of a child during the first year of its life, based upon the author's notes on the development of a child (No. 621 this section).

623 **Shirokogoroff, S. M.:** "Notes on the physical growth among the Chinese females and males of Chekiang." *China Medical Journal* [Shanghai], vol. 39 (1925), pp. 1029–1040.

A comparison of the process of growth of females in Chekiang with that of males of Chekiang and Kiangsu, based on measurements made by V. B. Appleton. The data appear as tables of average, absolute, and relative (weight-height, trunk-height, etc.) measurements for ages 6 to 20 or more, of stature in millimeters, and of grams per centimeter of stature. The influence of anthropologi-

cal type upon the phenomena of growth is discussed, with emphasis upon the importance of a due consideration of this matter in all studies of the Chinese. References.

624 **Sicheff, A. I.:** Izmĭerienie obyema i poverkhnosti tĭel u dĭeteĭ po vozrastam [Measurement of Volume and Surface of Children's Bodies]. St. Petersburg, 1902. 98 pp.

Dissertation (University of St. Petersburg). The first part consists of an account of the metabolism of infants, children, and persons up to 24 years of age, quoted almost entirely from Camerer, Rubner, Miller and others; numerous tables giving analysis of human and cow's milk, quantity of milk taken by infants, amounts of urine, feces, and perspiration excreted by infants, and changes in infants' weight. In the second part the author describes his own work of measuring the volume of the bodies of 101 children varying from premature infants to children 15 years old; in the third part, that of measuring the surfaces of 24 bodies varying from newborn infants to children 15 years old. After tabulating his data he presents conclusions on the relation between volume, surface, height, and weight. Bibliography.

625 **von Siebold, Eduard:** "Über die Gewichts- und Längenverhältnisse der neugeborenen Kinder, über die Verminderung ihres Gewichtes in den ersten Tagen, und die Zunahme desselben in den ersten Wochen nach der Geburt" [Weight and length of newborn children, decrease of their weight in first days, and increase of weight in first weeks after birth]. *Monatsschrift für Geburtskunde und Frauenkrankheiten* [Berlin], vol. 15 (1860), pp. 337–354.

Between 1832 and 1858 the author carefully observed the weight of 1,586 male and 1,414 female infants. He presents a table of their initial weights and a number on the loss and recovery of the birth weight. Comparisons are made with the findings of Elsässer, Quetelet, and others.

626 **Siesel, Prosper:** Über wiederholte Geburten derselben Frau in Bezug auf Gewichts- und Längenverhältnisse der Kinder und in Bezug auf die Geburtsdauer [Repeated Deliveries of the Same Woman, with Respect to Weight and Length of Children and to Duration of Birth Act]. Strassburg, 1905. 29 pp.

A thesis (Kaiser Wilhelm University at Strassburg). The author cites previous investigations on the physical inferiority of the first-born child and the longer duration of the first birth. He presents a table for 310 women who in the previous four years at the women's clinic of the Strassburg University had borne at least two children. This material he works over into statistics on the superiority in height and weight of later-born over first-born children. The question is complicated by the fact that boys are regularly larger than girls. With the second child there is a superiority in weight of 182.7 grams; with the third, of 50.71; with the fourth, of 27.94; with the fifth, of 57.86; with the sixth, of 230; with the seventh, of 34.26; with the eighth, of 33.33. In height there is much less difference; 0.6 centimeter superiority of second child over first; 0.75 centimeter in third over second.

627 **Sieveking, C. H.:** "Gewichtstabellen von Brustkindern und künstlich ernährten Säuglingen der Hamburger Fürsorgestellen, 1913" [Weight tables on breast-fed and artificially-fed infants of Hamburg milk nurseries, 1913]. *Zeitschrift für Säuglingsfürsorge* [Leipzig], vol. 8 (1914–15), pp. 154–159.

Data on the weight of breast-fed infants (3,851 legitimate and 164 illegitimate) and of artificially-fed infants (755 legitimate and 79 illegitimate) from records of milk nurseries of Hamburg in 1913. Percentages of loss and of gain in weight in the four classes are shown. Four pages of tables are given.

628 **Simon, Th., and G. Vermeylen:** "Comparison du développement physique (taille et poids) d'enfants normaux et anormaux" [Comparison of the physical development (height and weight) of normal and abnormal children]. *Bulletin de la Société clinique de médecine mentale* [Paris], vol. 9 (1921), pp. 75–79.

Comparison of height and weight (methods of measurement not given) of 79 feeble-minded children 6 to 20 years of age, with those of 79 normal children paired with them by year and month of birth. In the 79 couples the normal child was shorter only 13 times; in weight the normal child was inferior from the age of 6 to the age of 12 and gained no real superiority before the age of 15.

629 **Simon, W.:** "Gewicht Neugeborener, soziale Stellung und Ordnungsnummer der Geburt. Eine Untersuchung auf statistischer Grundlage" [The weight of newborn infants, social position, and order of birth. A study on a statistical basis]. *Archiv für Soziale Hygiene und Demographie* [Berlin], vol. 1 (1925), pp. 3–16.

The author studied 689 maternity cases in the city hospital of Aussig from 1921 to 1923. His purpose was not to prove that there is a connection between the weight of the newborn infant, the social position of the parents, and the

order of birth, because this circumstance is very well known. His purpose was mainly to determine mathematically the relationship of the three above factors. He found that the weight increases somewhat with the parents' position and considerably with the order of birth. This relation is expressed by the author in a series of mathematical formulas.

630 **Simpson, Jas. Y.:** "Memoir on the sex of the child as a cause of difficulty and danger in human parturition." *Edinburgh Medical and Surgical Journal*, vol. 62 (1844), pp. 387–439.

A discussion is included of the relative weights and sizes of male and female infants at birth, as found by a study of the records of the Dublin Lying-in Hospital and of British statistics.

631 **Snitkin, M.:** "Materiali dlia izucheniia rosta dietei pervych nedel zhizni" [Data on the growth of infants in the first weeks of life]. *Meditsinski otchet Imperatorskavo St. Petersburgskavo Vospitatelnavo Doma za 1876 god* [St. Petersburg], 1877, pp. 184–210.

A study of 1,170 newborn infants and 1,676 infants 1 month old made by the author at the Municipal Infant Asylum in St. Petersburg. He obtained the weight, length, and circumference of head and chest as soon as the infants were brought into the asylum. Each of the groups he divided into three classes, according to weight, and found that a higher weight was always combined with a longer body and a larger chest and head. At the end of the month the increase in the length of the body was greater than that of the chest or head. Children who on account of illness gained no weight at the end of the month showed a greater increase in length than in the circumference of the head or chest. A large number of tables referring to the author's cases are included.

632 **Soames, H. A.:** The Scientific Measurement of Children. L. Upscott Gill, London, 1891. 15 pp.

A pamphlet to attract parents' attention to the importance of weighing and measuring children regularly and accurately. Table 1 from Robert's Anthropometry gives sex and height by years from 6 to 16. Table 2 from the author's observations gives weight of boys for heights from 48 to 56 inches. Table 3 gives height and chest girth for boys. The number of cases observed is not stated.

633 **von Sobbe, August:** Über Gewichts- und Längenverhältnisse der Neugeborenen mit Bezugnahme auf das Alter der Mutter [Weight and Length of the Newborn Infant with Reference to Mother's Age]. Marburg, 1872. 32 pp.

Inaugural dissertation (University of Marburg). Between 1850 and 1870 the author measured 1,064 male and 936 female newborn infants. All weights under 2,800 grams were discarded as pathological. The average weights and lengths, respectively, were found to be 3,261.7 grams and 48 centimeters for boys; 3,188 grams and 47.2 centimeters for girls; 3,176 grams and 47.5 centimeters for first-born children; 3,263 grams and 47.8 centimeters for others. The age of the mother did not affect length, but increasing age did seem to mean increase in weight of the infant. The thesis contains 2 curves and 22 pages of tables.

634 **Sommerfeldt, O.:** Højde-og Vaegtbestemmelser af unge Maend, udførte paa Laerlinge-Plejehjemmet, med Bilag fra Haerens Elevskole og det konglig Opfostringshus [Height and Weight Determinations of Young Men Carried Out in the Apprentice Home, and an Addition from the Army Candidate School and the Royal Orphans Home]. Copenhagen, 1902. 64 pp.

In 16 detailed tables, 11 tabulations, and 2 graphs the material obtained by the author and many other investigators is arranged to show height, weight, yearly increase in height and weight, relation between height and weight, median height, and weight and chest measurements. Separate tables are given for the poorer and well-to-do classes, for the children of professional classes, for city and country youths, and for the army and apprentice schools. The author observed 2,242 youths between 14 and 21 years of age.

635 **Spielrein, Isaak:** "Über Kindermessungen in Rostow am Don" [Measurements of children in Rostof on Don]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 29 (1916), pp. 451–461, 503–513, 548–560.

In the spring of 1913 the author examined about 2,000 boys between the ages of 6 and 15 during the morning hours. Height was taken without shoes, weight with only hose; two chest measurements were made, of normal and of deep respiration, at nipples and below shoulder blades, and strength was tested with the Collin dynamometer. The author discusses the questionnaire he used; the effect of season and time of day; and the age, education, and occupation of parents. He describes the various schools he investigated. Data are shown in 27 tables. It is found that pupils have better development than children not studying; that in the public schools, Russians at first have higher values than Jews and Armenians, but that from 12 or 13 to 15 Jews

overtake Russians because of earlier puberty, and the Armenians, though the shortest, are the strongest. In the better schools Armenians showed the best results, then the Russians, then the Jews. A relation was noted between physical development and class standing.

636 **Spitzer, Olga:** "Untersuchungen an Krakauer Mädchen [Investigations on Krakow girls]. *Mittheilungen der Anthropologischen Gesellschaft in Wien* (1915), vol. 45, pp. 210–215.

The author took numerous anthropological measurements of 1,000 Polish girls between 6 and 15 years of age in the public schools of Krakow. Thirteen tables give the figures for height, length of torso, breadth of shoulder, pelvis, outstretched arms, length of hand, and indexes for head, face, nose, and ear. Observations were made also of hair, eyes, mouth, breasts, and menstruation.

637 **Springer, Maurice:** La croissance; son rôle en pathologie [Growth; Its Rôle in Pathology]. Paris, no. 89, 1890. 196 pp.

Thesis (University of Paris) presented for the doctor's degree in medicine. Following a discussion of the physiology of growth the author shows the effects of its demands upon the bony tissue, the nervous, vascular, and lymphatic systems and the digestive apparatus, and its relation to certain infectious diseases. His original research, an experiment with puppies fed on milk from which the salts had been extracted, is described in detail. Twenty-one cases are cited from the author's hospital practice, in which the demands of growth were a contributing factor in disease.

638 **Stage, G. G.:** "Über Körperwägungen während der Dentitionsperiode" [Body weight during the period of dentition]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 20 (1883), pp. 425–438.

The author made a study of many children (number not given) under 1 year old to determine the effect of dentition on weight. He weighed the children every week during a year. In his article he gives the figures for some of them and draws the conclusion that only in a very few cases was the weight directly affected by dentition, but that in no case could there be any question of considerable general effect on the development of the child.

639 **Starkov, I.:** Fizicheskoie razvitie vospitannikov voyennouchebnikh zaviedienii [Physical Development of Students in Military Schools]. Stasiulewich, St. Petersburg, 1897. 187 pp.

Report based on individual health records of 9,496 students, 10 to 22 years of age, in military schools throughout Russia. In a large number of tables are shown age, birthplace, occupations of parents, general constitution, development of muscles, thickness of subcutaneous layer of fat, color of hair and eyes, condition of hearing, sight, and teeth, height, chest circumference, weight, circumference of abdomen, and length of legs. A separate chart is devoted to the sexual development of the students. All the individual records were prepared simultaneously in one year according to uniform instructions issued for that purpose by the military authorities of Russia. More than half the report consists of tables.

640 **Stéenhoff, G.:** "Bidrag till kännedomen om vår folkskolehygien" [Contribution to the knowledge of our public-school hygiene]. *Hygiea, Medicinsk och Farmaceutisk Månadsskrift* [Stockholm], vol. 62, pt. 2 (1900), pp. 145–165.

In two tables and four graphs the author gives his findings as to the health conditions of 8,699 children of Stockholm, Sundsvall, and Christianstad. Height, weight, and chest measurements are given for 677 girls and 654 boys.

641 **Steet, G. C.:** "Notes on the development and growth of boys between thirteen and twenty years of age." *St. George's Hospital Report*, 1874–1876 [London], vol. 8 (1877), pp. 49–56.

To test the qualifications of "candidates for public and other services" the author suggests taking measurements of height, weight, strength, and chest development. A table gives the results of such measurements taken by the author (methods described) of boys 13 to 19 years of age, the number varying from 946 to 153 for different ages. Weight and chest capacity showed irregular increases. Height correlated with strength.

642 **Stépanoff, Nicolas:** Taille et poids des enfants des écoles primaires de Lausanne [Stature and Weight of Children in the Public Schools of Lausanne]. Charles Guex, Lausanne, 1903. 30 pp.

Data were obtained from anthropometric records of the schools of Lausanne. The author had at hand records of the height of 10,860 boys and 11,553 girls, taken in 1886, and of height and weight of 3,405 boys and 4,261 girls, taken in 1897. Methods of using the records are described, and tables and curves are constructed. The conclusions are: (1) The monthly growth of boys is more or less regular to 15 years, within 1 centimeter—after that age, within 2 or 3 centimeters; (2) in girls the corresponding irregularities begin at 12 years; (3) the monthly increase in weight in boys, within 1 kilogram, is fairly regular to 12 years; (4) in girls irregularity begins at 11 years; (5) pubertal variations in height and weight of the sexes are established; (6) increase in height and in weight, in boys and girls, has three distinct periods; (7) boys and girls born in the warm months are taller and heavier than those born in the cold months; (8) boys and girls of Lausanne are superior in height and weight to those of Brussels and Turin.

643 **Stephenson, W.:** "On the rate of growth in children." *Transactions Ninth International Medical Congress* [Washington], vol. 3 (1887), pp. 446–452.

From figures of other investigators the author derives curves showing the annual increase in weight in boys and in girls from birth to 18 years; tables showing annual gain in height and weight, in each sex, from 5 to 18; standard weight in pounds for each inch in height in boys from 6 to 18 and in girls from 5 to 18, with the method of computation. He compares his results with statistics for various classes in England and for American-born and Anglo-American in America.

644 ——— "The relation of weight to height and the rate of growth in man." *Lancet* [London], vol. 2 (1888), pp. 560–564.

Using the data of the Anthropological Committee of the British Association, and of Bowditch the author derived tables of average height and weight for boys and girls, aged 5 to 18, charts of the annual increase in weight for the same ages, and tables of standard weight in pounds for each inch in height from 40 to 61 in boys and 38 to 58 in girls, with explanation of the statistical method by which these figures were obtained. Part 4 of the article carries these investigations into adult life.

645 **Sternberg, G. M.:** [Statistics of the measurements of recruits, one group consisting of individuals 16 to 20 years of age.] Report of the Surgeon General of the Army to the Secretary of War for the fiscal year ending June 30, 1893. Washington, 1893.

646 **Stevenson, Paul H.:** "Collected anthropometric data on the Chinese." *China Medical Journal* [Shanghai], vol. 39 (1925), pp. 855–898.

The author has assembled the anthropometric data in the files of the Research Committee of the China Medical Missionary Association, contained in the records of physical measurements on over 10,000 individual Chinese collected during the 10-year period between 1915 and 1925 by more than 30 investigators. Eighteen tables and 11 figures, including graphic height charts of Chinese boys and girls from 5 to 15 years of age in South, Central, and North China, respectively, present the essential facts recorded. The author discusses at some length the height and weight of Chinese during the period of growth.

647 **Stewart, S. F.:** "A study of physical growth and school standing of boys." *Journal of Educational Psychology* [Baltimore], vol. 7 (1916), pp. 414–426.

Data were secured from measurements of 207 boys of the elementary and high schools of the University of Chicago during the eight years from 1906–7 to 1913–14, successive annual measurements made by the physical director of the school of education having been recorded as many times as possible. The first part of the study deals with averages; the second, with individual records of 29 boys whose physical measurements are complete for four or more successive years. The author concludes that when averages are considered the group one year ahead of normal grade averages both heavier and taller than the normal group; when individual curves are studied there seems no correlation; when individual curves and correlations are considered together with the size of the body at 14 years and stage of development, heavy or tall boys of early development rank better than those of later development; light boys of late development rank better than those of early or medium development.

Stiles, C. W., and G. A. Wheeler: Heights and Weights of Children. *See* U. S. Public Health Service.

648 **Stockton-Hough, John:** "Statistics relating to seven hundred births (white) occurring in the Philadelphia Hospital (Blockley) between 1865–1872." *Philadelphia Medical Times*, vol. 16 (1885–86), pp. 92–94.

A table which gives the average age of mother, whether single or married, the number of the pregnancy, duration of gestation, sex of infant, length of trunk, standing height, and weight.

649 **Stolte, K.:** Über Störungen des Längenwachstums der Säuglinge" [On disorders of growth in length of infants]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 78 (1913), pp. 399–425.

A summary and discussion of the findings of many workers on the regularity of increases in children's growth and the relation of growth increases to season, heredity, feedings, etc.

650 **Storey, T. A.:** "Some daily variations in height, weight, and strength." *American Physical Education Review* [Boston], vol. 6 (1901), pp. 293–297.

Weights and measures of a few students recorded by themselves; strength was estimated by the dynamometer and the ergograph. The number of cases in various observations is stated. Daily variations of 1.4 centimeters in height, of 0.9 pound and 10 to 15 kilograms in strength are normal.

651 **Stratz, C. H.:** Der Körper des Kindes und seine Pflege [The Child's Body and Its Care]. Verlag von Ferdinand Enke in Stuttgart, 1909. 386 pp.

A study bringing together the findings of many authorities on bodily measurements, weight, and nutritional requirements at different ages.

652 ——— "Het Normale Gewicht van Kinderen" [Normal weight of children]. Nederlandsch Maandschrift voor Verloskunde en Vrouwenziekten [Leyden], vol. 1 (1912), pp. 376–380.

On the basis of data by several writers author computes what he considers the average weight and height for the entire period of growth; that is, from birth to the age of 20. He gives in a table for each year of age by sex the height, weight, and the index of these two values; that is, weight for each centimeter of height.

653 ——— "Wachstum und Proportionen des Menschen vor und nach der Geburt" [Growth and proportions of the human being before and after birth]. *Archiv für Anthropologie* [Braunschweig], vol. 8 (1909), pp. 287–297.

On the basis of his own investigations (of which no account is given) and those of others the author works out laws of growth which he presents and illustrates by figures and charts. Growth from the first month of gestation to 20 years is discussed. Between the ages of 2 and 4 years and 8 and 10 years the increase in weight is relatively greater than the gain in height. Between the ages of 5 and 7 years and 11 and 15 years the growth in height is predominant.

654 **Studzinski, J. B.:** "Les indicateurs fondamentaux du développement physique régulier de l'organisme infantile" [Fundamental indicators of normal physical development in the infant organism]. *Annales de médecine et chirurgie infantiles* [Paris], vol. 4 (1900), pp. 73–74.

Working over the data of four works published in Paris, St. Petersburg, Tubingen, and New York, the author gives tables of weight, height, thoracic and cephalic perimeter, relation of thoracic perimeter to height and of cephalic perimeter to thoracic perimeter, for infants of 1 to 12 months and for children of 1 to 17 years.

655 **Stuhl, Karl:** "Messungen und Beobachtungen beim ärztlichen Dienst auf Schulschiffen" [Measurements and observations during medical service on school ships]. *Jahrb. f. Kinderh.* [Berlin], ser. 3, vol. 37 (1918), pp. 159–170.

The author, who was physician for two school ships with youths from working and rural classes and middle classes, conducted physical examinations in the fall of 1914. Boys entering these schools are 15 or 16, rarely as old as 19. Daily measurements were made. Results are shown in five graphs. The hard life reduced weight and even height but not girth of chest. The author touches on other phases of growth, quoting from Bernstein, Seitz, et al.

656 **Sue:** "Sur les proportions du squelette de l'homme, examiné depuis l'âge le plus tendre, jusqu'à celui de vingt-cinq, soixante ans, et au delà" [On the proportions of the human skeleton, examined from the earliest age to that of 25, 60, and beyond]. *Mémoires de mathématique et de physique présentés à l'Académie Royale des Sciences* [Paris], vol. 2 (1755), pp. 572–585.

A few measurements designed to show the relationship between the length of the trunk and of the upper and lower extremities in children.

657 **Suligowski, F.:** "Kilka słów o pomiarach antropometrycznych młodzieży gimnazyum męzkiego w Radomiu" [A few words on anthropological measurements of pupils in a high school for boys in the city of Radom]. *Medycyna* [Warsaw], vol. 15 (1886–87), pp. 512–528, 544–547, 559–564, and 641–643.

Account of a study, by the author, of 1,133 boy pupils ranging from 9 to 21 years in the secondary schools of Radom. In a number of tables the author gives the maximum, minimum, and average height, chest circumference, chest expansion, and weight for each of the pupils' ages, and the annual increase in these values. He compares his findings with those of Quetelet, Leshaft, and a few others, which he gives in parallel tables.

658 **Sutils:** Guide pratique des pesages pendant les deux premières années à l'usage des médecins inspecteurs [A Practical Guide to Weighing during the First Two Years, for the Use of Medical Inspectors]. Paris, 1889. 156 pp.

This work is based on 3,600 weighings of infants made in five years by the author, who also invented an apparatus for weighing. The text contains 64 weight curves, and discussions of the work done by Bouchaud, Odier, and Blache, on infants' normal monthly increase in weight.

659 **Sweden, National Labor and Social Welfare Department:** Sveriges Officiella Statistik. Socialstatistik. Kroppsutvecklingen hos minderåriga industriarbetare i Sverige av K. Socialstyrelsen [Physical development of industrially employed children in Sweden]. Stockholm, 1925. 100 pp.

This study, made in compliance with the law which requires the physical examination of every working child upon first entering employment at the age of 13 and annually thereafter until he reaches the age of 18, shows the results of the initial examination and of three annual examinations of 11,500 workers under 18 years old, 2,315 of whom were girls. All these workers remained in the same occupation during the entire period covered by the study. The report gives in numerous tables for each year of age and separately for the sexes the average weight, height, and chest circumference and the annual increase of these three measurements. It was found that girls at the age of 14 were better developed in regard to height, weight, and chest circumference than boys of the same age; after that the boys became superior to the girls. The above data are compared with those obtained by other studies in Sweden, Norway, and England.

660 **Symington, Johnson:** The Topographical Anatomy of the Child. E. & S. Livingston, Edinburgh, 1887. 75 pp.

This work is based on an investigation by the author. It is illustrated by 14 colored plates and 33 woodcuts, from frozen sections of cadavers of children of both sexes, aged 2 months to 13 years. Many of the plates are life size. Part I consists of plates, with descriptions; Part II, of a bibliography and full discussion of the sections.

661 **Talbot, Fritz B.:** "Studies in growth. I. Growth of normal children. II. Growth of premature infants." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 541–555.

The figures for Part I of this study were compiled from a series of body-surface measurements taken according to the DuBois linear formula on the subjects used for the metabolism experiments reported in Carnegie Institution of Washington Publication No. 302, 1921. Smoothed curves, drawn to indicate trend of growth, show separately for the sexes weight for age, height for age, height for weight, circumference of head, chest, and abdomen, and length of trunk, leg, foot, and arm. Corresponding curves are given in Part II for a series of premature infants. The author finds that the premature infant, smaller at birth than the normal infant, remains under size for an indefinite number of months. His measurements are submitted as of possible diagnostic value in uncertain cases of prematurity. References.

662 **Tattersall, C. H.:** "The medical inspection of schools in relation to public health work in Salford." *Public Health* [London], vol. 19 (1906–7), pp. 654–664.

Report of a medical officer to the Salford School Board, including the results of anthropometric measurements of 1,329 boys at approximately 8, 10, and 13 years, including a description of methods and a tabulation of results. It was observed that the better-fed children showed marked superiority in development.

663 **Taylor, C. K.:** Physical Standards for Boys and Girls. The Academy Press, Carteret Place, Orange, N. J., 1922. 56 pp.

A continuation of the author's work in promoting interest in physical measurement of school children to the seventeenth year of age. Tables are given of standard measurements for boys, derived from study of over 5,000 boys, and grouped by type of build—slender, slender-medium, medium, medium heavy, and heavy—and tables for girls, derived from a smaller number and grouped as preadolescent or postadolescent, slender, slender-medium, medium, medium-heavy, and heavy. There are directions for taking the measurements and scoring results.

664 **Taylor, Rood:** "The measurements of 250 full-term newborn infants." *Am. J. Dis. Child.* [Chicago], vol. 17 (1919), pp. 353–362.

At the University Hospital of Minnesota 250 full-term normal infants (125 of each sex) were measured, the ages varying from 2 to 10 days. The author tabulated the nationality, and the chest circumference according to sex and age. Table 3 gives the maximum-minimum and average of weight, span, length, sitting height, occipito-frontal circumference, chest circumference, trunk length, arm length, leg length, shoulder breadth, head and neck height, intertrochanteric diameter, foot length, and hand length, with a comparison of Weissenberg's measurements. A table from Pearson and Robertson gives the deviation from standard for British infants. Another table from Pearson gives the weight and length of newborn infants, 1,000 of each sex being measured. Graphic charts show for both sexes body length, chest circumference, occipito-frontal circumference, span, and body weights.

665 **Teixeira de Mattos, Jhr. Ed:** "Die Buttermilch als Säuglingsnahrung" [Buttermilk as an infant food]. *Jahrb. f. Kinderh.* [Berlin], vol. 55 (1902), pp. 1–61.

In connection with a discussion of the value of buttermilk for infants the author gives 15 case histories with weights of infants fed in a polyclinic from 1879 to 1901.

666 **Tezyakoff, N.:** "Fizicheskoie razvitie uchenikov zemskikh shkol Elisavetgradskago uieizda" [Physical development of the public-school pupils of Yelisavetgrad County]. *Vestnik obshtshestvennoy higieni, sudebnoy i prakticheskoy meditzini* [St. Petersburg], vol. 29, sec. 2 (1896), pp. 121–138.

An account of a study of the physical condition of 2,597 boys and 313 girls, 6 to 16 years old, pupils in rural public schools. The author gives height, chest circumference, and difference between the latter and the half-height for each year of age by sex and by duration of school attendance. It was found that in the majority of cases the chest was too narrow and that this narrowness increased with the school attendance.

667 **Theis, Wilhelm:** Über die Gewichtsveränderung der Neugeborenen [Change of Weight in Newborn.] Halle, 1868. 28 pp.

Inaugural dissertation (University of Halle). After a review of previous works on the subject the author gives data on three boys and nine girls from a series of four weighings during the first nine days of life. The average weight of the girls was 2,950 grams, of the boys 3,307. During the first three days the girls lost an average of 185 grams each, and the boys 117. Table gives data on 40 children born the same year and weighed on the day of birth and day of discharge, usually 15 days later. Average weights for boys on these two days were 3,092 and 3,265 grams, and for girls 3,148 and 3,267 grams, respectively. As causes of initial loss of weight the author suggests weight of meconium, lack of milk, defective functioning of alimentary tract, and profuse perspiration.

668 **Thiele:** "Der Einfluss von Krankheiten, insbesondere der Tuberkulose, auf das Wachstum und den Ernährungszustand der Schulkinder" [Effect of diseases, especially tuberculosis, on the growth and nutrition of school children]. *Berliner Klinische Wochenschrift*, vol. 52 (1915), pp. 949–950.

The author measured 1,000 Chemnitz school children 6, 9, and 13 years of age who were free from deformities; of these, 500 were anemic and 300 either tuberculous or with tuberculous tendencies. The results are given in tables. The anemic children were little inferior to the normal children, but the tuberculous children were underweight. The boys were also undersized, but the girls at the age of 13 showed excessive size, due to coming puberty, which is earlier in girls than in boys.

669 **Thoma, R.:** Untersuchungen über die Grösse und das Gewicht der anatomischen Bestandtheile des menschlichen Körpers im gesunden und im kranken Zustande [Investigations of Size and Weight of Anatomical Sections of the Human Body in Normal and in Pathological States]. C. W. Vogel, Leipzig, 1882. 291 pp.

The first part of the book deals with theoretical considerations, the second with a series of observations, and the appendix takes up the mathematical foundations for the theory of individual variations. The mathematical discussions are kept as simple as possible. The amount of material handled was very large, as is evidenced by the bibliography covering 12 pages. Some of the data on height the author collected from 732 boys between 7 and 19 in the schools of Heidelberg, measurements being taken without shoes. He finds that height and weight are greater in males than females except from 12 to 15 years of age. Normal growth is not regular but has stages of retardation and acceleration.

670 **Thorndike, Edward Lee:** "The physical growth of children." Notes on Child Study, pp. 21–30. Columbia University Contributions to Philosophy, Psychology, and Education. The Macmillan Co., New York, 1901.

An analysis of certain of the researches of Franz Boas on physical growth used in the author's classes at Teachers College.

671 **Thorne, L. T.:** "The physical development of the London schoolboy; 1890 examinations." *Brit. M. J.* [London], vol. 1 (1904), pp. 829–831.

An investigation of the physical condition of boys aged 9 to 16 years, inclusive, all pupils of the Technical Education Board of the London County Council, between 1898 and 1902. With data as to condition of lungs, heart, spine, eyes, throat, nose, hearing, and urine are included tables of chest expansion and circumference of chest with forced inspiration, of 1,644 boys, and a table of heights (in boots) and weights (stripped to the waist but with jackets on) of 1,710 boys.

672 **Törnell, Gottfried:** "En svensk folkskola på landet. Skolhygenisk studie" [A Swedish public school in the country. School hygiene study]. *Hygiea, Medicinsk och Farmaceutisk Månadsskrift* [Stockholm], vol. 71/1–2 (1910), pp. 911–933.

After describing the class schedules and home work required of pupils in the school at Hvetland and the development of pupils as compared with the incidence of disease the article gives three tables showing height, weight, and chest girth of 11 boys and 6 girls in whose families tuberculosis had appeared, the same data for 151 boys and 163 girls (normal), and median, maximum, and minimum heights for a group of boys and girls ranging in age from 6 to 14½ years.

673 **Tolentino, Mariano:** "Weight of newborn Filipino babies." *Journal of the Philippine Islands Medical Association* [Manila], vol. 1 (1921), pp. 111–112.

From the records of the weight of 200 healthy, full-term infants in the charity ward of the Philippine General Hospital the author derived an average of 2,962.4 grams. The records of 16 infants born in the pay department showed an average weight of 3,510.6 grams.

674 **Toronto, Canada, Department of Public Health:** "Height and weight tables of Toronto school children." *Public Health Journal* [Toronto], vol. 15 (1924), pp. 391–403.

In January, 1922, a survey was made of the public schools of Toronto to establish standards of height and weight for age among Toronto school children. Data were secured under uniform conditions for 30,035 boys and 29,185 girls, in indoor clothing, excepting shoes. Tables derived by ordinary statistical methods show an average height and weight for age a little lower than those of the new Baldwin-Wood tables. The rapid gain in height of girls of 13 years is especially marked in the case of Toronto girls, and Toronto boys of 13 are heavier than the Baldwin-Wood standard. The Baldwin-Wood tables show a greater range in both height and weight at each age, than do the Toronto tables. Growth curves are presented.

675 **Townsend, C. W.:** "Some statistics on weight of infants, sex, and fetal heart-rate." *Bost. M. & S. J.*, vol. 134 (1896), pp. 484–485.

A brief article, largely statistical, submitted to combat what the author felt to be erroneous statements in circulation, based on small numbers of observations. In 1,000 cases of infants born at full term at the Boston Lying-in Hospital he found the average fetal heart rate to be 140.26 in males, 141.83 in females. The weight of the same infants was 7 pounds 8.9 ounces for males and 7 pounds 5.1 ounces for females. Attempted prediction of sex from rate of heartbeat he felt to be useless.

676 ——— "The so-called physiological loss in infants." *Bost. M. & S. J.*, vol. 116 (1887), pp. 157–160.

Observations at the Boston Lying-in Hospital from May 1, 1885, to July 15, 1886, of 231 normal breast-fed infants of healthy mothers. Two tables are given: One compares the changes in weight in infants of primiparæ and of multiparæ; the second compares the changes in weight in infants fed in different ways. The author's observations were: (1) Initial loss of weight is physiological for civilized human beings—it does not occur in the few lower animals observed; (2) first-born lose more than later-born infants; (3) this loss of weight is due to (*a*) tardy secretion of milk (*b*) laxative effect of colostrum (*c*) the feeble condition of the infant; (4) additional artificial food diminishes, but does not eliminate, this weight loss, and is an objectionable practice. Many other workers are quoted and a bibliography compiled.

677 **Trettien, A. W.:** "Creeping and walking." *American Journal of Psychology* [Worcester], vol. 12 (1900), pp. 1–57.

A study of the attitudes and movements of the child during the first few years. Data were selected from medical journals, hospital reports, and replies to a questionnaire sent out by the author. He discusses development of the embryo; position in utero; prenatal movements; length, weight, and relative proportions of parts of the body in the infant at birth; composition and structure of the body, including a description of the spinal curves. Under the headings: Measurements, Arms, Chest, Legs, Creeping, First Steps, Reversion, with numerous subheadings, information was obtained by questionnaire as to the development of many children, and the results analyzed at length (45 pages) with regard to both mental and physical processes. References.

678 **Tschepourkovsky, Ethyme:** "Anthropologische Studien" [Anthropological studies]. *Archiv für Anthropologie* [Braunschweig], 1911, new ser. vol. 10, pp. 151–183.

The anthropological characteristics of the races of Great Russia are discussed, and many tables give data on height and on head dimensions of over 2,000 children.

679 **Tuckerman, F.:** Anthropometric Data Based upon Nearly 3,000 Measurements Taken from Students. Amherst, 1888. 1 page.

The subjects measured were 52 students of the three upper classes of the Massachusetts Agricultural College, in 1884–85. Average results are given and a table of percentage differences between the two sides of the body.

680 **Tudeer, O.:** Förberedande undersökningar af det s. k. "fullgångna" finska fostrets vikt- och dimensionsförhållanden" [Preliminary investigations of the so-called "full-term" Finnish fetus and its dimensions]. *Finska Läkaresallskapets Handlingar* [Helsingfors], vol. 57 (1915), pp. 875–893.

Results of investigations of other workers are given. The author observed infants of 5,289 women confined in the lying-in hospitals of Helsingfors. Confinements of 4,412 of these occurred between the thirty-ninth and fortieth week of pregnancy. The pregnancy of 877 lasted more than 40 weeks. In the first group the weight of female infants of unmarried mothers averaged 3,314 grams and male infants 3,486 grams; female infants of married mothers 3,445 grams and male infants 3,576 grams. Infants of married mothers were also found to be the longer.

694 Variot, G.: "L'accroissement statural et l'accroissement pondéral chez le nouveau-né" [Increase in length and weight of newborn infants]. *Presse médicale belge* [Brussels], vol. 60 (1908), pp. 821–826.

The author has already established that in hypotrophic conditions due to chronic gastroenteritis stature is arrested less than weight. For instance, an infant 8 months old had the length of a normal 4-month-old infant and the weight of a 2-month-old infant. This constitutes dissociation of growth. But dissociation is also physiological; from many mean weights of infants born in French hospitals taken 1 day after birth, 10 days after, and 30 days after, it is shown that in the first 10 days they gain 100 grams and 2.3 centimeters and in the next 20 days 600 grams and 2 centimeters. Four cases are described in detail.

695 Variot, G.: La croissance chez le nourrisson [Growth of the Infant]. G. Doin, Paris, 1925. 339 pp.

Dr. Variot gives in this volume the results of important studies made by him on the growth of infants, during the years when he was in charge of an infant asylum. The book is divided into two parts; one dealing with normal, the other with abnormal growth.

696 ——— "L'arrêt temporaire de croissance chez les nourrissons en rapport avec l'éruption dentaire" [Temporary arrest of infants' weight increase in relation to dentition]. *Journal de clinique et de thérapeutique infantiles* [Paris], vol. 7 (1899), pp. 210–14.

A study made by the author of 42 infants at the Dispensary of Belleville, whose weight loss could be ascribed only to dentition. Case histories with disturbances in health, weights, condition of teeth, etc., are given.

697 ——— "Note sur la dissociation de la croissance * * * chez les débiles" [Note on dissociation of growth * * * in weak children]. *Bulletins de la Société de pédiatrie de Paris*, vol. 10 (1908), pp. 193–195.

A brief discussion, illustrated by three cases, of the characteristic growth of healthy and sick premature infants. The author finds a pronounced dissociation of growth in weight and length when premature infants are not healthy.

698 ——— and Chaumet: "Tables de croissance des enfants parisiens de 1 an à 16 ans, dressées en 1905" [Growth tables of Parisian children from 1 to 16 years of age, compiled in 1905]. *Bulletins de la Société de pédiatrie de Paris*, vol. 8 (1906), pp. 49–58.

Measurements taken with Variot's pediometer. Abnormal children were eliminated, but as many Paris classes and communities as possible were represented. Height was taken without shoes and weight without clothing. The averages are calculated for 100 to 190 individuals for each year and each sex. This material the authors present in a table and in graphs, with discussion which brings out the superiority of girls from 10 to 15. Another table compares figures of Quetelet, Bowditch, Rotch, and others, all of which are similar, save those of Quetelet.

699 ——— and Fliniaux: "Tables des croissances comparées des nourrissons élévés au sein et au biberon durant la première année de la vie" [Tables of growth comparing breast-fed and bottle-fed children during the first year of life]. *Comptes-rendus hebdomadaires des séances de l'Académie des sciences* [Paris], vol. 158 (1914), pp. 1361–64.

To ascertain mean weight of newborn infants the authors took the statistics for 500 boys and 500 girls at St. Louis and obtained 3,130 grams for the former and 3,020 grams for the latter. For length they took the same numbers from the Hospice des Enfans-Assistés, and obtained 49.8 centimeters for boys and 49.3 for girls. For monthly growth up to 1 year they used the records of the Belleville Goutte de Lait and the Institute de Puericulture des Enfans-Assistés and found that there existed little difference in weight and length between artificially-fed and breast-fed infants. In the infants observed the weight for both sexes at the end of a year was 91 kilos and the length 71.7 centimeters. A table is given for weight and length of boys and girls for each of the first 12 months as related to the method of feeding.

700 Warrentrapp, G.: "Bericht an die Baudeputation zu Frankfurt am Main zur Beantwortung der Frage über die zweckmässigste Einrichtung der Schulbänke und Schultische" [Report to the committee of construction at Frankfort on Main in answering the question as to the most satisfactory installation of school benches and desks]. *Vierteljahrsschrift für Öffentliche Gesundheitspflege* [Braunschweig], vol. 4 (1872), pp. 298–306.

To improve school forms from the hygienic point of view the authorities at Frankfort on the Main in Germany about the year 1870 had the height measured, with shoes, of 3,459 boys from 6 to 21 years old and 2,448 girls from 6 to 19 years old, pupils in their public schools. The average, maximum, and minimum heights for each sex are shown in tables.

701 **Vasiliev, V. I.:** "K voprosu o vlijanii selskoi shkoli na fizicheskoye razvitie uchashtschikhsya" [Effect of the rural school on the physical development of the pupils]. *Vestnik obshtshestvennoy higieni, sudebnoy i prakticheskoy meditzini* [St. Petersburg], 1900, pp. 369–388.

The author studied 2,233 pupils 9 to 13 years old in rural schools, nearly one-third of them girls, to ascertain the effect of school on their physical development. Weight, height, and chest circumference are given by sex and age. Contrary to other writers the author finds that the absolute weight, height, and chest circumference increase with the years of school attendance, which he attributes to the happy spirit of the children in the schools investigated by him, to the devotion of the teachers to their work, and to the informality of the instruction, which prevents overwork and promotes happiness.

702 **Vasilievski, N. P.:** "K voprosu o vlijanii narodnoi shkoli na zdorovie i fizicheskoi razvitie uchashchikhsya dietie, po nabliudeniam proizvedennim v 1893–94 uchebnom godu nad uchenikami zemskikh shkol Kovrovskago uiezda" [On the question of effect of public school on the health and physical development of school children according to investigations made in the school year 1893–94 of the pupils of the rural schools of Kavrovski district]. *Vrach* [St. Petersburg], vol. 16 (1895), pp. 36, 59.

A study of 938 rural school children 7 to 14 years old (about one-sixth of them girls). The author gives in several tables the children's height, chest circumference, difference between chest circumference and half height for each year of age, annual increase in each of the above measurements; also an account of the physical defects found in the children.

703 **Vazhnov, K. V.:** "O fizicheskom razvitii uchashchikhsia v narodnikh shkolah Egorievskago ouiezda Riasanskoi gubernii v 1895–96 uchebnom godu" [On the physical development of the pupils in the public schools of Egorievski district, Government of Ryazan, in the school year 1895–96]. *Vestnik obshtshestvennoy higieni, sudebnoy i prakticheskoy meditzini*, February, 1897, pt. 7, pp. 31–43.

Original study of physical development of 562 boys and 155 girls 7 to 14 years old, pupils in rural public schools, made in the school year 1895–96. In a number of tables the author gives for each year of age the average height, chest circumference, form of chest, condition of spine, hearing, sight, teeth, and state of nutrition. He found that the rate of growth in height and in chest circumference decreased with each year of school attendance, but he refrains from attributing this to the effect of school life.

704 **Veit, G.:** "Beiträge zur geburtshülflichen Statistik" [Data on obstetrical statistics]. *Monatsschrift für Geburtskunde und Frauenkrankheiten* [Berlin], vol. 5 (1855), pp. 344–381; vol. 6 (1855), pp. 101–132.

In connection with data on delivery the author gives the weights at birth of 2,550 infants.

705 **Venn, J.:** "Cambridge anthropometry." *Journal of the Anthropological Institute of Great Britain and Ireland* [London], vol. 18 (1888–89), pp. 140–154.

The results of measuring height, weight, visual acuity, strength of pull and of squeeze, vital capacity, length and breadth of heart are recorded for 1,235 university students, by age and by scholastic grading.

706 ——— "Results of anthropometry at Cambridge." *Transactions of the International Congress of Hygiene and Demography*, 1891 [London], vol. 10 (1892), pp. 308–314.

A report of examination of over 2,000 men at Cambridge, aged about 19 to 23, the instruments and methods used being those selected by Francis Galton for anthropometrical investigations throughout England. Height was measured to the tenth of an inch, thickness of shoes being deducted; weight, in clothing, to a quarter of a pound. In general, the author found the Cambridge men more fully developed than Englishmen of the same age selected at random; the correlation between mental and physical capacity was too slight to be significant. Various tables.

707 **Vierordt, Hermann:** Anatomische, physiologische und physikalische Daten und Tabellen zum Gebrauche für Mediciner [Anatomical, Physiological, and Physical Data and Tables for Use of Medical Men]. Verlag von Gustav Fischer, Jena, 1888. 309 pp.

A mass of data collected from other investigators on the human body at different ages, its make-up, and needs. The first part (about 100 pages) gives height, weight, and size of organs, according to age, sex, race, etc. The second part (over 150 pages) treats blood, digestion, respiration, amounts of food required by children at various ages, analyses of milk, excretions, etc. The third part gives information on thermometry, specific gravity, pharmacopoeia, various tables of measurement, etc. Many references are given.

708 Vignes, Henri: "Le poids des enfants nés à terme ou au voisinage d terme dans la population hospitalière de l'agglomération parisienne [The weight of infants born at term, or near term, in the hospitals Paris and environs]. *Revue anthropologique* [Paris], vol. 34 (1924 pp. 152–159.

The author correlates the weight of the infant with the period of gestatio using as a basis for his conclusions a study of nearly 2,000 cases, and illustra ing his discussion with numerous curves.

709 Villermé, L. R.: "Mémoire sur la taille de l'homme en France" [Th stature of man in France]. *Annales d'hygiène publique et de médecin légale* [Paris], vol. 1 (1829), pp. 351–399.

Data for this article were secured from answers to a series of questions se out by the French Government in 1812 and 1813 as to the stature of militar conscripts, the age of complete development, and causes, whether of locatio or occupation, which rendered young men physically unfit. The author di cusses in detail the returns from the different sections of the country and fin that poverty and its accompaniments produces men of small stature and r tarded development and that rigor of climate can be considered only a secondar cause.

710 Vines, J. H.: "The physique of the public-school boy." *American phys cal Education Review* [Boston], vol. 9 (1904), pp. 110–115.

A record of height, weight, and age of English school boys in 1874 an 1901—about 700 cases reported each year. The conclusion is that Englis school boys are materially increasing in height and weight up to the eighteent year.

711 Vinogradova-Lukirskaya, L.: "K voprosu ob izliedovanii rosta i vies uchenitz srednikh uchebnikh zavedeniy" [Examination of height an weight of high-school grils]. *Vestnik obshtshestvennoy higieni, sudeb noy i prakticheskoy meditzini* [St. Petersburg], vol. 21, pt. 2 (1894 pp. 67–94, 186–218.

Account of height and weight of 1,680 school girls 8 to 20 years old o tained by the author at Moscow during four consecutive school years. Sh gives in numerous tables the maximum, minimum, and average height an weight of the girls for each six months of age; also the semiannual increas in height and weight. She also quotes in separate tables similar data for boy and girls obtained by several other writers, Russian and foreign. She co cludes that the Moscow girls 10 to 15 years old are taller and, between 1 and 14 years, heavier than boys of the same ages; that school life retards i crease in height and weight more than poverty; and that the average heigh and weight and their average annual increases are greater in children of wel to-do families than in children of poor families.

712 Viura y Carreras, J.: El examen del peso de los niños durante los prime ros meses de la infancia es el mejor metodo para reconocer si sigue la ley de crecimiento" [Study of the children's weight in the firs months of life is the best way of finding out whether the child i developing properly according to the law of growth]. *Revista d ciencias medicas de Barcelona*, 1886 (12), pp. 4–11.

The author describes three kinds of scales, quotes from several writers th weights of infants, and gives the weight of his own child as it progressed i the first six months of its life.

713 von Voit, C.: Über die Periodicität im Gewichte der Kinder" [Period in the weight of children]. *Münchener Medizinische Wochenschrif* vol. 33 (1886), pp. 129–131.

The author comments on the experiences of Malling-Hansen, president of th Royal Deaf and Dumb Institute in Copenhagen, who every day weighed his 13 pupils and noted that there was a loss in weight from May to July, a decide gain from July to December, and a slight gain from January to May; who note moreover that several improvements in the diet produced no apparent improv ment in health. The author discusses the complicated question of assimilatio and points out that an increase of weight may mean an increase of wate instead of body substance.

714 Voronov, G.: "K voprosu o raznitze nabliudaiemoi v narostanii viesa grudnikh dietie s bolshim i malim viesom" [Difference in increase o weight of large and small infants]. *Meditsinskoe Obozrenie* [Moscow] vol. 20 (1883), pp. 324–340.

A study of increase in weight of 1,582 normal infants under 10 days old in Moscow orphan asylum. The average weight was 3.100 grams. The infan were weighed immediately after admission to the asylum at the age of 1 to days and just before leaving it at the age of 4 to 10 days. In his tables th author shows the absolute daily fluctuations of weight in grams for infan 1 to 3 days old and separately for those 4 to 10 days old, and in each of thes groups he gives two subdivisions for those weighing less than 3,100 grams an those above that weight. He compares his data with those of several othe writers and concludes that infants of smaller weight regain their origin weight sooner than heavier children. The absolute gain of the average chil

is an indication of the state of his nutrition and in children of smaller weight it is greater than in heavier children.

715 **Wagner, G.:** Beobachtungen über Gewicht und Masse der Neugeborenen [Observations on Weight and Measurements of Newborn Infants]. R. Leupold, Konigsberg, 1884. 72 pp.

Study of weights and measurements of 1,500 newborn infants at a maternity clinic at Konigsberg. The author weighed and measured each infant once shortly after birth and a second time before the infant was discharged, usually between the eight and the fourteenth day after birth. He found that the better an infant is developed at the time of birth the less he gains, and the weaker the infant the more he develops in the days following birth. This, however, the author limits to normal children; he specifically excludes very poorly developed or premature children. He found that girls and first-born children develop more rapidly than boys or children of later birth. For every one of his 1,500 cases he gives the weight, length, size of head, width of shoulders, straight diameter, straight oblique diameter, and transverse diameter, as obtained in the first and second measurements. These data are arranged according to child's sex and mother's age.

716 **Walker, E. W. A.:** "The growth of the body in man. The relationship between the body weight and the body length (stem length)." *Proceedings of the Royal Society in London*, ser. B., vol. 89 (1916), pp. 157–173.

Measurements (number not given) made by the author of body length and weight of 1,613 boys and 56 girls in English schools are compared with those made by others. Formulas are presented for showing the relation between growth in body weight and body length, and for judging normality.

717 ——— "The relationship between body weight and the length of the body (stem length) in man." *Journal of Physiology* [Cambridge], vol. 50 (1915–16), pp. 3–4.

A report of 201 cases in which the actual and calculated body lengths and the percentage of difference are tabulated. A formula is presented for showing the relation of weight to body length.

718 **Warner, Francis:** "Mental and physical conditions among 50,000 children seen 1892–94 and the methods of studying recorded observations, with special reference to the determination of the causes of mental dullness and other defects." *Journal of the Royal Statistical Society* [London], vol. 59 (1896), pp. 125–168.

An elaborate study with great statistical detail. The subjects investigated were: (*a*) Development defects; (*b*) nerve signs; (*c*) nutrition; (*d*) dullness; (*e*) eye cases; (*f*) rickets; (*g*) exceptional children.

719 ——— The Study of Children and Their School Training. The Macmillan Co., New York, 1897. 264 pp.

A general study made by the author and others of the mental and physical development of 100,000 children, based rather upon observation than upon actual measurements. Special attention is paid to the points to look for in studying children and the characteristics of normal and subnormal children.

720 **Warren, S. P.:** "The average birth weight in 2,000 confinements in the State of Maine." *Am. J. Obst.* [New York], vol. 76 (1917), pp. 932–936.

A paper based on the author's personal record of confinements, during a practice of 40 years, in which he entered the weight of infants, without clothing taken with obstetric scales. Actual recorded birth weight showed an average of 8¼ pounds for girls and 8¾ for boys. Since parents were of different nationalities, many from races of comparatively small stature, the figures are presented merely as an interesting phenomenon. No conclusion is drawn.

721 **Wateff, S.:** "Anthropologische Beobachtungen an den Schülern und Soldaten in Bulgarien" [Anthropological observations on school children and soldiers in Bulgaria]. *Archiv für Anthropologie* [Braunschweig], vol. 27 (1900–1902), pp. 29–30.

In 1896 a committee was formed to make an anthropological study of the Bulgarian race. Part of the work consisted in examining 209,929 school children between the ages of 6 and 10, 20,810 between 10 and 15, and 6,145 between 15 and 20. Findings are here recorded.

722 **Wedholm, Karl:** "Über den Einfluss der Säuglingsernährung auf Ernährungszustand und Entwicklung der Musculatur im Kindesalter" [The effect of feeding during infancy on nutrition and muscular development in childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 66 (1916), pp. 179–186.

In order to investigate the effects throughout childhood of breast versus bottle feeding the author examined 814 children, of whom 535 had been breast fed and 279 bottle fed. They were studied in groups of first, second, and third year, fourth to sixth year, and seventh to fourteenth year periods. The bottle-fed children had not been breast fed more than two weeks after

birth; the breast-fed children had had mother's milk at least six mo
The data appear in two curves of development in fat and in muscle o
two classes of children during the aforesaid five periods. The author
cludes that the breast-fed children are fatter and stronger than the
during the first two years. Thereafter there is no particular difference
the second year rachitas occurs in 9 per cent of the first class and 5
cent of the second class of children.

723 **Weissbart, Max:** "Gewichtsbestimmungen während einer Stillpe
nebst Bemerkungen über Nährmittel für Stillende" [Weights du
nursing, with remarks on foods for nursing mothers]. *Jahr
Kinderh.* [Berlin], vol. 72 (1910), pp. 309–327.

The author describes the development of an infant that was weighe
his mother before and after every nursing from his twelfth day till he
6 months old. The child was 49 centimeters long at birth and weighed
grams. This article gives in tables and curves the amounts of milk
sumed each day and the increases in weight, and compares the progress o
infant with that of others. The child nursed for only 7 to 10 minutes
time. He increased most in weight in the second half of the first yea
pecially in the seventh and eighth months, when he was weighed three or
times monthly. He was weaned when 11 months old.

724 **Weissenberg, S.:** "Das Körpergewicht nach Alter und Geschle
[Weight of the body according to age and sex]. *Zeitschrift für
stitutionslehre* [Munich and Berlin], vol 10 (1924–25), pp. 738–74

The author attributes great importance to weight in estimating the
stitution of the human body. For this reason he weighed 4,400 persons,
and females in nearly equal numbers, ranging in age from infancy t
years; over 3,000 of these persons were under 20 years of age. In a tab
gives for each sex at each year of age, the minimum weight, the maxi
difference between these, the average annual increase, and the weight in g
for each centimeter of height. In the discussion accompanying the tab
takes up the differences in weight between the sexes at various ages.

725 ——— "Das Wachstum des Kopfes und des Gesichtes" [Growt
head and face]. *Jahrb. f. Kinderh.* [Berlin], vol. 68 (1908),
304–317.

The author measured 25 infants, 25 boys 5 years old, 25 boys an
girls 10 years old, 25 boys 15 years old, 100 men and 50 women, all o
Hebrew race, as to height, length, breadth, and circumference of head; l
and width of face and of nose. Results are shown in tables and curves.
skull proper grows least; the nose grows quickly; the jaw is the last pa
the head to develop.

726 ——— "Das Wachstum des Menschen nach Alter, Geschlecht und Ra
[Growth of man according to age, sex, and race]. *Globus* [Brunsw
vols. 93–94 (1908), pp. 101–109.

The author gives a table of the height of 2,590 Hebrew men and
women between birth and 75 years of age; also a curve for the same mat
To compare with these figures he presents a table of men's and wo
heights as estimated by Erismann, Roberts, Quetelet, Zeising, and Schs
and curves according to Erismann, Roberts, and Quetelet. Another
shows the influence of comfort and of occupation upon height and weight.
author justifies his choice of material by the facts that Jews are homoge
in race and living conditions and that they have the same average h
as other Europeans. He points out that general laws of growth persist th
differences of race. A growth curve is irregular; males are larger than fem
from about 10 to 15 years of age girls are larger than boys. Growth ma
divided into these periods: First 2 years of very rapid growth after wh
child has one-half of his ultimate height; 2 years to 6 years much sl
growth; 6 years to 10 or 12, slow growth, after which the child has t
fourths of his final height; 10 or 12 to 17 or 18, rapid growth; 17 or
25, slow growth; after 25, no growth. The full differentiation accordi
race, sex, and individual appears after accelerated growth at puberty.

727 ——— Das Wachstum des Menschen, nach Alter, Geschlecht,
Rasse [The Growth of Man as Affected by Age, Sex, and Ra
Strecker & Schröder, Stuttgart, 1911. 230 pp.

The author points out the irregularity of growth in seven periods, diff
rates of different parts of the body resulting in varying proportions o
child and adult, the important differentiating factors of age, sex, race, cli
occupation, rank, etc. Sixty tables, 22 curves, 2 plates, and 3 page
bibliography are included.

728 ——— "Die Körperproportionen des Neugeborenen" [The body
portions of the newborn infant]. *Jahrb. f. Kinderh.* [Berlin], vo
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729 Weissenberg, S.: "Die südrussischen Juden" [South Russian Jews]. *Archiv für Anthropologie* [Brunswick], vol. 23 (1894–95), pp. 347–424, 531–579.

After asserting that anthropometry should study colors and measurements of children and effect upon them of climate, economic condition, and occupation, and after describing anthropometrical measurements, the author enters upon a thorough discussion, from birth to old age, of the South Russian Jews, which he illustrates by many graphs and tables. Other writers on Jews and other races are cited. Various parts of the body are considered separately; also localities, sexes, and ages.

730 ——— "Mediko-soziale Untersuchung an den von den öffentlichen Küchen gespeisten Kindern" [Medico-social study of the children fed in public kitchens]. *Ztschr. f. Kinderh.* [Berlin], vol. 39 (1925), pp. 634–644.

A study of the physical condition and of the social and economic circumstances of 1,313 children ranging in age from 4 to 15 years, boys and girls in nearly equal numbers, fed in the public kitchens of three cities during the famine in Russia. In several tables the author gives the weight, height, chest circumference, and general physical condition of these children. He concludes that a food shortage of brief duration produces no permanent injury to the body.

731 Wesener, Felix: Über die Volumverhältnisse der Leber und der Lungen [Volume of the Liver and the Lungs]. Marburg, 1879. 45 pp.

Inaugural dissertation (University of Marburg). A study based upon 471 dissections of which four-sevenths were made in Vienna and the rest in Marburg. Twelve of the 19 tables give data on sex, height, volume of liver and lungs, etc., up to the age of 21 years. The greatest increases in the volume of liver and lungs occur during the first year. The former seems unaffected by puberty but shows a spurt in growth during the eighteenth to twentieth year. The lungs increase in size especially during puberty. At birth the liver is considerably larger than both lungs together; at puberty a change begins; and by maturity in men the lungs are larger than the liver.

732 West, Gerald M.: "Anthropometrische Untersuchungen über die Schulkinder in Worcester, Massachusetts, Amerika" [Anthropological investigations of the school children of Worcester, Mass., U. S. A.]. *Archiv für Anthropologie* [Brunswick], vol. 22 (1893–94), pp. 13–48.

This is a thorough treatment of measurements collected by Dr. Franz Boas and others, of the school children of Worcester, Mass. The material comprises data on 3,250 boys and girls from 5 to 21 years of age. Sixty-six per cent of the parents were American, 20 per cent Irish, 7 per cent English and Scotch, and 6 per cent from other European countries. The data include weight, total height, sitting height, length and width of head, and width of face. The article contains 5 figures and more than 30 tables, and very full discussions, embracing mean variations, difference of averages, and comparisons between different measurements. Other anthropometrical statistics are also considered.

733 ——— "The anthropometry of American school children." *Memoirs International Congress of Anthropology*, 1893 [Chicago], 1894, pp. 50–58.

The author discusses statistics collected for the World's Columbian Exposition on the anthropometry of school children in Toronto, Oakland, Boston, Milwaukee, St. Louis, and Worcester. He calls attention to differences due to heredity and environment, race and locality, sex and social status; he explains the factors, rate of growth and period of growth, "shoots" in growth at certain ages, asymmetry in curves due to precocious children, and the many variations in the period of female superiority. Apparent fluctuations in figures are sometimes due to different mathematical treatment of material. Children of foreign parents are better developed when born here than when born abroad. In the Toronto intelligence tests the "poor" students are almost invariably the better developed physically. Both boys and girls are mesocephalic at all ages.

734 Whyte, G. D.: "Report of the research committee of the C. M. M. A. on the height, weight and chest measurements of healthy Chinese." *National Medical Journal of China* [Shanghai], vol. 3 (1917), pp. 101–113.

Data were collected by physicians in different parts of China and compiled in an effort to establish a standard of physical fitness for the Chinese, from height, weight, and chest circumference. About 2,100 cases of both adults and adolescents were reported. Results are tabulated. The Chinese were found to weigh less per inch of stature than Europeans, and to exhibit sufficient racial peculiarities to make special standards necessary.

735 ——— "The height, weight, and chest measurements of healthy Chinese." *China Medical Journal* [Shanghai], vol 32 (1918), pp. 210–216, 322–328.

Measurements were made on adult and adolescent males and females in different parts of China. Chest, height, and weight measurements are given for about 1,000 adolescents. Weight for height indexes and factors for establishing a "norm" for Chinese are discussed. Southern Chinese were found to be of a slighter builld than those of the northern part. A study of increase in

birth; the breast-fed children had had mother's milk at least six months. The data appear in two curves of development in fat and in muscle of the two classes of children during the aforesaid five periods. The author concludes that the breast-fed children are fatter and stronger than the others during the first two years. Thereafter there is no particular difference. In the second year rachitas occurs in 9 per cent of the first class and 50 per cent of the second class of children.

723 **Weissbart, Max:** "Gewichtsbestimmungen während einer Stillperiode nebst Bemerkungen über Nährmittel für Stillende" [Weights during nursing, with remarks on foods for nursing mothers]. *Jahrb. f. Kinderh.* [Berlin], vol. 72 (1910), pp. 309–327.

The author describes the development of an infant that was weighed by his mother before and after every nursing from his twelfth day till he was 6 months old. The child was 49 centimeters long at birth and weighed 3,200 grams. This article gives in tables and curves the amounts of milk consumed each day and the increases in weight, and compares the progress of the infant with that of others. The child nursed for only 7 to 10 minutes at a time. He increased most in weight in the second half of the first year, especially in the seventh and eighth months, when he was weighed three or four times monthly. He was weaned when 11 months old.

724 **Weissenberg, S.:** "Das Körpergewicht nach Alter und Geschlecht" [Weight of the body according to age and sex]. *Zeitschrift für Konstitutionslehre* [Munich and Berlin], vol 10 (1924–25), pp. 738–741.

The author attributes great importance to weight in estimating the constitution of the human body. For this reason he weighed 4,400 persons, males and females in nearly equal numbers, ranging in age from infancy to 80 years; over 3,000 of these persons were under 20 years of age. In a table he gives for each sex at each year of age, the minimum weight, the maximum, difference between these, the average annual increase, and the weight in grams for each centimeter of height. In the discussion accompanying the table he takes up the differences in weight between the sexes at various ages.

725 ——— "Das Wachstum des Kopfes und des Gesichtes" [Growth of head and face]. *Jahrb. f. Kinderh.* [Berlin], vol. 68 (1908), pp. 304–317.

The author measured 25 infants, 25 boys 5 years old, 25 boys and 25 girls 10 years old, 25 boys 15 years old, 100 men and 50 women, all of the Hebrew race, as to height, length, breadth, and circumference of head; length and width of face and of nose. Results are shown in tables and curves. The skull proper grows least; the nose grows quickly; the jaw is the last part of the head to develop.

726 ——— "Das Wachstum des Menschen nach Alter, Geschlecht und Rasse" [Growth of man according to age, sex, and race]. *Globus* [Brunswick], vols. 93–94 (1908), pp. 101–109.

The author gives a table of the height of 2,590 Hebrew men and 1,884 women between birth and 75 years of age; also a curve for the same material. To compare with these figures he presents a table of men's and women's heights as estimated by Erismann, Roberts, Quetelet, Zeising, and Schadow, and curves according to Erismann, Roberts, and Quetelet. Another graph shows the influence of comfort and of occupation upon height and weight. The author justifies his choice of material by the facts that Jews are homogeneous in race and living conditions and that they have the same average height as other Europeans. He points out that general laws of growth persist through differences of race. A growth curve is irregular; males are larger than females; from about 10 to 15 years of age girls are larger than boys. Growth may be divided into these periods: First 2 years of very rapid growth after which a child has one-half of his ultimate height; 2 years to 6 years much slower growth; 6 years to 10 or 12, slow growth, after which the child has three-fourths of his final height; 10 or 12 to 17 or 18, rapid growth; 17 or 18 to 25, slow growth; after 25, no growth. The full differentiation according to race, sex, and individual appears after accelerated growth at puberty.

727 ——— Das Wachstum des Menschen, nach Alter, Geschlecht, und Rasse [The Growth of Man as Affected by Age, Sex, and Race]. Strecker & Schröder, Stuttgart, 1911. 230 pp.

The author points out the irregularity of growth in seven periods, different rates of different parts of the body resulting in varying proportions of the child and adult, the important differentiating factors of age, sex, race, climate, occupation, rank, etc. Sixty tables, 22 curves, 2 plates, and 3 pages of bibliography are included.

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height and weight showed that the gain in height was distributed evenly through the year, but 96 per cent of a year's gain in weight occurred in the winter.

736 **Wilcke, K.:** "Das Geburtsgewicht der Kinder bei engem Becken" [Birth weight of children whose mothers have narrow pelves]. *Beiträge zur Geburtshilfe und Gynäkologie* [Leipzig], vol. 4 (1901), pp. 291–302.

After discussing the work of other investigators on the relation between narrow pelvis of the mother and weight of the child the author gives data on 1,858 normal births between 1894 and 1900 in the obstetrical division of the women's clinic in the University of Halle. In 358 cases (19.26 per cent) the pelvis was narrow. After classifying material as shown in several tables the author concludes that a smaller average birth weight accompanies a narrow than a normal pelvis. A narrow pelvis does not cause a longer pregnancy. First-born children of mothers with narrow pelves weigh less than those born later.

737 **Williams, J. W.:** Obstetrics. D. Appleton & Co., New York, 1923. 1076 pp.

The development of the child from the first few weeks of pregnancy until birth is described. Besides data from other workers the author gives results of observations made under his direction of over 15,000 infants. The weight, length, and physical characteristics are given for healthy infants at birth. Weights and lengths at birth of colored and white children are compared.

738 **Wimmenauer:** "Über die Bestimmung des Ernährungszustandes bei Schulkindern" [Determination of nutrition in school children]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 25 (1912), pp. 601–619.

The author describes examination of the state of nutrition of Mannheim school children by the inspection method, with illumination falling directly on ribs. The nutrition is good if no depression appears between ribs, and so on. Of 1,175 boys 6 to 7 years old 18.6 per cent showed undernutrition and of 767 girls of the same ages 13.8 per cent. Tables give average height and weight of 538 boys and 613 girls between 6 and 13 years with comparative figures for Munich and from Vierordt's material. A table contrasts findings in height and weight with those of inspection method. Really "hungry" children are two years behind normal in weight, but they are not so numerous as certain publications in 1911 would indicate.

739 **Winckel:** "Untersuchungen über die Gewichtsverhältnisse bei hundert Neugeborenen in den ersten zehn Tagen nach der Geburt" [Investigations on the weight of 100 newborn infants in the first 10 days after birth]. *Monatsschrift für Geburtskunde und Frauenkrankheiten* [Berlin], vol. 19 (1862), pp. 416–442.

Weight of 100 normal newborn infants (56 boys and 44 girls) at a maternity hospital in Berlin taken once a day during the first 10 days of life. The author discusses the course of their weight for each of the 10 days, giving the amount of decrease or increase, the number of cases, and the average change in weight. He attributes the physiological loss to (1) evacuation of urine and meconium, (2) accelerated activity of the skin, (3) pressure of clothes and exertion caused by crying and suckling, and (4) change from intrauterine to extrauterine method of nutrition.

740 **Wissler, C.:** "The growth of boys; correlations for the annual increments." *American Anthropologist* [Washington], new ser. vol 5 (1903), pp. 81–88.

A study to assist in determining the probable annual increment of growth in the individual for each degree of adult stature. Data were gymnasium records of about 300 boys, aged 11 to 18, in a private school. Stature was recorded in centimeters to nearest unit, weights in kilograms to tenths, ages to nearest birthday (methods of weighing and measuring not given). Correlations were calculated by the Pearson formula and tabulated as to the annual increments for stature, weight, and arm reach, compiled from groupings of 126 to 199 cases; the annual increments of stature and the annual increments of weight from complete records of 70 boys, aged 12 to 17. A table also shows average increment and variabilities in seven groups of 33 to 198 cases. The author suggests certain inferences but considers the data insufficient for definite conclusions.

741 **Woinarski, S. E. A. Z.:** "Some statistics of the length and weight of children born in the Lying-in Hospital, Melbourne, during the first four months of 1879." *Australian Medical Journal* [Melbourne], new ser. vol. 1 (1879), pp. 415–420.

A purely statistical study giving for each month the number of cases, births, sex, civil state of mother, number of the pregnancy, and number of births. The maximum, minimum, and average length and weight are given for the total number of cases and for each sex.

742 **Wood, Edith E.:** "Notes on oriental babies." *American Anthropologist* [Lancaster], new ser. vol. 5 (1903), pp. 659–666.

Measurements are given for 61 Chinese children from 1 day to 7 years of age, and of 22 Japanese from 6 days to 6 years, as to weight, height, spine,

chest, skull, arm, foot, and number of teeth, with notations as to health. Measurements were made by physicians (methods not stated). Results are tabulated and compared in a general way with statistics for other nationalities.

Woodbury, Robert M.: Statures and Weights of Children under Six Years of Age. *See* Children's Bureau.

743 **Woolley, Helen Thompson, and Charlotte Rust Fischer:** "Mental and physical measurements of working children." The Psychological Monographs, Psychological Review Publications, vol. 18, no. 1 (whole no. 77). Princeton, N. J., 1914. 247 pp.

The report of a small portion of a larger investigation, undertaken to furnish a scientific demonstration of the effect of early child labor. More than 800 working children were tested in the 14-year-old series, data on 753 of whom appear in the summary. Of these, 679 were retested at 15 years. Height standing was taken with shoes, height of heel being later subtracted. Weights were taken with clothing, the scale recording weights to twentieths of a kilogram. Summarizing tables show height in centimeters and inches, percentiles and limits; weight in kilograms and pounds, percentiles and limits. Graphs show correlation of height and weight with school grade. Further investigations were made of visual acuity, auditory acuity, vital capacity, strength and steadiness of hand, and rapidity of movement. The authors found a positive correlation between physical tests as a whole and school grade.

744 **Woronichin, N.:** "Fortlaufende Wägungen während der Dentition" [Regular weighing during dentition]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 16 (1880–81), pp. 133–143.

A collection of measurements, including weight of a male infant during dentition. Details are given of the contrivance used for making head measurements.

745 **Wurtz, Adolf:** "Ein Beitrag zur Ernährungsphysiologie des Säuglings" [A contribution to the physiology of infant nutrition]. *Jahrb. f. Kinderh.* [Berlin], vol. 58 (1903), pp. 528–571.

A detailed account of the development of the author's son, who weighed 3,950 grams at birth, giving changes in weight, amount, kind, and caloric value of food consumed, times of feeding, etc., for about the first five months.

746 **Yeats, John:** "On human growth in towns." *Transactions of the National Association for the Promotion of Social Science* [London], 1864, pp. 536–547.

A historically interesting article, one of the early investigations of the relation between physical and mental development. The author had height, weight, and chest girth of 500 boys measured, and tabulated the results.

747 **Yerington, Henry Herbert:** "Clinical supervision of the well baby during the first year." *J. A. M. A.* [Chicago], vol. 71 (1918), pp. 1043–1045.

A brief report of methods and work in a well-baby clinic in San Francisco. It includes also a record of 2,966 weighings at the clinic of 521 infants, from which the author found the initial loss in weight greater than that given in Holt's tables. At the end of the first year, however, he found the San Francisco infants heavier than infants from any locality previously recorded.

748 **Ylppo, Arvö:** "Das Wachstum der Frügeborenen von der Geburt bis zum Schulalter. Untersuchungen über Massen-, Längen-, Thorax- und Schädelwachstum bei 700 Frühgeborenen" [Growth of premature infants from birth to school age. Investigations on growth in length, thorax, and skull in 700 premature infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 24–25 (1919–20), pp. 111–178.

The measurements covered several months in 50 per cent of the cases and up to 9 years in one case. Premature children showed retardation of growth in all respects, especially in the second half of the first year. The growth is made up from about the third to the fifth or sixth year. Twenty-nine figures and a bibliography of 64 titles are included.

749 ——— "Zur Physiologie, Klinik, und zum Schicksal der Frühgeborenen" [Physiology, clinical condition, and fate of premature infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 24–25 (1919–20), pp. 1–110.

This article contains 23 photographs and graphs, 12 tables, and a bibliography of 143 titles. It estimates that in Germany the percentage of premature infants amounts to 10 and points out that often they are mentally as well as physically subnormal. The author bases his studies upon others' investigations and upon 668 cases at the Empress Augusta Victoria House. Infants weighing less than 2,500 grams were considered premature. Of the 668 cases 128 were twins. Thirty-four weighing less than 1,000 grams showed a very high mortality. Of the whole number 40 to 45 per cent reached school age. Sections are devoted to the nutrition, metabolism, and care of premature infants.

750 **Young, Josephine E.:** "Supernormal environment in its relation to the growing child." *Transactions of the Fourth International Congress on School Hygiene* [Buffalo], vol. 2 (1913), pp. 17–30.

Data for this report were secured from the children attending the school of education connected with the University of Chicago—404 girls and 201 boys, all of the favored classes. Records were made of height, weight, lung capacity, blood pressure, hemoglobin content of blood, condition of adenoids and tonsils, and rank in scholarship. Details of method are not given. Results are tabulated and compared with existing reports on children of the poorer classes. The hemoglobin studies are compared with a control series of 100 from the Jewish Home for the Friendless. The author found that the children of the rich were taller and heavier and had greater lung capacity than public-school children, but they had lower hemoglobin content and blood pressure. The prepubertal increase in development of girls over boys does not appear in her records, the prepubertal boys showing relatively and absolutely greater growth than boys of the public school but a greater loss of vigor and development than girls of the same group.

751 **Zacharias, Otto:** "Über Periodicität in der Gewichtszunahme bei Kindern" [Periodicity in gain of weight by children]. *Monatliche Mittheilungen aus dem Gesammtgebiete der Naturwissenschaften* [Berlin], vol. 6 (1888–89), pp. 35–37, 57–60.

The author discusses the content and purpose of Pastor Malling-Hansen's Tabellen über den Wachsthumsrythmus der Kinder, based on daily measurements for four years of 58 girls and more particularly of 72 boys in his school at Copenhagen. Throughout the year Malling-Hansen discovered decided fluctuations. Height increased from April to August, weight from August to December. He concludes that variable weather is not conducive to health; small stature marks races subject to great changes of temperature.

752 **Zahorsky, J.:** "The weight of infants as a diagnostic and prognostic means." *St. Louis Courier of Medicine*, vol. 28 (1903), pp. 7–12.

The author considers the weight as sensitive and as important a diagnostic and prognostic index in pediatrics as is the temperature. Case histories are cited.

753 **Zeiner-Henriksen, K.:** "Skolebarns vekst. I. Undersøkelse av 1,333 skolebarn ved Hortens folkeskole" [Growth of school children. I. investigations of 1,333 school children of Hortens (Norway) public school]. *Norsk Magazin for Laegevidenskaben* [Christiania], ser. 5, vol. 16 (1918), pp. 52–60.

In two graphs and three tables the author sets forth his own observations and those of other investigators. He finds the ages of 8, 12, and 13 years to be the time of greatest variation in growth for girls. During puberty there is the greatest variation in individual growth. From 9 to 10 and 12 to 13 are periods of maximum growth for girls. The maximum growth for boys is from 8 to 9 and the minimum from 12 to 13 with a rise to 14.

754 ——— "Skolebarns vekst. II. Vekstøkning i sommerhalvaaret. Maaling av 1,008 skolebarn (521 gutter—487 piker) ved Hortens folkeskole" [Growth of school children. II. Growth increase in summer. Measurements of 1,008 school children (521 boys—487 girls) of Hortens (Norway) public school]. *Norsk Magazin for Laegevidenskaben* [Christiania], ser. 5, vol. 18 (1920), pp. 262–271.

Observations are set forth in three tables and a graph. The curve for girls rises from 11 to 13; rate of growth for boys decreases from 9 to 11, and rises from then to 14. The maximum rate of growth for both sexes is in May and June and the minimum in October.

755 **Zeising, A.:** Über die Metamorphosen in den Verhältnissen der menschlichen Gestalt von der Geburt bis zur Vollendung des Längenwachstums [Changes in the Proportions of the Human Form from Birth to Completion of Growth in Height]. Bonn, 1859. 99 pp.

The author gives the number of centimeters added to stature by each year of growth both according to measurement and according to calculation, and also gives widths of head, thorax, etc., in terms of body height. He points out that different parts of the body grow at different rates. Successive growth follows a certain law, which applies to the whole sphere of natural science. In the first period of growth, 8 years, there is an increase of 28 inches; in the second period, 13 years, there is an increase of 20 inches.

756 **Zeltner, E.:** "Die Beziehungen zwischen Brustwachstum, Schädelwachstum und Körpergewichtszunahme bei Säuglingen" [The relation between the growth of the chest and skull and the increase in body weight of infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 74 (1911), pp. 421–428.

The purpose of the study was to determine the relation between the development of the chest and skull and the increase in weight of little children. The author measured 695 infants in a municipal consultation center in Nuremberg and presents his data in three charts. He concludes that (1) there is a relation between the development of chest and skull on the one hand and increase in weight on the other; (2) increase in chest circumference produces

increase in weight; (3) the same is true of the skull, but the relation here is much less pronounced; (4) in cases of thriving infants the increase in the chest circumference soon becomes greater than the increase in weight or in size of skull; in cases of retarded development the latter takes the lead.

757 Zenetz, M. N.: "O sootnoshenii mezhdu pulsom, dikhaniem i rostom u chelovieka" [Relation between pulse, breathing, and size of man]. *Vrach* [St. Petersburg], vol. 13 (1892), pp. 649–651.

The article, according to the author's statement, is a brief excerpt from a work by Landois, entitled "Die Lehre vom Arterienpuls" and published in 1872. The data refer to 45 adults and 38 children 2 to 15 years old, for each of whom the height, chest circumference, and pulse were obtained. This material is arranged in a table according to the height of the individuals. The author concludes that frequency of the pulse is in inverse ratio to the height of the individual.

758 Zhbankoff, D. N.: "O vljanii narodnoi shkoli na fizicheskoye razvitye uchashchikhsya" [Effect of the public school on the physical development of the pupils]. *Vestnik obshtshestvennoy higieni, sudebnoy i prakticheskoy meditzini* [St. Petersburg], vol. 1, pt. 2 (1899), pp. 147–194.

The author measured 1,051 boys 7 to 14 years old in rural public schools. About one-third of them were measured two or three times at intervals of one year. In several tables the author gives the average height, chest circumference, and relation between these two measurements for each year of the boys' age and for each year of school attendance, and the annual gain in height and chest circumference. He also quotes similar data obtained by other writers. In conclusion, the author, contrary to the writers whom he quotes, states that the assertion that the rural schools have a bad effect on the children's health has no basis in fact because of the shorter school year and lighter program in the rural schools.

759 Zhukoovski, I. T.: O stepeni pitania v S. Peterbursgkom Vospitatelnom Domie dietiei otpravliennikh v okruga v 1890 godu [On the Degree of Nutrition of Infants Admitted to the Infant Asylum of St. Petersburg and Placed Out in Villages in 1890]. St. Petersburg, 1892. 36 pp.

The author conceived the idea that the nutrition of the infant is indicated by the daily gain in his weight, in percentages of his original weight. For this purpose he weighed 7,530 infants who were cared for at the St. Petersburg infant asylum during 1890, prior to being sent to the villages. They were weighed daily during their stay in the asylum, which lasted on the average 26 days. The author found that the average daily gain for infants fed by the mother was seven-tenths of 1 per cent of the infant's weight at the time he was brought to the asylum, and for those fed by a paid nurse six-tenths of 1 per cent. Several tables and charts are given.

760 Zhukovski, I.: "O vzvieshivanii grudnikh dietiei, kak mierylie ikh vozrastania." [On weighing of infants fed at the breast as a means of judging their growth]. *Sbornik sochinienii po sudebnoi meditzine* [St. Petersburg], vol. 2, pt. 1 (1880), pp. 71–98.

A study of weight changes of 6,686 infants under 1 year of age at a municipal asylum in St. Petersburg. The author observed the children during an average period of five weeks in an attempt to ascertain the relation of weight to state of nutrition.

SECTION II. GROWTH AND DEVELOPMENT OF SPECIAL PARTS OF THE BODY

A. SKELETAL SYSTEM AND TEETH

1. SKELETON

1 **Aeby, Chr.:** "Die Altersverschiedenheiten der menschlichen Wirbelsäule" [Variations in human spinal column at different ages]. *Archiv für Anatomie und Entwickelungsgeschichte* [Leipzig], 1879, pp. 77–138.

The author describes his dissection and examination of the spinal column of 8 newborn infants and 13 adults of both sexes as well as of a few embryos, fetuses, and children. He concludes that the vertebral columns of children and adults have very different proportions. The child's lumbar column is relatively shorter and the cervical column longer than that of the adult. The adult column is relatively more slender than the juvenile. The article contains 1 plate, 9 charts, 12 long tables, and many shorter tables.

2 **Alexander, Béla:** "Die Entwicklung des knöchernen Handskeletts vom Beginne der ersten Knochenpunkte" [The development of the skeleton of the hand from the beginning of the first centers of ossification]. *Wiener Klinisch-Therapeutische Wochenschrift*, vol. 12 (1905), pp. 671–676, 702–705.

Without describing the material on which he bases his findings, except that studies were made with X rays, the author discusses each detail of the skeleton of the hand from the beginning of ossification. In four children of one family the order was os magnum, unciform, cuneiform, semilunar, scaphoid, trapezoid, and trapezium; whereas in four children of another family the order of ossification was os magnum, unciform, cuneiform, trapezoid, semilunar, scaphoid, and trapezium.

3 **Arsimoles, L., and Du Courneau de Carritz:** "Étude du thorax et de la section thoracique dans la deuxième enfance" [Study of the thorax and of the thoracic cross section from 6 to 16 years of age]. *Annales de médecine et chirurgie infantiles* [Paris], vol. 10 (1906), pp. 181–192.

The authors advocate ascertaining the anteroposterior and maximum transverse diameters and the cross section of the thorax of children by Maurel's technique with the aid of stethograph, compasses, or stethometer, and paper ruled in square centimeters. The child examined is nude, either seated or upright, and the methods of measuring are explained in detail. The thoracic perimeter increases with age but not in proportion to it. It grows rapidly between the ages of 14 and 16. The right half is usually larger than the left. The transverse diameter increases more than the anteroposterior. At every age there is a corresponding, constant, average value for the thoracic index $\frac{(\text{transverse diameter} \times 100)}{(\text{anteroposterior diameter})}$. This average index for the 6 to 16 year period is 148. The normal thoracic cross section should be over 200 square centimeters between 6 and 8, over 240 square centimeters between 8 and 10, over 250 between 10 and 12, over 280 between 12 and 14, and at least 350 between 14 and 16.

4 **Bade:** "Die Entwickelung der menschlichen Fussknochen nach Röntgogrammen" [Development of the bones in the human foot as shown by Röntgen rays]. *Deutsche Med. Wchnschr.* [Leipzig and Berlin], vol. 26 (1900), pp. 90–91.

The lecturer presents and explains X-ray pictures on the development of the human foot. The human infant at birth has the astragalus, calcaneum, metatarsals, and phalanges, and in a few days the external cuneiform. Later come the epiphyses of tibia and fibula, the internal and middle cuneiform, and last of the ankle bones, the scaphoid. The sesamoid appears on the great toe at 14 years, and tuberosity continues to the eighteenth year. Illness affects the development of the tarsal bones. Development is earlier in girls than in boys.

5 **Bade, Peter:** "Die Ossifikation des menschlichen Fuss-Skeletts nach Röntgogrammen" [The ossification of the skeleton of the human foot as shown by Röntgen rays]. *Fortschritte auf dem Gebiete der Röntgenstrahlen* [Hamburg], vol. 3 (1899–1900), pp. 134–140.

This concise article with its 40 Röntgenograms on three plates treats the ossification of the human foot from the eighth week of fetal to the eighteenth year of extrauterine life. After a survey of former observations with X rays the author discusses the fetal period and then states that at birth the foot does not yet show the scaphoid, three cuneiform, distal epiphyses of tibia and fibula, epiphyses of metatarsal bones, and single phalanges in ossified condition. The ossification of the foot is then traced through childhood.

6 Ballantyne, J. W.: "The head of the infant at birth." *Edinburgh Medical Journal*, vol. 36, pt. 1 (1890), pp. 97–111; 429–440.

After stating the definitions of the various diameters of the head, laid down at the International Medical Congress in Washington, 1887, the author discusses the size of the normal head before, immediately after, and several days subsequent to birth, and gives his observations on measurements made by himself and by other investigators. Diagrams are included.

7 ——— "The spinal column in the infant." *Transactions of the Medico-Chirurgical Society of Edinburgh* [Edinburgh], new ser. vol. 11 (1892), pp. 71–80.

By the use of frozen sections the author studied a 6½, a 7½, and an 8½ months' fetus and two full-term infants, extending this study by examination of four skeletonized fetuses and infants, and dissection of several fresh specimens. Tables show for eight cases the total height, length of spine, and length of cervical, dorsal, lumbar, and sacrococcygeal portions of spine; one plate shows representations of the spine from five frozen sections.

8 Bean, Robert Bennett: "The growth of the head and face in American (white), German-American, and Filipino children." *Anatomical Record* [Philadelphia], vol. 9 (1915), pp. 50–52.

The author presents concisely his findings on the head diameters and the cephalofacial index of 146 Filipino girls and 579 boys, 309 German girls and 324 boys, 412 American girls and 415 boys. The cephalofacial index has been originated by the author. He calls the Filipinos hypo-phylo-morphs, the Germans meso-phylo-morphs, and the Americans hyper-phylo-morphs.

9 Beddoe, John: "The somatology of eight hundred boys in training for the royal navy." *Journal of the Anthropological Institute* [London], vol. 34 (1904), pp. 92–99.

The author secured head measurements of about 200 boys in training for the British Navy, with general observations of the groups of 800 to which they belonged. With these he compared measurements secured at reformatories and industrial schools, finding that the Navy boys were superior in head measurements. Methods are not given in detail.

10 Behrendsen: "Studien über die Ossifikation der menschlichen Hand vermittels des röntgenschen Erfahrens" [Studies on the ossification of the human hand by means of the Röntgen process]. *Deutsche Med. Wchnschr.* [Leipzig and Berlin], vol. 23 (1897), pp. 433–435.

In this article eight figures give radiograms of children's left hands from birth to 12 years. The author describes the ossification as it advances each year, and in conclusion gives the order in which the bones, epiphyses, etc., develop, with physiological variations.

11 Berkenbusch, Hans: Die innern Proportionen des menschlichen Halses in den verschiedenen Lebensaltern und die Fascienverhältnisse dieses Körperteiles [Interior Proportions of the Human Neck at Various Ages and Fasciae of This Part of the Body]. Gottingen, 1890. 43 pp.

A dissertation (University of Gottingen). Two tables give proportion of median diameter of third cervical vertebra (lower edge) to that of occipital foramen, median diameter of vertebra to that of spinal canal from fourth cervical vertebra, median diameter of spinal canal to third cervical vertebra to that of occipital foramen, length of cervical vertebral column to median diameter of occipital foramen, length of cervical vertebral column to height of skull; and hyoid bone, upper edge of epiglottis, upper edge of thyroid cartilage, lower edge of crocoid cartilage, upper edge of cricoid lamina, lower edge of cricoid lamina, breastbone, for two newborn infants, a 1-year-old girl, a 6-year-old boy, and a 13-year-old girl, as compared with three adults. Text is divided into two sections entitled "Interior Proportions of the Human Neck at Various Ages" and "Fasciae in the Neck." Bibliography.

12 Binet, Alfred: "La croissance du crâne et de la face chez les enfants normaux entre 4 ans et 18 ans" [The growth of the skull and of the face in normal children from 4 to 18 years of age]. *l'Année psychologique* [Paris], vol. 8 (1901), pp. 345–362.

A report of an investigation made by the author among Parisian school children, 20 of whom at each 2-year age period from 4 to 18 years, were measured in May and June, 1901. Subjects from 14 to 18 years of age were remeasured in October and November, 1901. Fifteen measurements (heights, diameters, etc.) of the head are recorded, and total body stature. The author found that the size of skull increased 12 per cent; that the face increased 24 per cent; that the ophryosubnasal distance had an increment equal to 39 per cent; that during puberty there was an acceleration in rate of growth of both skull and face.

13 Blandet, L.: "De la croissance. Article 1er—Système osseux" [Growth. First article—Bony system]. *Journal de médecine* [Paris], vol. 4 (1846), pp. 349–351.

Author discusses osteogenetic disorders in first and second dentitions and in ossification of the skull. He found in a 2-year-old boy who had died of convulsions, a close union of skull bones, occlusion of fontanels, circular depression, crowded brain, and over 30 grams of fluid.

14 **Bloch, A. M.:** "Étude de la croissance des ongles." [Study of the growth of the nails]. *Comptes rendus hebdomadaires de la Société de biologie* [Paris], vol. 65 (1908), pp. 335–336.

Studying the growth of the nails by moulds of the fingers and toes, the author found, as in previous studies, that from birth to the age of 5 years the nails of the hand grow 0.06 to 0.08 millimeter a day and from 5 to 30 years, 0.10 to 0.14 millimeter a day; that the nail of the great toe, from 7 to 30 years, grows from 0.04 to 0.07 millimeter a day; that the seasons have no influence on the growth of the nails.

15 **Boas, F.:** "Heredity in head form." *American Anthropologist* [Lancaster, Pa.], 1903, new ser. vol. 5 (1903), pp. 530–538.

A mathematical study based upon head measurements of 48 families of East European Jews, secured for the author by Dr. Maurice Fishberg. A table shows the distribution of cephalic indexes of the 256 individuals, men, women, and children, the indexes ranging from 73 to 91. Results of the study are inconclusive.

16 **Böhm:** "Über die forensische Bedeutung des Knochenkerns in der untern Epiphyse des Oberschenkels der Neugeborenen" [Forensic significance of center of ossification in lower epiphysis of the thigh of newborn infants]. *Vierteljahrsschrift für Gerichtliche und Öffentliche Medicin* [Berlin], vol. 14 (1858), pp. 28–45.

The author first lists his own findings on 40 bodies and then compiles a table on 186 infants examined by Ollivier, Mildner, Casper, and himself and shows the importance from a forensic standpoint of the center of ossification studied.

17 **Bonnifay, Jean:** Du développement de la tête au point de vue de la céphalometrie depuis la naissance jusqu'à l'âge adulte [The Development of the Head from the Point of View of Cephalometry from Birth to Adult Life]. Lyon, no. 138, 1897. 80 pp.

Thesis for the degree of doctor of medicine (University of Lyon). Following a résumé of previous investigations and discussions of the exterior morphology and evolution of the skull and of the principles of craniometry, and cephalometry, the author reports the results of his own measurements of 1,093 normal subjects. He tabulates, in 19 age groups from birth to 24 years, the number of cases at each age, the stature, the horizontal circumference, transverse and anteroposterior demicircumference, transverse and anteroposterior diameter, and cephalic index. On this material he bases a discussion of the general evolution of the head, of individual variations in the dimensions of the head, and of their relation to stature.

18 **Breslau:** "Neue Ergebnisse aus Schädelmessungen an Neugeborenen" [New data on measurements of the skull of newborn infants]. *Wiener Medizinische Wochenschrift*, vol. 12 (1862), pp. 785–787.

To decide whether the skulls of newborn boys are larger than those of newborn girls the author weighed and measured 576 infants (300 boys and 276 girls) at a maternity hospital in Zurich. The skulls of the boys were found to be larger than those of the girls in full-term and premature children even when body weight was the same. Data appear in a table.

19 **Brubacher, Heinrich:** "Über den Gehalt an anorganischen Stoffen, besonders an Kalk, in den Knochen und Organen normaler und rachitischer Kinder" [Content in inorganic matter, especially calcium, of the bones and organs of normal and rachitic children]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 27 (1890), pp. 517–549.

The author examined chemically the bodies of three normal children, one newborn, one 28 weeks old, and the third 4 years old. Ample tables give content in water, fat, ash, calcium oxid, magnesium oxid, and phosphoric acid. The skeleton becomes poorer in water and richer in ash, etc., with growing age. Muscles, skin, and intestines lose water content with growth. In the growing organism the requirement for inorganic matter is much greater than in the adult; is especially great in the fetus and the young child. The infant needs 0.32 gram of calcium daily for the bones alone. It seems that the young organism possesses some storing place other than the blood for its calcium and iron.

20 **Budin:** "Considérations sur la forme du crâne au moment de la naissance et pendant la première semaine qui suit l'accouchement" [On the form of the skull at the moment of birth and during the first week following delivery]. *Bulletins de la Société d'anthropologie de Paris*, ser. 2, vol. II (1876), pp. 553–557.

A descriptive article, based on the author's own study of anteroposterior and transverse diameters of an indefinite number of heads of infants born at a lying-in hospital. Comparisons of the difference in head form between vertex and face presentation are made.

21 **Channing, Walter, and Clark Wissler:** "Comparative measurements of the hard palate in normal and feeble-minded individuals. A preliminary report." *American Journal of Insanity* [Baltimore], vol. 61 (1904–5), pp. 687–697.

To verify or disprove the assumption that certain types of deformity of the hard palate are correlates of feeble-mindedness, the authors collected about 1,600 casts of the hard palate from public-school children and adults, and from inmates of schools for the feeble-minded. The measurements reported upon in this article are (1) the minimum distance between the first molars, measured horizontally from the bases of the molars; (2) the maximum height of the palate above the plane of the gum line; (3) the distance from the line connecting the two first molars to the alveolar point; (4) the distance between the canines measured horizontally from their bases. They found no difference in size of palate between feeble-minded and normal individuals and small difference in variability of dimensions. According to their results, the width of palate remains approximately unchanged from the ninth or tenth year, and there is little growth after the sixth year. Tables are given.

22 **Cheatle, Arthur H.:** "A few notes on 250 temporal bones of all ages sectioned vertically through the antrum and mastoid process." *Journal of Laryngology, Rhinology, and Otology* [London], vol. 20 (1905), pp. 150–151.

This concise article gives facts on the outer antral wall, suprameatal triangle, suprameatal spine, petrosquamosal sinus, forward lateral sinus, and types of mastoid process, usually with special reference to their condition in childhood.

23 **Clarke, J. Jackson:** "Some observations on the temporal bone, chiefly in childhood." *Journal of Anatomy and Physiology* [London], vol. 27 (1892–93), pp. 411–414.

The author shows a table on the temporal bones of children from 3 weeks to 20 years old, 19 of the 24 being younger than 7 years. The thickness of the outer wall of the antrum or of accessory air cells, the thickness of bone between antrum and lateral sinus, vertical distance of posterior and superior point of tympanic bone from best spot for opening antrum, and other features are noted. The author advocates taking the posterior extremity of the tympanic bone as the lower limit of the posterior border of the meatus and the suprameatal spine as the upper limit.

24 **Coffin, L. A.:** "The development of the accessory sinuses of the nose." *American Journal of the Medical Sciences* [Philadelphia and New York], vol. 129 (1905), pp. 297–312.

The author summarizes the statements of many observers as to the time of the appearance of the various sinuses, and from these and his own observations of 12 to 15 skulls of infants and stillborn makes the following deductions: (1) But two of the accessory sinuses are present at birth—the ethmoidal cells and the maxillary antrum; (2) the ethmoids and the antrum are constant sinuses; (3) the antrum in infancy occupies a position which makes impossible the usual methods of drainage and cuts off the antral route to the ethmoid and sphenoidal sinus; (4) the sphenoidal sinus makes its appearance shortly after birth; (5) the frontal sinus appears between the end of the first and the beginning of the third year. The article is illustrated with 19 photographic plates.

25 **Corson, Eugene R.:** "A skiagraphic study of the normal membral epiphyses at the thirteenth year." *Annals of Surgery* [Philadelphia], vol. 32 (1900), pp. 621–647.

Twelve reproductions of skiagraphs of the epiphyses of a mulatto boy 13 years of age, with description, discussion, and references, largely to the work of John Poland on "Traumatic Separation of the Epiphyses."

26 **Dane, J.:** "Further studies upon the arch of the foot in infancy and childhood." *Transactions of American Orthopedic Association* [Philadelphia], vol. 11 (1898), pp. 54–69.

By means of frozen sections and careful measurements (not tracings) of the feet of 38 children under 1 year of age and 10 children 1 to 2 years of age, the author found that—contrary to the prevailing opinion that the feet of newborn and very young children are flat—the feet of these children were not really flat but appeared so because of the pad of fat under the arch. Tables summarize measurements of the length and height of the arch in each foot, for the 48 children, up to 2 years of age. The average height of the arch for infants of 1 year and under was 1.651 centimeters, and for children 1 to 2 years it was 1.510 centimeters. Also 0.301 and 0.218 represent the averages for the ratio of the height to the length of the arch for children of these ages.

27 ——— "Report of some studies upon the arch of the foot in infancy." *Journal of the Boston Society of Medical Sciences* [Boston], vol. 3 (1898–99), pp. 209–213.

Measurement of 76 feet of children under 2 years of age (method described) showed the height of the arch for infants 1 year and under to be 1.651 centimeters; between 1 and 2 years, 1.510 centimeters. Photographs from frozen sections show the bones of the feet arranged to make a good arch.

28 **Davis, Warren B.:** "The development of the bones of the face." *International Journal of Orthodontia* [St. Louis], vol. 3 (1917), pp. 567–591.

A summary of opinions as to development to the sixtieth day of embryonic life, followed by statements based chiefly on the author's own study of sections and dissections of a series of 145 specimens covering development from the 60-day fetus to adult life. Twenty-nine figures are given. Bibliography.

29 **Ducournau de Carritz, Gaston:** Étude du thorax et de la section thoracique chez l'enfant de 6 à 16 ans [Study of the Thorax and Thoracic Section in the child from 6 to 16 Years Old]. Toulouse, no. 618, 1905. 130 pp.

Thesis (Toulouse University). After a sketch of previous work on the thorax, the author describes the technique of measurement employed by Professor Maurel, showing cuts of his stethometer and stethographer, and describes in detail his own investigation of the thorax with Maurel's methods upon 63 boys between 6 and 16 years old in a private and a public school. Thirteen lads were ruled out as abnormal. The remaining 50 were put into five classes according to ages: 6 to 8, 8 to 10, 10 to 12, 12 to 14, and 14 to 16. Besides many data on the thorax, including the anteroposterior and transverse diameters, thoracic perimeter, respiratory type, pulmonary capacity, length of thorax and sternum, etc., the author determined the height, weight, and cutaneous surface. The figures are tabulated and frequently are compared with those obtained by Quetelet of Belgium and Dick of Russia. Many conclusions are drawn by the author. Briefly, he believes that in the period between 6 and 16 there is a constant proportion between the thorax on the one hand and the height, weight, and body surface, on the other.

30 **Dwight, Thos., and T. M. Rotch:** "The spine in infancy." *Arch. Pediat.* [Philadelphia], vol. 8 (1891), pp. 161–172.

A record of observations of the morphology and flexibility of the infant's spine compared with that of the adult. Tables showing the absolute proportional length of the divisions of the spine are quoted from Reby, Symington, and Cunningham. Three specimens were prepared and studied by the authors.

31 ——— ——— "The thorax in infancy." *Arch. Pediat.* [Philadelphia], vol. 8 (1891), pp. 321–332.

The author discusses the contour of the infant's thorax and the relation of the viscera. Exact data and references are not given.

32 **Engel, S., and Ella Runge:** "Normaltafeln des Kindesalters" [Indexes of normal conditions in childhood]. *Ztschr. f. Kinderh.* [Berlin], vol 33 (1922), pp. 61–64.

Authors present 10 pictures of normal hands and wrists of children up to 12 years of age and an elaborate graph showing variation in development of the bones of the hand.

33 **Fagerlund, L. W.:** "Om benkärnans utveckling i extremiteternas ben under första lefnadsåret" [Development of centers of ossification in bones of extremities during the first year of life]. *Finska Läkaresällskapets Handlingar* [Helsingfors], vol. 32 (1890), pp. 37–51.

The sizes of various centers of ossification in the newborn were studied in 40 infants. The author gives the results of his observations in six pages of tables. Work of other investigators is discussed.

34 **Fankhauser, Max:** Die Schädelform nach Hinterhauptslage, Studien über den Einfluss der Geburt auf die Gestalt des kindlichen Kopfes [Shape of Skull after Occipital Position. Studies on the Effect of Birth upon the Form of the Child's Head]. Bern, 1872. 110 pp.

This dissertation (University of Bern), of 110 pages contains a comprehensive discussion on the heads of infants born in the occipital position. Two plates show 10 figures of skulls, and numerous tables give measurements at birth and at stated periods thereafter of the following diameters: Mentooccipital, frontooccipital, suboccipitobregmaticus, biparietal, bitemporal, frontosuboccipital, occipitobregmatic, frontobregmatic, frontomental, and biorbital. The subject matter considers the progress of the birth act, dislocations of the sutures, and form and volume of the head. Body weight and length, sex of the infant, number of previous children borne by the mother, and many other factors are also discussed. Full data are collected on 85 newborn infants in lying-in institutes at Bern and Prague.

35 **Fehling, H.:** "Die Sternfontanelle und der Horizontalumfang des Schädels" [Anterior fontanel and horizontal circumference of the skull]. *Archiv. für Gynäkologie* [Berlin], vol. 7 (1874–75), pp. 507–530.

A study of the infant skull in relation to length, weight, sex, order of birth, etc., based upon measurements of about 300 infants on the third or fourth day after birth, according to methods recommended by Elsässer.

36 **Fetterolf, Geo., and J. C. Gittings:** "Some anatomical features of the child's thorax and their practical application in physical diagnosis." *Am. J. Dis. Child.* [Chicago], vol. 1 (1911), pp. 6–26.

Data are original. Thoraces of newborn children (number of cases not stated) were examined in cross and sagittal section after fixing by injecting 10 per cent formalin and freezing. The relations of the thoracic viscera are

discussed in detail; 18 figures of the frozen sections illustrate the article. The horizontal position of the ribs, the elevation of the sternum, the more horizontal position of the heart, with the right ventricle anterior and the large size of the thymus are emphasized. The authors think it highly problematical that enlarged bronchial lymph nodes cause a bruit, or an impaired percussion note possible of diagnosis.

37 **Freiberg, A. H., and J. H. Schroeder:** A note on the foot of the American negro." *American Journal of Orthopedic Surgery* [Boston], vol. 1 (1903–4), pp. 164–167.

To determine whether the widespread belief in the flatness of the negro foot is founded on fact, the authors made examination of the feet of 88 adult negroes, 34 adult whites, and 40 negro children. They found that among negro children the normal foot preponderates, but flattening of the arch of the foot is much more frequent in the negro than in the white adult.

38 **Fridolin, Julius:** "Studien über das Wachsthum der Extremitäten beim Menschen, nach der Geburt" [Studies on growth of extremities in human beings after birth]. *Archiv für Anatomie und Physiologie* [Leipzig], 1881, pp. 79–81.

The author investigated relative growth of parts of limbs as compared with whole limbs and time of change to proportions of adults. Ages of infants examined ranged from 1 day to 1 year. Freshly dissected limbs of right side were measured. A long table contains data on length, weight, sex, age, upper and lower arm and hand, calf, thigh, and foot of 100 subjects. The relative energy of growth of different parts of limbs is varied. The change to relative proportions of adults takes place in first half year for lower limbs and in second half year for upper limbs.

39 **Friedleben, Alex:** "Beiträge zur Kenntnis der physikalischen und chemischen Constitution wachsender und rachitischer Knochen der ersten Kindheit" [Contributions to the knowledge of the physical and chemical constitution of growing and rachitic bones in early childhood]. *Jahrb. f. Kinderh.* [Berlin], vol. 3 (1859–60), pp. 61–137; 147–178.

Two-thirds of this article is devoted to normal conditions. A 15-page table gives results of many tests on 22 breast-fed and 4 artificially-fed infants: Data include sex, age, diet, girth of skull, great fontanel, teeth, and external condition of skull. The defective ossification of newborn infants disappears within a few weeks, more rapidly in breast-fed infants than others. In the second section on the chemical analysis of children's skeletons, data obtained by various other investigators are tabulated. The author then describes his own methods of examination and shows a cut of his apparatus. Twenty pages of tables give his findings on bones of 46 children, including 8 infants. Other tables treat the medulla. Emphasis is put on second half of the first year of life, when water content increases and mineral salts decrease.

40 **Hasselwander, Albert:** "Untersuchungen über die Ossifikation des menschlichen Fussskeletts" [Investigations on ossification of the bones of the human foot]. *Zeitschrift für Morphologie und Anthropologie* [Stuttgart], vol. 5 (1902–3), pp. 438–508.

Hasselwander studied ossification of 301 feet of 284 fetuses and young children, of whom 208 were cadavers. These latter he examined anatomically as well as with X rays. The calcaneous talus, trigonum tarsi, naviculare pedis, cuboideum, cuneiform I, II, III, primary, middle, and end metatarsalia, and phalanges are considered. The article is illustrated with a plate of 5 figures, 29 text figures, and 16 elaborate tables. Bibliography.

41 **Hawkes, Onera A. M.:** "On the relative length of the first and second toes of the human foot, from the point of view of occurrence, anatomy, and heredity." *Journal of Genetics* [Cambridge], vol. 3 (1913–14), pp. 249–274.

The author examined the feet of 1,461 males and 840 females, most of them under 18 years of age, studied the skeletons of 91 embryos and 14 fetuses, and sent out 7,000 cards for tracings of feet, from which he obtained 808, including 381 of offspring of unknown parents and 150 where one parent was known. A flexed position is normal for all but the great toe.

42 **Heimann, Alfred, and Karl Potpeschnigg:** Über die Ossifikation der kindlichen Hand" [Ossification of the child's hand]. *Jahrb f. Kinderh.* [Berlin], vol. 65 (1907), pp. 437–456.

Impressed with the importance for pathology, law, etc., of X-ray determinations of ossification, the author investigated the ossification of the hand in 100 boys and girls between the ages of 4 weeks and 12 years, at the children's clinic in the Royal University of Munich. He found in healthy children a great variation in the time when ossification took place; the order of ossification was fairly regular as follows: Os magnum, unciform, cuneiform, semilunar, trapezoid, trapezium, scaphoid, pisiform. These results he puts into a table of age, sex, weight, height, diagnosis of health, and explanation of ossification.

43 **Hess, Alfred F., and Mildred Weinstock:** "A comparison of the evolution of carpal centers in white and negro new-born infants." *Am. J. Dis. Child.* [Chicago], vol. 29 (1925), pp. 347–354.

Röntgenograms of the wrists of about 500 newborn infants were made between November, 1923, and November, 1924, at a hospital which cares for

both negro and white women. Charts and figures classify the subjects according to race, sex, and size, and present the results of the study. Carpal centers were observed in 28 per cent of the 131 full-term negro infants, and in 10 to 11 per cent of the 212 full-term white infants. A similar preponderance among negro infants was shown in the premature and small group. Carpal centers at birth were noted more frequently in female than in male, and in heavy than in light infants.

44 **Hewson, Addinell:** "Diameters of the foetal head, from measurements made in the Dublin Lying-in Hospital." *Medical Examiner and Record of Medical Science* [Philadelphia], new ser. vol. 7 (1851), pp. 634–637.

A report of the result of measurements of the heads of 166 infants born at term. Measurements were made within 24 hours after the birth of the child, with Turner's calipers and an ivory scale marked to the twentieth and fiftieth of an inch. Biparietal, occipitofrontal, and occipitomental average diameters were recorded, and compared with figures of Baudeloque, Velpeau, Cazeaux, Burton, Ashwell, Murphy, and Churchill. Comparisons are made also with the figures of Doctor Meigs, to whom this communication is addressed.

45 **Hoffmann, Phil.:** "Conclusions drawn from a comparative study of the feet of barefooted and shoe-wearing peoples." *American Journal of Orthopedic Surgery* [Philadelphia], vol. 3 (1905–6), pp. 105–136.

A comparative study of the feet of barefooted people and 560 Caucasians who wore shoes. A study is made of the length of the foot and of the phalanges in relation to body weight, among these two classes of people, both in infants and adults, and of the shape of the foot, range of motion, etc. Twenty-five photographs.

46 **Hofmann, Edward:** "Zur Kenntnis der natürlichen Spalten und Ossifikationsdefecte am Schädel Neugeborener, insbesondere in gerichtsärztlicher Beziehung" [Knowledge of normal fissures and ossification defects in the skull of the newborn, especially in their medico-legal aspects]. *Vierteljahrsschrift für die Praktische Heilkunde* [Leipzig and Prague], vol. 121–124 (1874), pp. 53–76.

Without closely describing his material or presenting tables, author discusses in detail the physiological fissures and gaps in ossification that appear in the skull of newborn infants as well as fontanels and sutures. The occipital bone often shows such fissures in three definite places: Parietal bones have them often; most frequent mistakes as to possibility of violence occur in the posterior portion of sagittal suture. Actual cases of fissures in parietal bones are described with precision. Face often shows fissures 2 centimeters long. Various other forms of fissures are noted in other sections of the skull. A plate shows two figures of natural fissures in occipital bone of the newborn, five specimens of fissures on back part of sagittal suture, one skull of a seven-month fetus.

47 **Hoth, Hermann:** Über die Veränderung der Kopfform Neugeborener in den ersten vierzehn Lebenstagen [Change in Shape of Head in Newborn Infants during First Fourteen Days of Life]. Marburg, 1868. 28 pp.

Inaugural dissertation (University of Marburg). Four measurements were made of skulls of 250 boys and 250 girls born in the Lying-in Institute at Marburg between 1859 and 1863. Tables show relation of sex, presentation at birth, and order of birth to skull measurements.

48 **Hrdlička, A.:** "Measurements of the cranial fossae." *Proceedings of the United States National Museum* [Washington], vol. 32 (1907), pp. 177–232.

Report of measurement of 198 crania, of which 40 were skulls of fetuses and children, 60 adult white males, 30 adult white females, 20 adult Indian males, 15 adult negro males, 10 adult negro females, 13 adult anthropoid apes, 10 adult monkeys, and other mammals. Technique is fully described, many tables showing comparative figures are given, and results are summarized.

49 **Hueter, C.:** "Anatomische Studien an den Extremitätengelenken Neugeborener und Erwachsener" [Anatomical studies of the joints of extremities of newborn and adults]. *Archiv für Pathologische Anatomie* [Berlin], vol. 26 (1863), pp. 484–519.

A detailed study of the joints of extremities of newborn infants and of adults.

50 **Humphry, George Murray:** A Treatise on the Human Skeleton. Macmillan & Co., Cambridge and London, 1858. 604 pp.

A comprehensive work by a lecturer on surgery and anatomy in the Cambridge University Medical School, treating of the bones from their formation in the fetus to their condition in old age. The author gives, not a detailed description of the bones but a summary of information, physical, physiological, pathological, and practical, gathered from his own observation and researches, to supplement standard manuals of anatomy. Sixty plates and many references are given.

51 **Huntington, G. S.:** "Contribution to the topographical anatomy of the thorax in the foetus at term and the newborn child." *Medical Report of the Society of the Lying-in Hospital* [New York], 1897, pp. 324–350.

A detailed study of original material from the New York Lying-in Hospital. The paper is in two sections: (1) The form and external character of the lungs; (2) the topography of mediastinum and mediastinal surface of the lung. "The following anatomical conditions * * * impress their character most strongly on the arrangement of the viscera in the fetal thorax, when contrasted with the form and contents of the adult chest cavity: (1) Differences in extent and configuration of the lungs before and after pulmonary respiration has been established; (2) differences in the extent of the pleural sacs and of the complementary pleural spaces, especially the costophrenic sinus; (3) presence of thymus; (4) relative large size of fetal liver, influencing indirectly the arrangement of the thoracic contents by determining the level of the diaphragm." The author merely gives an inventory of the specimens. There is no conclusion nor discussion of the material. Twenty-one plates are shown.

52 **Jürgens, E.:** "Der Sinus sigmoideus im Kindesalter" [Sigmoid sinus in childhood]. *Monatsschrift für Ohrenheilkunde* [Berlin], vol. 44 (1910), pp. 429–451; 509–517.

This complete article on the sigmoid sinus in childhood contains a table on 62 cases from 2 months to 14 years, showing length of axis and distance from asterion to end of jugular canal, and remarks on the bulb of the jugular vein, another table on the greatest sinus width and depth, and still another on the jugular foramen and the emissary mastoid vein. The sinus in the years 12, 13, 14, especially, is carefully described. Photographs and drawings are included.

53 **Konikow, M.:** "Zur Lehre von der Entwickelung des Beckens und seiner geschlechtlichen Differenzierung" [Theory of development of the pelvis and its sexual differentiation]. *Archiv für Gynaekologie* [Berlin], vol. 45 (1893–94), pp. 19–42.

Author studied development of the pelvis in living individuals, three males and three females, of every year of age between birth and 20 years. Measurements were made of spines, crests, trochanters, and conjugate diameters. Data are shown in full tables and one graph. During the first year a great and regular increase of the pelvis in all diameters takes place. In the following four years the external conjugate grows but slightly as compared with transverse measurements. From 6 to 10 the external conjugate has a relatively great growth, and the other measurements a more or less regular increase. From 10 to 11 all female dimensions are larger than male, and during the next four years they increase much more rapidly than in the male. Until the age of 10 to 11 there has been little difference between the sexes. By the age of 20 the male pelvis has equaled the female in transverse dimensions but not in conjugata.

54 **Landa, E.:** "Contribución al estudio de la forma de la cabeza en los niños recién nacidos" [Data on the study of the form of the head of newborn children]. *Gaceta Médica* [Mexico], ser. 3, vol. 7 (1912), pp. 41–47.

Author describes the forms of head of newborn infants as affected by the process of delivery, use of instruments, or presentation at birth; also the changes in the shape of head taking place in the first few days of life. He distinguishes three forms of head: Brachycephalic (very short), mesocephalic (medium), and dolichocephalic (very long). He illustrates his points by a brief account of 240 newborn infants whose cephalic indexes he measured.

55 **Le Courtois, E.:** Essai sur l'anatomie de la voûte du crâne [Essay on Anatomy of Vault of Skull]. Paris, no. 274, 1870. 134 pp.

Thesis, University of Paris. The author gives data on measurements of 130 fetal and infant skulls, and discusses the intrauterine development of the skull. Several plates, tables, and figures are included.

56 ——— "Sur la forme et le développement du crâne chez les nouveau-nés" [The form and the development of the skull of the newborn]. *Bulletins de la Société d'anthropologie de Paris*, ser. 2, vol. 4 (1869), pp. 720–721.

Brief résumé of observations by the author as to the head forms of the new born and the fetus, recording, without details as to the manner in which they were obtained, the cephalic indexes of 26 infants, aged 1 to 10 days.

57 **Le Damany, P.:** "Recherches sur quelques proportions du corps chez les nouveau-nés; differences sexuelles du bassin" [Research on certain bodily proportions in the newborn; sexual differences in the pelvis]. *Journal de l'anatomie et de la physiologie normales et pathologiques de l'homme et des animaux* [Paris], vol. 46 (1910), pp. 664–690.

In seeking an anatomical cause for the greater frequency of hip dislocation among girls than boys the author measured 21 cadavers of infants. He arrived at a corrective figure for the thickness of the genitals in measuring the length of the lower extremities. In 200 boys and 200 girls he found the difference of this length insignificant. Measurement, in 200 subjects, of the

transverse diameter of the trunk at the level of the iliac crest showed no appreciable variation. Height of the pelvis covered with flesh, in 100 subjects of both sexes, showed a negligible difference. Anteroposterior diameter of the pelvis at level of the anterior and superior iliac spines was notably greater in girls than in boys. Data are presented in tables.

58 **Long, Eli, and E. W. Caldwell:** "Some investigations concerning the relation between carpal ossification and physical and mental development." *Am. J. Dis. Child.* [Chicago], vol. 1 (1911), pp. 113–138.

Data are original, the work corresponding to that reported by Doctor Rotch in "The Roentgen Ray in Pediatrics." Two hundred radiographs of both wrists were taken. The subjects varied in age from infants to young men, and in mental capacity from idiots to brilliant high-school students. Figures 1 to 13 and 19 to 44 are X rays and photographs of cases cited. Charts 14 to 18 show the relation of carpal development to height, weight, age, and mind. The author's conclusions are: (1) The two wrists do not develop synchronously in an individual, neither is carpal development an index of general osseous or of mental development; (2) age, height, and weight increase in general with advance in carpal development.

59 **Mandelstam, J.:** "Über die Grösse des gegenseitigen Abstandes der grossen und kleinen Fontanelle bei neugeborenen Kindern" [Distance between large and small fontanel in newborn children]. *Archiv für Gynaekologie* [Berlin], vol. 16 (1880), pp. 182–191.

The author measured with caliper compasses fontanels of 98 infants on the third or fourth day after birth. Three tables show distance between fontanels; frontooccipital diameter; long transverse and short transverse, long and short diagonal diameters; and perimeters of frontooccipital, of long and small oblique diameters. Other tables show length, weight, sex, serial number of birth, and dependence of distance between fontanels or sagittal suture on other dimensions.

60 **Manouvrier, L.:** "Recherches sur le développement quantitatif comparé de l'encéphale et de diverses parties du squelette" [Researches in the comparative development in volume of the brain and different parts of the skeleton]. *Bulletin de la Société zoologique de France* [Paris], vol. 7 (1882), pp. 131–229.

Data for this study, which the author feels insufficient for final conclusions, were secured by measurement of various series of skulls and skeletons, including a small number of those of children, from birth to age of maturity. The relations studied in this paper concern the skull, the femur, and the jaw, the first as having a protective relation to the brain and sense organs, the second as representing by its weight the development in volume of the organs of locomotion and support, and the third representing the development of the nutritive system. The data include a table showing the craniocerebral index of a number of children (perhaps 20; inexactly stated), a table showing craniomandibular index of 14 children, and a few other observations on subjects under 20 years of age.

61 **Maurel, E.:** "Étude du thorax chez le nouveau-né" [Study of the thorax of the newborn infant]. *Archives mensuelles d'obstétrique et de gynécologie* [Paris], vol. 5 (1914), pp. 517–544.

A detailed study of the thorax of 37 newborn infants. Many sternoxyphoid cross sections of the thorax are shown. Nine tables give the diameter, perimeter, surface of radiation, and other thoracic measurements.

62 **Mauro, C.:** "Intorno ad alcune misure antropometriche degli scolari" [On some anthropological measurments of school children]. *Gazzetta internazionale di Medicina, Chirurgia, Igiene e Interessi professionali* [Naples], vol. 16 (1913), pp. 183–184.

A brief discussion of the method of measuring chest expansion and chest diameters and of their significance as an index of the child's physical development.

63 **de Mérejkowsky, C.:** "Recherches sur le développement du squelette humain" [Researches on the development of the human skeleton]. *Bulletins de la Société d'anthropologie de Paris*, ser. 3, vol. 6 (1883), pp. 152–177.

In discussing the theory that the human fetus is the intermediate link between man and the ape the author gives many data concerning the infant skull.

64 **Merkel, Fr.:** "Beitrag zur Kenntnis der postembryonalen Entwicklung des menschlichen Schädels" [Contribution to knowledge of postembryonic development of the human skull]. *Beiträge zur Anatomie und Embryologie als Festgabe Jacob Henle* [Bonn], 1882, pp. 164–185.

Material for this detailed study consisted of 20 skulls of children between birth and 17 years taken from the Gottingen collection. The author compares skulls of newborn infants and adults and discusses at length the growth of the skull. Postembryonic development of the skull is divided into two periods—birth to about the seventh year, and after a temporary cessation of growth, puberty to maturity. A summary at the close of the article traces changes in the skull through different phases of these periods.

65 **Mies, Joseph:** "Unterschiede zwischen Länge, Breite und Längen-Breiten-Index des Kopfes und Schädels" [Differences between length, breadth, and length-breadth index of head and cranium]. *Mittheilungen der Anthropologischen Gesellschaft in Wien* (1890–91), new ser. 10–11; General Register, new ser. 1–10, pp. 37–49.

In and about the year 1886 the author measured 25 subjects in the Public Hospital of Cologne of persons native to that city, and 25 in the Munich Insane Asylum of persons from other parts of Germany than Cologne. Thirty-nine were male, 11 female. The subjects included a fetus of 7 to 8 months, 10 bodies of children up to 5 years, and 3 between 7 and 14 years. The text and seven tables treat the length, breadth, and index of length and breadth of head and cranium. The author concludes that the average differences between length, breadth, and length-breadth index of head and skull increase from birth to maturity, and that it is highly probable that these differences are greater in males than in females.

66 **Morin:** "Radiographies relatives à l'accroissement du système osseux" [Radiographic studies of the growth of the bones]. *Revue d'orthopédie* [Paris], ser. 2, vol. 3 (1902), pp. 275–289.

An X-ray study of one child photographed at half-yearly periods from 3 to 7 years. Four skiagraphs are reproduced and many described in detail.

67 **Moser, Emil:** Über das Wachsthum der menschlichen Wirbelsäule [Growth of Human Spinal Column]. Strassburg, 1889. 59 pp.

An inaugural dissertation (University of Strassburg). The seven tables and six curves placed at the conclusion of this article show age (birth to maturity); body length; length of free spinal column; relation of same to length of body; dimensions of cervical, dorsal, lumbar, vertebræ, etc. The author describes in detail the spinal column of newborn infants, children of 3 years and of 5 to 6 years, children at puberty, and adults and determines peculiarities characterizing these periods. In the course of growth the head attains twice its size at birth, the spinal column three times, and lower extremities four to five times. Bibliography.

68 **Neumayer, V. L.:** "Ein Beitrag zur Lehre von Längenwachstume des Hirnschädels" [A contribution to the study of growth in length of the skull]. *Mitteilungen der Anthropologischen Gesellschaft in Wien* [Vienna], vol. 38 (1908), pp. 1–16.

Part II deals with a study of 50 skulls of infants from birth to 6 months of age. Part III deals with a study of 236 skulls of subjects from birth to 101 years of age. The method of measurement is described and the following conclusions reached: The infant's skull differs from the adult's in various proportions; at birth the postauricular part is longer than the preauricular, but in process of growth this postauricular dolichocephaly is gradually, though not entirely, lost. Length in growth takes place both in the preauricular and in the postauricular regions; the postauricular part grows until about the tenth year, and the preauricular until about the twentieth. References.

69 **Papillault, G.:** "Quelques lois touchant la croissance et la beauté du visage humain" [Some laws concerning the growth and the beauty of the human face]. *Bulletins de la Société d'anthropologie de Paris*, ser. 4, vol. 10 (1899), pp. 200–241.

Deals largely with questions of phylogeny but contains (pp. 223–226) a comparison of measurements of 20 skulls of newborn infants, with skulls of 50 adults previously measured.

70 **de Parchappe, J. B. M.:** Recherches sur l'encéphale, sa structure, ses fonctions, et ses maladies [Researches on the Brain, Its Structure, Functions, and Diseases]. Bouvier & Bouvier, Paris, 1836. 111 pp.

A work in three parts: (1) The volume of the head in man; (2) the volume of the brain in man; (3) relation between the volume of the head and of the brain. Most of the inquiries concern adults, but a few figures of measurements of children are included.

71 **Pearson, K.:** "On the laws of inheritance in man. II. On the inheritance of the mental and moral characters in man, and its comparison with the inheritance of the physical characters." *Journal of the Anthropological Institute of Great Britain and Ireland* [London], vol. 33 (1903), pp. 179–237. See also *Biometrika* [Cambridge], vol. 3 (1904), pp. 131–190.

To ascertain the degree of resemblance, mental and physical, among children of the same parents and to discover whether there is any relationship between the external shape of the head and a teacher's estimate of the general grade of ability of a pupil, the author collected between 3,000 and 4,000 schedules from teachers of various kinds of schools, showing family relationships, physique, mental ability, head measurements, color of hair and eyes, and temperament. The head measurements were made by spanners devised for this work and admittedly not so accurate as metal calipers. Examination of this material by statistical methods, fully described, led the author to the conclusion that evolution and selection play no greater and no less a part in production of psychical than of physical characteristics. Thirteen diagrams and five tables are given.

72 **Pfister, H.:** "Die Kapazität des Schädels (der Kopfhöhle) beim Säugling und älteren Kinde" [The capacity of the skull in the infant and older child]. *Monatsschrift für Psychiatrie und Neurologie* [Berlin], vol. 13 (1903), pp. 577–589.

The author measured the capacity of the skulls of 77 boys and 77 girls from a few days to about 10 years old, most of them less than a year old. The material was from the Children's Hospital of Emperor and Empress Frederick and excluded foreign races and pathological conditions. The data are shown in tables, and the mean volumes for given ages are listed. The author describes his methods of dissection and explains how he arrives at the conclusion that the capacity of the cranial cavity is that of the skull minus 6½ per cent. That of boys is always larger than that of girls. This difference, about 20 cubic centimeters at birth, is over 100 cubic centimeters by the fourth year. At 2½ years of age, two-thirds of the total increase in head volume has been attained. Large individual variations often occur, even when sex and age are the same.

73 **Pleissner, Hugo:** Nonnulla de Ossificatione in Femoris Inferiore Epiphyse [Ossification of the Lower Epiphysis in the Femur]. Leipzig, 1861. 22 pp.

Thesis (University of Leipzig). Author gives data first of Olivier, Mildner, Casper, and Bohm, and then his observations of 21 newborn infants. Contending that Bohm's conclusions are overdefinite, Pleissner offers the following results of his study: Ossification in the lower epiphysis of the femur can be wanting in the full-term new born especially if the child or the mother is weak. Size ¼ to 3 rheinish lines (rheinish line = ½ inch) proves that child can not have been born very prematurely. A diameter of over 3 rheinish lines makes it a matter of certainty that the infant is fully developed.

74 **Poland, John:** Skiagraphic Atlas Showing the Development of the Bones of the Wrist and Hand. Smith, Elder & Co., London, 1898. 40 pp.

A series of 19 skiagraphic plates showing the development of the bones of wrist and hand from 1 to 17 years of age, with a brief introductory chapter on anatomy, and descriptive notes.

75 **Pryor, J. W.:** Ossification of the Epiphyses of the Hand. Bulletin of the State College of Kentucky, ser. 3, no. 4, October, 1906. 33 pp.

A study, illustrated by 20 skiagrams, with notes by the author, and a chronological table comparing his findings with those of Morris, Cunningham, Gray, Holden, and Poland.

76 ——— The Chronology and Order of Ossification of the Bones of the Human Carpus. Bulletin of the State University of Kentucky, new ser. 1, no. 2, April, 1908. 22 pp.

A report of observations by the X-ray method of 554 hands, 266 female and 288 male, including a chronological table showing the degree of ossification of the bones of the carpus in 136 female hands, from 3 months and 8 days to 12 years, 7 months, and 9 days, and of 153 male hands from 44 days to 14 years and 16 days. A summary, in tabular form, shows what the author believes to be the chronological order of ossification, with its variations and combinations.

77 ——— "Time of ossification of the bones of the hand of the male and female and union of epiphyses with the diaphyses." *American Journal of Physical Anthropology* [Washington], vol. 8 (1925), pp. 401–410.

The studies reported are based on Röntgenograms of 64 white males, 12 years, 6 months to 22 years, 10 months of age, and 81 white females, 12 years to 22 years 6 months of age; and on a table previously published by the author giving the size of the centers of ossification and the order in which they appeared in the hands of 113 females, aged 3 months and 8 days to 8 years, and of 116 males from 7 months and 12 days to 8 years of age. Original data of the first study are given in tabular form. The author found the ossification of the bones of the female in advance of that of the male from the time of appearance of centers of ossification in the embryo until the epiphyses are united with the diaphyses. References.

78 **Puyhaubert, A.:** "Recherches sur l'ossification des os des membres chez l'homme" [Researches in the ossification of the bones of the limbs in man]. *Journal de l'anatomie et de la physiologie* [Paris], vol. 49 (1913), pp. 224–268.

Report of results of radiographic studies, the number of observations varying with the points observed. Tables show ossification of the bones of the feet from before birth to 16 years; time of appearance of the epiphyseal points of tibia, fibula, and femur; and comparison of the dates assigned by various authors for ossification of the bones of wrist and ankle.

79 **Pye, Walter:** "On the growth rate of the bones of the lower extremities, with especial reference to ricketty curvatures." *Journal of Anatomy and Physiology* [London and Edinburgh], vol. 23, new ser., vol. 3 (1889), pp. 116–123.

Children to be measured were placed upon a board covered with paper ruled in 2-inch squares upon which were made tracings of the outline of the limbs. Tattoo points over the anterior iliac spine, the interval between the outer tuberosity and the head of the tibia, and the lower border of the external malleolus, assured measurement from identical points. The heights of 54 children of the hospital-patient class, who were without ailment causing a diminished stature, compared with normal standards, showed them to be of fair average development. Various measurements at two-month and at three-month intervals are recorded and summarized, and comparisons are made with ricketty subjects.

80 **von Ranke, H.:** "Die Ossifikation der Hand unter Röntgenbeleuchtung" [Ossification of the hand as determined by X-ray examination]. *Verhandlungen der Versammlungen der Gesellschaft für Kinderheilkunde auf den Versammlungen Deutscher Naturforscher und Aertze* [Dusseldorf], 1898, pp. 138–152.

The author displays 17 very clear radiograms of children's hands between birth and 18 years of age. His discussion covers the ossification as it advances with age according to his own researches and those of Rauber, Behrendsen, and Schwegel.

81 **Rodes, Charles Bradford:** "The thoracic index in the Negro." *Zeitschrift für Morphologie und Anthropologie* [Stuttgart], vol. 9 (1905–6) pp. 103–117.

This article, after reviewing the literature on the thoracic index, considers first thoracic measurements made upon 506 healthy negroes (212 males and 294 females) from the age of a few days to 86 years. Very few showed predominant white blood. Age, sex, weight, height, and physique also were noted. The individuals were measured standing, with arms hanging naturally at sides, clothed, and at the end of quiet expiration, with an elastic band placed around the thorax at the level of the gladiolo xiphoid articulation. The circumference of the thorax was measured with a steel tape measure, the anteroposterior diameter in the midsagittal plane with Martin's pelvimeter, and the transverse diameter at the widest point of thorax. As defined by Rodes, the thoracic index (unlike that of investigators before Hutchinson) is the ratio of the anteroposterior to the transverse diameter. There was a rapid decrease in the thoracic index of the negroes examined from about birth to puberty, and thereafter a more gradual rise. The thorax was more rounded in the female than in the male. In 50 young white women at Missouri University, the index was found by the author to be 73.14. In 48 young negro women he found it to be 70.9. Other investigators have determined the index of white males to be 73.48, 73.6, 74.6, and 70. The author has determined it for male negroes at 70.7. Therefore the thorax of the negro is flatter than that of the whites. The author also measured 11 embryos and fetuses, irrespective of race, finding that the thoracic index is at first very high, then decreases, at first rapidly, and then more slowly. The results of investigations are shown in five tables and three graphs.

82 **Röse, C.:** "Beiträge zur europäischen Rassenkunde und die Beziehungen zwischen Rasse und Zahnverderbnis" [Data on European races and the relation between race and tooth decay]. *Archiv für Rassen- und Gesellschaftsbiologie* [Berlin], vol. 2 (1905), pp. 689–798; vol. 3, pp. 42–134.

A detailed discussion of the form and size of the head and face of the European races and of the relation of race to tooth decay. A considerable part of the author's investigations was concerned with school children 6 to 14 years old. He and several assistants measured the heads and faces of 24,260 boys and 20,947 girls in Germany, Sweden, Denmark, the Netherlands, Belgium, Bohemia, and Switzerland. The results of this investigation are given in the article.

83 **Rotch, Thomas Morgan:** "A comparison in boys and girls of height, weight, and epiphyseal development." *Transactions of the American Pediatric Society* [New York], vol. 22 (1911), pp. 36–38.

A reproduction of a triple chart shows a comparison of boys and girls with regard to weight, height, and epiphyseal development. Original data are not given. The article calls attention to the earlier epiphyseal development of girls and states the author's belief that this development is a true index of physical, and probably of mental, age.

84 ——— "A study of the development of the bones in childhood by the Roentgen method, with the view of establishing a developmental index for the grading of and the protection of early life." *Transactions of the Association of American Physicians* [Philadelphia], vol. 24 (1909), pp. 603–624.

Analysis of Röntgenographs of the hands and wrists of about 200 children, normally developed, taken at the Children's Hospital in Boston. Discussing the various methods of determining the fitness of children for school and for physical work, the author concludes that no other index is so satisfactory as the epiphyseal development. Eleven plates.

85 **Rotch, Thomas Morgan:** "School life and its relation to the child's development." *American Journal of the Medical Sciences* [Philadelphia], new ser. (1909), vol. 138, pp. 702–712.

According to the author, a Röntgen picture of the body structure, especially of the wrist joint, affords the surest index of development of the child. Six illustrations show the development of hand and wrist bones under the Röntgen ray from the age of 6 months to 13½ years. Observations are from general practice. Precise data are not given.

86 ——— **and Harold Wellington Smith:** "A study of the development of the epiphyses of the hand and wrist for the purpose of classifying the cadets at Annapolis." *Transactions of the Association of American Physicians* [Philadelphia], vol. 25 (1910), pp. 200–211.

A report of work done in establishing standards of epiphyseal development for young men from 15 to 20 years of age, illustrated with seven plates from Röentgen pictures and three type charts. The work is considered by the author to be introductory only.

87 **Runge, George:** "Versuch einer anthropologischen Untersuchung des neugeborenen Schädels" [Attempt at an anthropological investigation of skulls of newborn infants]. *Archiv für Anthropologie* [Braunschweig], vol. 20 (1891–92), pp. 303–319.

The author studies skulls of 10 St. Petersburg children. He describes each one, noting kind of presentation at birth, and gives 45 determinations for each in a table, with which he shows for comparison Tarenetzky's corresponding data on 10 adult skulls. The text brings out differences between newborn and adults.

88 **Scammon, Richard E., and William H. Rucker:** "Changes in the form and dimensions of the chest at birth and in the neonatal period." *Am. J. Dis. Child.* [Chicago], vol. 21 (1921), pp. 552–564.

Data were obtained by measurements of the thoraxes of late fetuses and full-term stillborn children and of living infants on the first, third, fifth, seventh, tenth, and twelfth days after birth. Data on the circumference of the chest immediately before and after the first inspiration were taken from the observations of Linzenmeier. The authors found that the horizontal chest circumference (at the nipples) is markedly increased at the first inspiration. Within 12 hours after birth it enters a period of decrease which continues for two or three days and is followed by increase, the initial circumference being regained in the second week. The anteroposterior and the transverse diameter of the thorax, both at the level of the nipples and at the tenth rib, shows changes comparable with those of the circumferences at these levels. The thoracic index (anteroposterior diameter divided by transverse diameter and multiplied by 100) at the nipples stands at about 86 before birth, rises to an average of 106, and then drops to about 102 in the first 24 hours. Bibliography.

89 **Von Skatkowski, Bronislaw:** "Über das Verhältniss gewisser Durchmesser des kindlichen und des mütterlichen Schädels" [Relation of certain diameters of the child's and the mother's skull]. *Archiv für Gynaekologie* [Berlin], vol. 38 (1890), pp. 501–510.

Four tables show the relation of the mother's skull to her infant's in the bitemporal, biparietal, and suboccipitobregmatic diameters in 200 cases in which 64 of the mothers were Slavic, 6 Hungarian, and 130 German. The infants were never measured during the first day after birth. All were full-term infants. There was a striking similarity between the mother's skull and her child's, especially in the protuberances of the parietal bones. In the 86 first born there was in most cases a difference between mother and child of 4.5 centimeters in the bitemporal diameter, 5 centimeters in the biparietal, and 5.5 centimeters in the suboccipitobregmatic.

90 ——— "Über das Verhältniss gewisser Durchmesser des kindlichen und des mütterlichen Schädels" [Relation between certain diameters of the skull of the child and the skull of the mother]. *Archiv für Gynaekologie* [Berlin], vol. 40 (1891), pp. 245–252.

The article compares diameters of skulls of 100 mothers with those of their newborn infants, which in this investigation were premature, between 1,400 and 2,700 grams in weight, usually 2,000 to 2,500 grams. The five tables give length and relation to the bitemporal, biparietal, and suboccipitobregmatic diameters. The older a premature infant, the greater is the similarity between his skull and that of his mother. In 75.2 per cent cases his biparietal diameter is 5 to 6 centimeters smaller than his mother's.

91 **Spitzy, Hans:** "Über Bau und Entwicklung des kindlichen Fusses" [On structure and development of a child's foot]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 57 (1903), pp. 731–762.

This long and detailed article treats of the child's foot, beginning with the embryonic stage, both physiologically and anatomically. The prevailing opinion that the infant foot is flat is due to the thick pad of fat usual after birth. In reality the infant foot even in the fetal stage is well arched and architecturally very similar to the adult foot. The author carefully describes the

development of the foot through the creeping and walking stages and gives tables of measurements. Bibliography.

92 **Stettner, Ernst:** "Über die Beziehungen der Ossifikation des Handskeletts zu Alter und Längenwachstum bei gesunden und kranken Kindern von der Geburt bis zur Pubertät" [The relations of ossification of the skeleton of the hand to age and height in healthy and sick children from birth to puberty]. *Arch. f. Kinderh.* [Stuttgart], vol. 68 (1920–21), pp. 342–368, 439–466; vol. 69–70 (1921–22), pp. 27–62.

In the Children's Clinic of Erlangen University, from the spring of 1918 to the summer of 1919, the author took 700 X-ray pictures of children, 250 of whom were normal. Of these, 68 girls and 57 boys, between birth and the age of 13, from the moderate-sized children of the laboring class constituted the mean. In studying age, sex, height, class, etc., in relation to ossification, the author classified his subjects into tall, medium, and short children, according to Pirquet, and into laboring, agricultural, and upper classes. He concludes that the centers of ossification appear earlier in girls than boys, as regards both age and height; that wealthier children develop more rapidly; that there is no appreciable difference between right and left hands in ossification; that growth processes are regulated by the endocrines; and that even for normal children no general scheme is valid. Thirty-two tables and a bibliography are included.

93 **Stevenson, Paul H.:** "Age order of epiphyseal union in man." *American Journal of Physical Anthropology* [Washington], vol. 7 (1924), pp. 53–93.

Material for study was a collection of 110 skeletons in the laboratory of Western Reserve University. Of these, 20 belonged to the age period from 15 to 19, inclusive, barring the possibility that one was of the fourteenth year. An extended study showed the essential reliability of epiphyseal union as an indicator of age, especially in the case of the long bones. In the 15 to 20 year period the epiphysis of the distal extremity of the humerus unites first; that of the head last. The age of the greatest epiphyseal activity is the nineteenth year. References.

94 **Sullivan, L. R.:** "Growth of the nasal bridge in children." *American Anthropologist* [Lancaster, Pa.], vol. 19 (1917), pp. 406–409.

An analysis of material collected in 1890 by Professor Boas, in the measurement of school children of Worcester, Mass. The technique of measuring the nasal arch is described and tabulations made for both boys and girls of ages 5 to 16. The results showed that the growth in anteroposterior diameter in girls to the age of 14 antedated that of boys by one year or more, but that 14, 15, and 16 year old girls all corresponded to 14-year-old boys.

95 **Thoma, R.:** "Untersuchungen über das Schädelwachstum und seine Störungen. I. Die Spannung der Schädelwand" [Investigations on growth of skull and its disturbances. I. Tension of wall of skull]. *Virchow's Archiv* [Berlin], vol. 206 (1911), pp. 201–271.

This article, one of a highly technical series on the skull, contains 70 pages, 23 figures, and 6 tables on the tension of the cranial wall. Much space is given to the pressure of the cerebrospinal fluid in the subarachnoid spaces. The development of the complicated forms of the skull is to be explained only when pressure of the brain is added to pressure of said fluid and at least in certain places is greater than the latter. The relatively slight pressure exerted by its contents on the wall of the skull calls forth relatively high tension of material. A final table gives intracranial fluid pressure, material tension of bony tissue, and highest pressure of brain for individuals of 2, 11, 12, and 19 years.

96 ——— "Untersuchungen über das Schädelwachstum und seine Störungen. III. Das postfötale Wachstum" [Investigations on growth of skull and its disturbances. III. Postfetal growth]. *Virchow's Archiv* [Berlin], vol. 219 (1915), pp. 80–191.

The author discusses blood vessels, Sharpey's fibers, and bone lacunæ, thickness of bone lamellæ, cell counts in bony tissue, tertiary bone tissue and substantia spongiosa, appositional and interstitial growth of bone, and bones of cranial roof. He attempts to prove that almost the whole surface growth of bones of cranial roof after the third year of extrauterine life is interstitial. Sixty-five figures and 14 tables are presented.

97 **Tikhanoff, M. T.:** Ob energii rosta konechnostey i pozvonochnago stolba do 14 lietniago vozrasta [On the Energy of Growth of the Extremities and Spinal Column until the Age of 14 years]. St. Petersburg, 1894. 81 pp.

A dissertation (St. Petersburg University) giving an account of the author's study of the bodies of 70 children ranging in ages from embryos to 14 years for the purpose of determining the relative energy of growth; that is, the difference in rate of growth of the bones composing the upper and lower extremities and of various parts of the spinal column. The author gives his findings in numerous tables and also quotes extensively from other writers.

98 **Töppich, Gerhard:** "Die Porosität der Knochen des Neugeborenen mit Berücksichtigung des Verhaltens der Porosität bei Erwachsenen und Greisen" [The porosity of bones of the newborn infant with consideration of condition of porosity in later life]. *Archiv für Anatomie und Physiologie. Anatomische Abteilung* [Leipzig], 1914, pp. 9–24.

From tests made on carefully prepared skeletons of one young man and of five infants in the Anatomical Institute of the University of Breslau, compared with statistics of other investigators, the author presents tables and numerous results on porosity of different bones and finds that the skeletons of infants show a different grade of porosity from those of adults, but the same relative values. He gives other tables on the volume of red marrow and the weight and volume of the spleen; the marrow is greater in volume than the spleen.

99 **Tomes, C. S.:** "Studies on the growth of the jaws." *Transactions of the Odontological Society of Great Britain* [London], new ser. vol. 24 (1892), pp. 143–158.

A study of models of children's jaws, taken at intervals from 4 to 21 years of age, which are in the museum of the Royal College of Surgeons. A table shows the distance between the middle of the grinding surfaces of the second temporary upper molars and of the second upper bicuspids; from the middle of the back edge of the grinding surface of the second temporary molar to the center of the back of the neck of the central incisor of the same side, where it joins the gum. The author found that the early attainment of its full dimensions by the antefior portion of the jaw is an essentially human characteristic.

100 **Van Pelt, Joseph K. J.:** "Measurements of the diameters of the foetal head at term, collected from seven hundred cases of labour." *American Journal of the Medical Sciences* [Philadelphia], new ser. vol. 39 (1860), pp. 111–114.

Measurements by the cephalometer of Stein, and occipitomental, occipitofrontal, and biparietal diameters of 646 subjects are recorded in tabular form. A list of the longest diameters observed in both sexes is also given, and a summary of the measurements of above diameters as recorded by 15 other investigators. References.

101 **Veit, J.:** "Die Entstehung der Form des Beckens" [Origin of form of pelvis]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 9 (1883), pp. 347–372.

The author examined the pelves of 50 newborn infants of at least 2,400 grams' body weight. The average value for conjugata vera was 3.478, and the greatest value for transverse diameter was 3.802. The relation, therefore, was 1 : 1.093, whereas in the adult it is 1 : 1.22–1.29. The adult pelvis is essentially different from that of the newborn infant, and extrauterine factors are necessary to account for the change. The article contains tables and a review of other work on this subject.

102 **Voltolini:** "Der Knochenkern in der untern Epiphyse des Femur" [Center of ossification in the lower epiphysis of the femur]. *Vierteljahrsschrift für Gerichtliche und Öffentliche Medicin* [Berlin], vol. 15 (1859), pp. 95–106.

Report of a case of a very young infant whose center of ossification in the lower epiphysis of the femur was unusually large.

103 **Weissenberg, S.:** "Das Wachstum der Hüftbreite nach Alter und Geschlecht" [Growth of pelvic width in relation to age and sex]. *Monatsschrift für Geburtshülfe und Gynaekologie* [Berlin], vol. 29 (1909), pp. 822–829.

The author measured the pelves of 2,500 persons of both sexes and of various ages. The breadth of hip is greater in boys till the eighth year, the same in boys and girls during the ninth year, and thereafter larger in women than men. The greatest increase in size of hips is during the first two years; there is also a very rapid increase in girls from the eleventh to the fifteenth year and not so rapid an increase in boys from the fourteenth to the seventeenth year. The author also clearly demonstrates a connection between broad hips on the one side and on the other early menstruation and developed breasts. Furthermore, he shows that the width of hips compared with shoulders is much greater in women than in men. The article contains five tables and one graph.

104 **Witzinger, M.:** Über die Stirnfontanelle und den horizontalen Umfang des Kopfes beim Neugeborenen [On the Anterior Fontanel and the Horizontal Head Circumference of the Newborn]. Jent & Reinert, Bern, 1876. 31 pp.

A discussion of the relations of such head measurements as the horizontal head circumference, size of fontanels, etc., to weight, length of body, sex, and number of previous births. Measurements are given for 100 mature newborn infants. The value of head measurements as criteria for judging the maturity of infants is discussed. The author believes that well-developed bodies have large fontanels and that larger fontanels generally accompany wide sutures.

105 **Wolff, Julius:** "Über das Wachsthum des Unterkiefers" [Growth of the lower jaw]. *Virchow's Archiv* [Berlin], vol. 114 (1888), pp. 493–547.

A very thorough treatment of growth of the lower jaw. Former literature is reviewed. The author's own measurements are shown in a table on breadth of alveoli of both incisors, breadth of incisors and canine teeth, breadth of first five teeth, etc., of fetus, newborn infant, 6-months-old child, 1-year-old child, 2-year-old child, 6-year-old child, and four adults. The author also studied the upper jaw. The major conclusion is that the lower jaw is subject to a much more powerful growth and expansion than has been found in any other bone.

106 **Woronichin, N.:** "Neue Beobachtungen über den Einfluss des Körperbaues, des Ernährungszustandes, der rachitischen und syphilitischen Processe auf den Durchbruch der Milchzähne" [New observations on the effect of body structure, nutritional condition, rachitic and syphilitic processes on eruption of milk teeth]. *Jahrb. f. Kinderh.* [Leipzig], vol. 11 (1877), pp. 143–159.

To clarify the matter of canine teeth in a former publication on 23,732 observations of children in St. Elizabeths Hospital at St. Petersburg, the author presents here 6,802 observations from the year 1875 on the first three years of life, dividing age between two and three years according to months, so as to determine more precisely the time of eruption of the first 20 teeth. Tables covering 16 pages are divided into material on boys and girls, on rachitic and nonrachitic children. Preliminary tables show also distribution of good, ordinary, and deficient body structure.

107 ——— "Über den Einfluss des Körperbaues, des Ernährungszustandes und des rachitischen Processes auf den Durchbruch der Milchzähne" [Effect of bodily structure, nutritional condition, and rachitic processes on eruption of the milk teeth]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 9 (1875–76), pp. 91–105.

The author presents tables on body structure, nutrition, and dentition of 23,732 children in the first three years of life, of whom 6,836 boys and 6,810 girls were nonrachitic, and 5,765 boys and 4,321 girls were rachitic. Among nonrachitic children in the eighth month the average number of teeth was 1.2 for boys and 1 for girls, whereas for nonrachitic boys the average was 0.8 and for nonrachitic girls 0.7. Children of good build get teeth more easily and at an earlier age than weak children.

108 ——— "Untersuchungen über den Durchbruch der Milchzähne" [Investigations on eruption of milk teeth]. *Jahrb. f. Kinderh.* [Leipzig], vol. 13 (1878–79), pp. 193–225.

Many tables on teeth, weight, height, head measurements, and chest girth of 187 young children in the Elizabeth Hospital and 33 in a foundlings' home in St. Petersburg. Boys and girls and rachitic and nonrachitic children are discussed separately

109 **Zeltner, E.:** "Die Entwicklung des Thorax von der Geburt bis zur Vollendung des Wachstums und ihre Beziehungen zur Rachitis" [Development of thorax from birth to completion of growth and its relation to rachitis]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 78 (1913), Supplementary vol., pp. 150–169.

The author compares the thorax in many individuals up to about 19 years with the thorax of 100 healthy adults. He considers all three dimensions and the relation between thorax and lungs. The infant chest is emphysematous, conical; that of the adult is cylindrical. The thorax of the newborn infant is conditioned entirely by the lungs. During the first year it grows rapidly in width and during the first half of the second year in length. This latter period is most significant; the child is learning to sit and walk. By 18 months or 2 years the child's thorax is formed. Next, there is a slow growth, chiefly in length. From 3 to 7 years diaphragmatic breathing changes to costal breathing. From about the fifth or sixth year the upper chest girth surpasses the lower. There is little breast development in ages 10 to 12. The second most important period of thoracic development is puberty. The greatest changes are in volume and formation of upper lobes. The volume doubles between the ages of 12 and 20. Increase in body height comes in middle period of puberty. Constant reference is made to rachitis. The article contains 5 tables, 6 curves, and a short bibliography.

110 **Zielinsky, W.:** "Das Wachstum der Kiefer und Zähne und ihre Beziehungen zur Kaufunktion" [Growth of jaws and teeth and their relations to chewing]. *Deutsche Monatsschrift für Zahnheilkunde* [Berlin], vol. 26 (1908), pp. 804–840.

A discussion of the development of jaws, teeth, and the function of chewing, beginning with the embryo and covering the 21 years needed for the development of the human jaw. Different proportions are noted of skull and face of newborn, child, and adult. The infant's head is relatively large and its face very short on account of its undeveloped jaw. The jaw is used and begins growing with the appearance of the milk teeth. At the end of the second year the calcification of the permanent teeth starts. The growth of the various teeth is carefully described. The article contains 35 figures and a bibliography.

111 **Zielinsky, W.:** "Inwieweit sind Zahnwachstum und Kieferbildung abhängig von der Körperentwicklung?" [How far are growth of teeth and formation of jaw dependent on bodily development?]. *Oesterreichisch-Ungarische Vierteljahrsschrift für Zahnheilkunde* [Vienna], vol. 28 (1912), pp. 280–300.

A description of the development of the jaw and teeth in children. The different types of jaws and faces are described, and the effect of growing teeth on the jaw, especially when the stimulus of chewing has started. The effect of different diseases and of mouth breathing is traced. The author believes that if the jaw has been retarded in growth in early years it can not later make up this development.

2. TEETH

112 **Abbott, Frank:** "Teeth of the lower jaw at birth." *Transactions of the World's Columbian Dental Congress* [Chicago], vol. 1 (1894), pp. 266–288.

Thirteen figures show sections of teeth from the dissected lower jaws of two infants born at term. Description and discussion.

113 **Ahrens, Hans:** "Die Entwickelung der menschlichen Zähne" [The development of human teeth]. *Anatomische Hefte, Referate und Beitrage* [Wiesbaden], vol. 48 (1913), pp. 169–266.

The author's material consisted of 43 fetuses, 1 newborn infant, and 8 children 4 months to 8 years old. The various stages of development are discussed in detail. Bibliography.

114 **Bean, R. B.:** "The eruption and decay of the permanent teeth." *Anatomical Record* [Philadelphia], vol. 8 (1914), pp. 299–302.

A preliminary report on the teeth of 2,221 school children—776 Filipino, 628 German, 817 American. The author found eruption among the Filipinos from one to four years earlier than among Germans and Americans, and among Americans slightly earlier than among Germans; the females of the races studied were more precocious than males in regard to the eruption of teeth, but this difference was very slight among Filipinos. He found also that the lower teeth erupt before the upper, except the upper premolars; that there are slight racial differences in the order of eruption; that the law of alternation in development of the structures of the body decrees that periods of acceleration in the development of one structure shall be synchronous with periods of retardation in the development of another.

115 ——— "The eruption of the teeth as a physiological standard for testing development." *Pedagogical Seminary* [Worcester], vol. 21 (1914), pp. 596–614.

The data for this paper were secured by examination of 630 Filipino boys and 146 Filipino girls, 322 boys of German extraction and 306 German girls, 407 American boys and 410 American girls. Determining the average or mean number of teeth erupted or erupting at each age, the author found that eruption begins earlier among Filipinos than in the German and American groups; that the girls of each group are more precocious than the boys in eruption of teeth. From his data he constructed a table giving the physiological standard of eruption, and the time at which 50 per cent of the teeth are present. The morphologic form of the face (hyperontomorph and hypoontomorph) is discussed in its relation to tooth eruption and the relation between mental and dental development. Bibliography.

116 **Bunting, R. W.:** "Report of the examination of the mouths of 1,500 school children in the public schools of Ann Arbor, Michigan." *Dental Cosmos* [Philadelphia], vol. 51 (1909), pp. 310–322.

Tabular records of the results of an examination made in 1906 and 1907, showing percentage of eruption of each tooth at various ages; number of teeth erupted at various ages; distribution of caries in percentage of total caries examined; percentage of caries found in each tooth at the various ages; stature weight in relation to eruption in boys and girls; stature weight in relaton to caries in boys and girls, brain weight in relation to eruption and to caries in boys and girls. The results for negroes and whites were found to be noticeably different. The correlations noted were, for the most part, very slight.

117 **Debègue, André:** Les dents à la naissance [The Teeth at Birth]. Paris, no. 371, 1911. 62 pp.

Thesis for doctor's degree (University of Paris). Contains one table from the author's study of records of 500 infants, showing the dates of appearance of the central incisors and 20 case studies of infants born with teeth. Bibliography.

118 **Gundobin, N. P.:** "O proriezivanii zubov u dietie" [On teething in children]. *Meditsina* [St. Petersburg], vol. 6 (1894), pp. 202, 218, 234, 251.

Description of normal, irregular, and difficult teething (almost entirely quotations). A brief account of 80 cases of teething observed by the author, who disagrees with the prevailing opinion that teething is accompanied by morbid processes. He thinks that these processes are rare; that when present they are due to diseases of childhood and not to teething itself. Long bibliography.

119 **Heffenfinger, E.:** "What is normal dentition and what shall we do with premature teeth?" *Massachusetts Medical Journal* [Boston], vol. 24 (1904), pp. 97–104.

A general article based on observations from the author's practice. His table of dentition is: First molars, 6 years; incisors, 7 to 8 years; bicuspids, 9 to 10 years; canines, 12 to 14 years; second molars, 12 to 15 years; third molars, 17 to 25 years.

120 **Herpin, A.:** "Les dents à la naissance" [The teeth at birth]. *Bulletins et mémoires de la Société d'anthropologie de Paris*, ser. 6, vol. 3 (1912), pp. 386–393.

The author quotes figures relative to the development of the teeth from Legros, Magitot, Roese, and others, and describes and discusses several cases of eruption of one or two teeth at birth or immediately thereafter.

121 **Hrdlička, Aleš:** "Human dentition and teeth from the evolutionary and racial standpoint." *Dominion Dental Journal* [Toronto], vol. 23 1911), pp. 403–421.

This article, though largely on evolution, recounts on pages 413 and 414 some results of the investigation of the teeth of 960 Apaches and Pima children.

122 **James, W. W., and A. T. Pitts:** "Some notes on the dates of eruption in 4,850 children, aged under 12." *Proceedings of the Royal Society of Medicine (Odontological Section)* [London], vol. 5, pt. 3 (1912), pp. 80–101.

The authors investigated the eruption of teeth of all the children attending the dental department of a hospital for children during a period of about five years. Method of examination and record are explained in detail. Cases ranging from 5 to 12 years were grouped in periods of three months, and a system was devised to show the teeth present in each age group. Tables and curves were derived, and a final table compiled showing the average date at which the teeth appear.

123 **Jung:** "Die Entwicklung des Gebisses und seine Pflege im Kindesalter" [The development of the teeth and their care in childhood]. *Die Gesundheit in Wort und Bild* [Berlin], vol. 2 (1905), pp. 446–456.

The author describes the mouth of the newborn infant, the appearance of milk teeth from the sixth or seventh month to the end of the second year, their replacement by the second set of teeth, and the child's general health at this time.

124 **Livy, John:** "On the periods of eruption of the permanent teeth as a test of age." *Brit. M. J.* [London], vol. 2 (1885), pp. 241–244.

About 4,000 children were examined, 2,000 over 10 years of age, at various mills and workshops in Bolton, England, to determine the age at which eruption of the permanent teeth takes place and the normal progress of eruption. Considerable variability was found. The results of the investigation are shown in extended tables.

125 **Röse, C.:** "Die Zähne der Dalarner und Götländer" [Teeth of people of Dalarne and Gotland]. *Deutsche Monatsschrift für Zahnheilkunde* [Leipzig], vol. 22 (1904), pp. 735–748.

Comparisons are made between the teeth of 626 school children in Dalarne, Sweden, and of 626 school children in the island of Gotland. Possible reasons for the difference in the quality of the teeth of the two groups of children are discussed.

126 ——— "Über die mittlere Durchbruchszeit der bleibenden Zähne des Menschen" [Average time for cutting permanent teeth among human beings]. *Deutsche Monatsschrift für Zahnheilkunde* [Leipzig], vol. 27 (1909), pp. 553–570.

After discussing the inadequacy of previous statistics on teeth, the author presents results for children he personally examined. Children of different sexes and ages are considered separately. The numerous tables include figures for thousands of children from different parts of Germany. The author found that all permanent teeth erupt earlier with girls than boys; the canine teeth are much larger in the male than the female and are particularly late in erupting in boys; in general, the time of cutting permanent teeth is very variable. The fact that teeth are out earlier in Sweden than in Germany, and earlier in the upper than in the lower classes, may be due to the predominance of the Germanic race.

127 ——— "Zahnverderbnis und Militärtauglichkeit" [Decay of teeth and military fitness]. *Deutsche Monatsschrift für Zahnheilkunde* [Leipzig], vol. 22 (1904), pp. 135–150.

In addition to data on recruits, tables on school children are given showing correlation of condition of teeth, weight, and height. One table gives figures on 1,529 boys and 1,391 girls between 6 and 13 years of age in the Catholic schools of Dresden. The children with very bad teeth are on an average 2½ kilograms lighter and 5 centimeters shorter than children with good teeth. Another table concerns children (number not given) in Koetzting, Bavaria.

128 **Röse, C.:** "Zahnverderbnis und Zensur" [Decay of teeth and school standing]. *Deutsche Monatsschrift für Zahnheilkunde* [Leipzig], vol. 22 (1904), pp. 347–360.

From data collected for the most part by himself, the author presents 20 tables correlating the condition of the teeth of school children with their weight and height and with their school reports. Material is based on examinations of 2,920 children in Dresden, 1,021 in Frankfort on the Main, 3,868 in Nordhausen, 243 in Clingen, 395 in Weissensee, 461 in Frankenhausen, 310 in Leuben b. Riesa, and 248 boys and 234 girls in Koetzting. Physical development and school reports vary in excellence directly in accordance with good condition of teeth.

129 **Spier, Leslie:** "The growth of Porto Rican boys, with special reference to the relation between their stature and detention." *Journal of Dental Research* [New York], vol. 1 (1919), pp. 145–157. See also *American Anthropology* [Lancaster, Pa.], vol. 20 (1918), pp. 37–48, and *Dental Cosmos* [Philadelphia], vol. 60 (1918), pp. 899–905.

Data for this investigation were obtained from plaster casts of the dental arches and from measurements of some 350 schoolboys of Utuado, P. R., collected by Franz Boas in 1915. Tables were constructed showing the number of deciduous and permanent teeth present among a total of all possible teeth, and these formed the basis for other tables showing the average age and variabilities for the loss of the deciduous and the eruption of the permanent teeth. These were compared with similar data on Boston boys, from figures by Channing, and showed that the Porto Rican boys appear to erupt their teeth about a year in advance of Boston boys. Further investigation of the data showed a marked functional relation between stature and stage of dental development in both groups of boys.

130 **Spokes, Sidney:** "The teeth as a test of age, a note on eruption." *Brit. M. J.* (London), vol. 2 (1905), pp. 568–569.

From the tooth charts of a number of boys of known age in a large public school the author deduces figures showing to what extent the second permanent molars may be expected to be present in the mouth at the ages of 12, 13, and 14 years.

131 **Suk, V.:** Eruption and decay of permanent teeth in whites and negroes, with comparative remarks on other races." *American Journal of Physical Anthropology* [Washington], vol. 2, no. 4 (1919), pp. 351–388.

Material for this article was obtained by the author through observations on 1,008 subadult Zulu (492 males and 516 females), most of them in schools of the American Zulu Missions, and through observations in Europe by the author and Prof. J. Matiegka mostly on children of Czech extraction, representing the urban and rural population of central Bohemia. Their results are compared with those of Bean on Filipinos and German-Americans, Hrdlička on Indians, and Roese on Europeans. Observations are reported in great detail with many tables. The author concludes that in general dentition is earlier in girls than in boys, in colored races than in white, that the beginning and end of eruption in the lower jaw is somewhat earlier and the main period of eruption a little shorter than in the upper jaw; on the whole, eruption proceeds in the right side a little in advance of the left. Uncivilized races have better teeth than civilized. Bibliography.

B. CIRCULATORY SYSTEM

1. HEART AND BLOOD VESSELS

132 **Baccichetti, A.:** "Sulla forma del cuore infantile" [On the form of the infant's heart]. *La Clinica Pediatrica* [Modena], vol. 6 (1924), pp. 341–363.

The author studied the form of the heart of 108 infants from 1 to 3 days old. He presents in a table for each case the detailed measurements of the heart as obtained by him by means of the teleradioscope and concludes that in the newborn infant the round form of the heart is most frequent; the sex has no effect on the form and size of the heart. The average dimensions of the heart as obtained by him were: Length 4.79 centimeters, the sum of the greatest distance of the left and right boundaries of the heart from the median line of the sternum 4.47 centimeters, surface of the heart 13.48 square centimeters. The angle of inclination showed great variations, but the oblique position was most prevalent. The dimensions of the heart of the newborn are proportionate to the length of the body. Up to a certain limit these dimensions increase in proportion to the weight.

133 **Bamberg, Karl, and Hermann Putzig:** "Die Herzgrösse im Säuglingsalter auf Grund von Röntgenfernaufnahmen" [Size of heart in infancy on basis of Röntgen photographs]. *Ztschr. f. Kinderh.* [Berlin], vol. 20 (1919), pp. 195–211.

The author studied at the Empress Augusta Victoria House 133 X-ray photographs of the heart of 75 healthy infants under 1 year. He chose an instantaneous exposure of $\frac{1}{20}$ second, 60 amperes, 110 volts, and a distance of 150 centimeters. One table arranged alphabetically shows age, weight, length of

torso, chest diameter, and seven heart measurements. In other tables the data are rearranged according to age, weight, girth of torso, length of torso, weight, and relation of length of torso to breast diameter. There are also one sketch, two X-ray pictures, and two curves. The infant's heart grows very rapidly, particularly in the first six months. The mass is influenced by height and torso index, but little by weight.

134 **Bardeleben, Karl:** "Das Klappendistanzgesetz" [The valve-distance law]. *Jenaische Zeitschrift für Naturwissenschaft* [Jena], new ser. 7, vol. 14 (1880), pp. 467–529.

The author made 700 examinations of veins in six adults and five children. He describes preceding literature on this subject, his methods of investigation of the important veins, and his findings. In most cases and in the majority of veins the valves are most numerous in infancy and decrease with age.

135 **Bean, Robert Bennett:** "Notes on the postnatal growth of the heart, kidney, liver, and spleen in man." *Contributions to Embryology* [Carnegie Institution of Washington], vol. 9, nos. 27–46 (1920), pp. 265–284.

From about 1,300 records from the Charity Hospital, New Orleans, and Johns Hopkins Hospital data were accumulated on the growth of the heart, kidney, liver, and spleen, with relation to race, age, puberty, heredity, state of nutrition, etc.

136 **Beneke, F. W.:** Über das Volumen des Herzens und die Weite der Arteria pulmonalis und Aorta ascendus in den verschiedenen Lebensaltern [Heart Volume and Width of the Pulmonary Artery and Ascending Aorta at Various Ages]. Verlag von Theodor Kay, Cassel, 1879. 56 pp.

Two hundred and eighty-five cadavers in Vienna and 330 in Marburg were examined. There are graphs on these organs at different ages, and many tables, one showing age, sex, height, nutritional condition, volume of heart, circumference of pulmonalis and aorta. The discussion covers 28 pages, of which 10 consider ages up to 21 years. At different ages the relation of the width of these arteries to height and to heart volume varies greatly. The pulmonary artery is larger than the ascending aorta to the end of puberty; later the relation changes. The heart develops most rapidly in the first and second years. The sexual difference is slight up to seven years. To the fifteenth year the growth is greater in the female; thereafter it is greater in the male. From puberty on, the blood pressure in the two great arteries leading from the heart is lower in the female than in the male. Blood pressure in general increases with age till it reaches its height at the prime of life. Pubertal development depends very largely on relatively great increase of blood pressure at this time, when the arterial system is relatively narrow and the heart is growing rapidly.

137 **Cavaglieri, E.:** "Il cuore e l'apparechio circolatorio nei primi dieci anni di vita" [The heart and circulatory system in the first ten years of life]. *Morgagni* [Milan], vol. 42 (1900), pp. 549–591.

A description of the heart and circulatory system of 34 children, varying in age from 1 to 10 years, who were examined by the author at the pediatric clinic in Padua. The article gives for each child the height, span, chest circumference, total length of sternum, length of abdomen, distances between the iliac chest, cardiac index, distances between the tips of the second and fifth metacarpals of the right hand, and condition of the heart, blood vessels, and lymphatic system.

138 **Cruchet, René:** "Les trois faces du cœur chez l'enfant" [The three surfaces of the heart of the child]. *Bulletins et mémoires de la Société anatomique de Paris*, vol. 76 (1901), pp. 96–100.

Post-mortem observations of 29 subjects less than 15 years of age led the author to question the findings of Testier and others as to the shape of the heart in childhood. Observations are recorded in detail, but the number is considered too small for definite conclusions.

139 **DeBuys, L. R., and E. C. Samuels:** "Growth of the heart: roentgenographic observations." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 355–358.

From study of 623 röntgenograms of 400 normal infant hearts, taken within the first 24 hours after birth and at different periods up to the thirty-ninth month, the authors conclude that up to this time there is no rotation of the heart and that it does not assume a more vertical position.

140 ——— ——— Further observations upon the shadows of the thymus and the heart." *Southern Medical Journal* [Birmingham], vol. 17 (1924), pp. 260–264.

A report on 450 observations, a part on infants included in the authors' first study, new observations having been made at 6 months and 1 year, and a part on newborn infants. Eighteen additional reproductions of radiographs confirm the findings of the original study. The authors believe that "the change in the position of the apex beat of the heart in the first year is apparently not due to its rotation, but to the slower growth in size of the heart as compared with the more rapid growth in the size of the thorax."

141 **Dietlen, Hans:** "Die Perkussion der wahren Herzgrenzen" [Percussion of true heart limits]. *Deutsches Archiv für Klinische Medizin* [Leipzig], vol. 88 (1906–7), pp. 286–301.

The author studied percussion of the heart in over 200 adults and 25 children between 3 and 14 years. The group of "adults" included children of 15 or over. Eight dimensions were ascertained for subjects in the horizontal position according to Moritz's orthodiagraph method. A table gives percentage of correctness attained for each dimension in case of males, of females, and of children under 14. Two plates contain 276 diagrams of the heart.

142 **Dobrovolski, N.:** "Ob izmienieniakh arterii u dietie po vozrastam" [On the changes in the arteries in children according to ages]. *Medizinskiia Pribavleniia k Morskomu Sbornika* [St. Petersburg], 1903, pt. 1, pp. 24, 81, 149, 189, 246, 303; pt. 2, p. 11.

The author summarizes studies of arteries of embryos, infants, older children, and adults made by several writers. In numerous tables he gives averages of diameters of arteries, thickness of arterial walls in micromillimeters, and circumference of arteries as obtained by those writers. The purpose of his own study was to ascertain changes in arterial walls produced by the growth of the individual. With this aim in view he studied the arteries of the bodies of 29 children, most of them under 1 year old, and those of 2 adults. In a number of tables he gives the circumferences and thicknesses of the walls of various arteries of each subject and presents his findings on the increase with age in the thickness of the walls and circumferences of the various arteries and aorta. Bibliography.

143 **Elsässer:** "Über den Zustand der Fötuskreislaufwege bei neugeborenen Kindern" [Condition of fetal circulatory passages in newborn children]. *Zeitschrift für die Staatsarzneikunde* [Erlangen], 21st year (1841), pp. 3–18.

The author examined the fetal circulatory system in 144 newborn infants. Of 52 born dead, 48 showed the fetal passages still open, but in 4 the foramen ovale was closed. Of the other 92 infants who died during the first month, 58 showed passages fully open. Hence the time of closing is uncertain. As a rule, ductus Arantii closes first, then ductus Botalli, and, last, foramen ovale. In other words, fetal circulatory passages are usually fully open some time after birth. Therefore, their being open or closed is no indication whether a newborn child found dead has breathed or not.

144 ——— "Über den Zustand der Fötuskreislaufwege bei neugeborenen Kindern" [Condition of fetal circulatory passages in newborn children]. *Zeitschrift für die Staatsarzneikunde* [Erlangen], vol. 63–64 (1852), pp. 247–261.

On examining 70 stillborn children the author found ductus Botalli and foramen ovale open in all, and ductus Arantii open in all but 1. Among 300 infants that died after birth all passages were open in 80 of 108 prematurely born and in 127 of 192 full-term infants. Therefore, as a rule, the fetal passages mentioned are still open after birth. The time at which they close can not be determined precisely, but it falls within the first six weeks.

145 **Gibson, G. A.:** "Some deductions from a study of the development of the heart." *Edinburgh Medical Journal*, vol. 38, pt. 1 (1892), pp. 429–433.

Largely a discussion of fetal growth. Contains one plate showing comparison of the thickness of the walls of the heart in eight specimens from the age of 3½ months (fetal) to 22 months (postnatal).

146 **Gierke:** "Über die Lage und Grösse des Herzens im Kindesalter" [Position and size of heart in childhood]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 2 (1868–69), pp. 391–394.

The author measures the size and location of heart in 50 normal children, aged between 8 days and 13 years, all having well-formed thoraxes. He discusses percussion, which he finds easier and more reliable in children than in adults. The results are presented in two drawings and one table giving the constitution, age, height, and weight, and the dimensions of thorax and of heart.

147 **Groedel, Franz M.:** "Die röntgenologische Untersuchung des kindlichen Herzens" [Röntgen-ray investigation of the heart of the child]. *Ztschr. f. Kinderh.* [Berlin], vol. 29 (1921), pp. 36–42.

The author discusses the great value of taking Röntgen photographs of the hearts of children. Any method, he asserts, is adapted to young children. From the school age on, only orthodiagraphy or teleröntgengraphy should be used. Size, form, and function can thus be studied satisfactorily. The orthodiagraphic relation between heart and basal breadth of the lungs is on an average 1 : 1.9. The author discusses also the great variations of the heart and the pathologically enlarged heart in the growing body.

148 **Haberda, Albin:** Die fötalen Kreislaufwege des Neugeborenen und ihre Veränderungen nach der Geburt [Fetal Circulatory Blood Vessels of the Newborn Infant and Their Changes after Birth]. Verlag von Josef Säfár, Vienna, 1896. 112 pp.

In addition to citing the work of many other investigators, the author gives results of his own studies on the time when the stump of the umbilical cord came off for 155 infants, and of his observations on obliteration of navel vessels in over 100 cases. He examined the ductus arteriosus in about 500 bodies of young children.

149 **Hapke, Theodor:** Über die Bestimmung der Herzresistenz bei Kindern [On Ascertaining Resistance of Children's Hearts]. Gottingen, 1893. 42 pp.

Inaugural dissertation (Gottingen University). The author explains his procedure in taking chest measurements and "heart resistance" of 21 boys from 1¾ to 14 years and 20 girls from 4 to 13 years, and describes in detail, using tables, how maximum breadth and resistance vary with age, height, weight, constitution, and position of diaphragm. The article concludes with a bibliography and a large chart giving all details for the 41 subjects examined.

150 **Hochsinger, Carl:** Die Auscultation des kindlichen Herzens [Auscultation of the child heart]. *Beiträge zur Kinderheilkunde aus dem Ersten Öffentlichen Kinderkranken-Institute in Wien* [Vienna], pt. 1, 1890–91. 194 pp.

The first two chapters of this treatise, entitled "Introduction" and "Normal Auscultation," describe the heart in healthy children and repeat many data collected by other students. The heart in the young child is strong, owing to the relatively wide diameter of the subclavian and carotid. Between the ages of 7 and 12 this diameter diminishes as compared with the mass of the heart. The conclusions drawn by Rillet and Barthez from examination at autopsy of 193 children, aged between 15 months and 14½ years, show that the girth of the heart remains relatively the same between 15 months and 5½ years; from then to puberty it increases. The author considers normal auscultation, rhythm of heart tones, prevalence of systolic tones, influence of respiration, with tables by Steffen on the frequency of the pulse, and by Beneke and Bigot on the volume of the heart and width of the aorta and pulmonalis in children.

151 **Lange, R., and H. Feldmann:** "Herzgrössenverhältnisse gesunder und kranker Säuglinge bei Röntgendurchleuchtung" [Size of heart in healthy and sick infants determined by Röntgen rays]. *Monatschr. f. Kinderh.* [Berlin], vol. 21 (1921), pp. 458–474.

The authors studied the size of the heart of 150 infants with the X rays according to Altstaedt, photographing some many times. In healthy children the relation of transverse diameters of heart and lungs is 1 : 1.9–2; in new born, 1 : 1.7. The latter have relatively large hearts. The infant heart is usually a long oval, and its position is slightly tilted, almost never horizontal. It shows, however, a remarkable movability.

152 **Linzenmeier, Georg:** "Der Verschluss des Ductus arteriosus Botalli nach der Geburt des Kindes" [Closure of the ductus arteriosus Botalli after the birth of the child]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 76 (1915), pp. 217–253.

After discussing discovery by Galen of the closing of the ductus arteriosus at birth, and the investigation concerning it since Harvey, the author attempts to test the topographical and anatomical findings of Walkhoff. He dissects four full-term infants that died at birth without breathing, and two that died at age of 4 or 5 days when the tissue would still show conditions at birth, describing in detail how the chests had changed in these two groups. He also inflated the lungs in 15 fetuses, treating some with lime, some with paraffin, till he obtained three good molds of the ductus tube, wherein a sudden bend was clearly to be discerned. He concludes that several factors are concerned in closing the arterial duct. The newborn infant breathes, the lungs expand, the heart is raised in toto, it turns on its long axis, and its point turns to the left. The tube is bent; there is a muscular contraction. All this is made possible by the loose placing of the ductus and the yielding structure. One table and a bibliography are included.

153 **Ludger, Henri-Edmond-Guillaume:** De la mensuration clinique du cœur chez les enfants du sèxe masculin de 10 à 14 ans [The Clinical Measurement of the Heart of Boys 10 to 14 Years of Age]. Paris, no. 76, 1883. 50 pp.

Thesis for medical degree (University of Paris). The original work consists of observations of 210 subjects as to height, weight, chest circumference, pulse rate, constitution, and dimensions of the heart. The method of ascertaining heart dimensions is minutely described. Results are tabulated. The relation of average dimensions of the heart to height and to chest circumference are studied. Results are inconclusive.

154 **Mayer, Katherine M.:** "Obesrvations on the capillaries of the normal infant." *Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 381–387.

The author made microscopic examinations of the capillaries of the fingers of a number of infants and has illustrated her findings with eight drawings. "In general," she states, "it might be said that from birth the end capillaries begin development from small loops at the periphery of the subcapillary plexus. Until about the third month the development is very rapid. From then on there is not much change." The article includes a review of the literature of similar research.

155 **Mosler, E., and M. Kretschner:** "Über den Tonus des kindlichen Herzmuskels" [On the tonicity of the cardiac muscle in the child]. *Klinische Wochenschrift* [Berlin and Munich], vol. 3 (1924), pp. 2096–2097.

The author made Valsalva's experiment on 16 children, 7 of them girls 6 to 14½ years old, in order to form a judgment of the degree of persistency of form of the child's heart and to compare the data with those obtained on adults. All children had healthy lungs and organs of circulation. In most of these cases the child's heart showed very slight resistance to Valsalva's experiment, as shown by the shadow on the X-ray screen. The pulse disappeared in all cases in which the Valsalva was carried out in an orderly manner; the blood pressure, which before the experiment was 100 to 120, went down to zero after 3 to 4 pulse beats. There was never a rise in the blood pressure as is the case with adults. The authors conclude that the child's heart possesses a considerably slighter persistency of form than the adult heart, that it, therefore, resembles an insufficient adult heart with decreased tonicity; that for this reason children in general should be kept away from excessive exercise, and that in athletics and gymnastics attention should be paid to proper breathing exercises, because children knowing how to breathe properly will not often employ the type of breathing of the Valsalva experiment, and will thus avoid injury to the circulatory system. The X-ray findings for each case are given in a table.

156 **Potain, and Vaquez:** "Du cœur chez les jeunes sujets et de la prétendue hypertrophie de croissance" [The heart in young people and its alleged hypertrophy due to growth]. *Semaine médicale* [Paris], vol. 15 (1895), pp. 413–415.

The authors deny that growth causes a cardiac hypertrophy such as was described in *Semaine médicale* in 1885 by G. Sée, and in 1894 by S. Saache. They examined 43 boys 5 to 13 years old at the Hospital of St. Louis; 27 boys 14 to 20 years old at the École d'Alembert, in a very fine state of health; 12 soldiers from 20 to 24 years old at Fort de Mogent; and 20 more soldiers between 20 and 29 at the École de la Faisanderie. Pathological hearts were excluded. The authors regard percussion as the only accurate means of determining the volume of the heart. They found that the heart grows gradually to the eleventh or twelfth year, then very rapidly for some years, and more moderately between the seventeenth and twenty-third years. The volume of the heart shows no relation to weight but a decided relation to height and thoracic perimeter, as is shown in a graph. No relation appears to exist among frequency of pulse, arterial tension, and physiological development of the heart. Another graph shows how muscular exercise in military service increases the volume of the heart. Dividing soldiers into groups according to amount of gymnastics, the authors ascertained for the volume of the heart 91 cubic centimeters in the least athletic group, 98 cubic centimeters in the next, and 101 cubic centimeters in the most athletic group.

157 **Preisich, Kornel:** "Herzvolumen im Säuglings- und Kindesalter" [Volume of the heart in infancy and childhood]. *Jahrb f. Kinderh.* [Berlin], ser. 3, vol. 41–42 (1920), pp. 400–403.

This article contains a table giving age from birth to 12 years, sex, cause of death, and heart volume, of 35 cases in the Stephanie Hospital of Budapest. The author recognizes the limitations of his data and intends the article merely as encouragement to further investigations on the volume of the heart. The method of dissecting the heart and finding its volume by amount of water displaced from a full vessel is described. The volumes varied from 19 cubic centimeters in a newborn infant to 133 cubic centimeters in a child from 8 to 12 years old.

158 **Sahli, H.:** Zur topographischen Percussion des kindlichen Herzens [Topographical Percussion of the Child Heart]. Bern, 1881. 47 pp.

Thesis (University of Bern). Author gives much space to other authorities on the heart, as Bizot and Beneke on dimensions; Rauchfuss on position; and Locher, Bednor, Gierke, and Weil on percussions. Tables give many data on the normal deep dullness of children's hearts from the age of 9 months to 12 years and the normal superficial dullness. The text lists differences between the child and the adult heart and reasons therefor. Transition sometimes has taken place by the age of 6, sometimes not before 12. Many phases of the heart are treated, such as mobility, relation to lungs and thymus, and shifting of position according to pose of body.

159 **Sawyer, J. E. H.:** "A note upon the position of the apex beat in children." *British Journal of Children's Diseases* [London], vol. 6 (1909), pp. 535–540.

The author examined 500 normal children of varying types of development from less than 1 year to 15 years of age to determine the position of the apex beat in relation to the left mammary line in the fifth intercostal space. All the children were examined in the erect position, the mammary line being determined by the position of the left nipple. Charts show the usual position of the apex beat in each year of childhood. The apex beat was found outside this line in 104 cases, at the line in 310 cases, and inside in 86 cases. The author concludes that the apex beat is normally outside the line up to the third year and at the line from the third to the tenth year; after this it gradually assumes the adult position.

160 **von Starck, W.:** "Die Lage des Spitzenstosses und die Percussion des Herzens im Kindesalter" [Position of apex beat and percussion of heart in childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 9 (1887–88), pp. 240–293.

The author gives summaries, often with tables, of work done by other investigators on the size of the child's heart, its position, form and development of thorax, position of mammillæ, etc., and presents his own findings from examination of 300 healthy, well-built children between the ages of 12 days and 15 years. The tables, covering eight pages show, for about 20 children in each year, circumference and diameters of chest, position of apex beat, and distance of mammillæ from midline. Apex beat lies outside of the mammillary line usually till the fourth year, then more and more seldom till the thirteenth year; it ceases to do so after. In general, the apex beat is higher in childhood than in adult life. Many pages are given also to percussion of children's hearts. Tables and eight figures are presented. Bibliography.

161 **Stocquart, A.:** "Contribution à l'anatomie de l'enfance. Le poids du cœur" [Contribution to the anatomy of childhood. The weight of the heart]. *Archives de médecine et de chirurgie pratiques* [Brussels], vol. 3 (1889), pp. 165–167.

Weights of 33 hearts of children, aged from 1 to 10 years, from the author's own researches, are tabulated with no comment except a description of the method of dissection.

162 **Strassmann, P.:** "Anatomische und physiologische Untersuchungen über den Blutkreislauf beim Neugeborenen" [Anatomical and physiological investigations on circulation of the blood in the newborn]. *Archiv für Gynaekologie* [Berlin], vol. 45 (1893–94), pp. 393–445.

After devoting pages to the ductus arteriosus as treated by Galenus, Botalli, Harvey, and others, the author describes his own dissections and operations on many newborn infants and fetuses, as well as on animals. A long and careful account is given of the position and condition of organs in the chest before breathing and of the mechanical closing of the ductus arteriosus. The author gives 13 conclusions. Bibliography.

163 ——— "Zur Lehre vom Blutkreislaufe beim Neugeborenen" [The knowledge of the circulation of the blood in the newborn infant]. *Berliner Klinische Wochenschrift* [Berlin], vol. 31 (1894), pp. 498–500.

The author discusses the closure of the ductus arteriosus (falsely called ductus Botalli), the great vessel that leads from the pulmonalis to the aorta in the fetus and is dropped from the circulation after birth. He dissected this duct in the fetus, and also experimented on it with injections of gypsum, gelatine, etc. He explains how the duct is closed when breathing commences by the lowering of pressure in the right heart and in the arteria pulmonalis. In the fetus before the thirtieth week the closure is not sufficient and all the vessels in the thorax are filled with blood. But normally the closing of the duct is momentary and mechanical, as is proved by the clear heart tones of the newborn.

164 **Térrien, Eugène:** "Situation et déplacements physiologiques de la pointe du cœur chez les enfants de 5 à 15 ans" [Situation and physiological displacements of the apex of the heart in children from 5 to 15 years of age]. *Revue mensuelle des maladies de l'enfance* [Paris], vol. 21 (1903), pp. 548–552.

A study of normal children (number not given) in three postures: Lying on the back, on the left side, and on the right side.

165 **Vallois, H., and Ch. Bennejeant:** "Le développement du canal dentaire inférieur et la vascularisation des dents de la machoire inférieure aux différents âges" [The development of the lower dental canal, and the vascularization of the teeth of the lower jaw at different ages]. *Bulletins et mémoires de la Société d'anthropologie de Paris*, ser. 6, vol. 4 (1913), pp. 568–584.

A study to test the theory of Serres that the blood supply of the milk teeth is furnished by a special artery occupying its own canal. Data are based on a study of 56 mandibles of children, from birth to 8 years of age, and about 20 fetuses and newborn infants. The author found the theory untenable.

166 **Vasilevsky, S. O.:** "Polozhenie i granitzi serdtza u dietiei" [Position and limits of heart in children]. *Vrach* [St. Petersburg], vol. 6 (1885), pp. 546, 560.

An account of the method used by the author for finding the position and limits of the heart in 865 living children and 112 cadavers. The ages represented 2 weeks to 12 years. The author gives for each age the number of cases, width of the heart at the level of the nipples, and width from the apex on the left to the outer border on the level of the diaphragm on the right.

167 **Veith, Adolf:** Über orthodiagraphische Herzuntersuchungen bei Kindern im schulpflichtigen Alter" [Orthodiagraphic investigations of the heart in children of school age]. *Jahrb. f. Kinderh.* [Berlin], vol. 68 (1908), pp. 205–223.

Veith examined orthodiagraphically the hearts of healthy children between 6 and 14 years of age. The tests were made in the Children's Clinic of Munich University upon 80 boys from a Catholic orphanage and 25 boys and 25 girls from the public schools. All the children were examined sitting and some also in a lying position. The heart was taken in diastole with moderate breathing. The median distance right and left was found to be on an average 1 : 22 : : 2 : 5. There was a certain parallel between body size and the heart silhouette. Weight and chest girth proved less significant than with adults. Age in itself and sex showed no effect. Tables contain many measurements of the heart as well as weight, height, age, and chest girth.

168 **Vernois, Maxime:** Mémoire sur les dimensions du cœur chez l'enfant nouveau-né [Memoir on the Dimensions of the Heart of the Newborn Child]. J. B. Ball ère. Paris, 1840. 40 pp.

Measurements are given of the hearts of 336 infants, aged 1 day to 4 months. Measurements taken were as follows: Height, breadth, thickness of left ventricle, thickness of right ventricle, thickness of interventricular partition, circumference of aorta at its union with the heart, circumference of pulmonary artery at its union with the heart. The exact position of measurements taken is described, and tables are given.

169 **Ziskin, Thomas:** "Development and size of the heart in children as revealed by teleroentgen-ray measurements." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 851–855.

From teleröntgenograms of the hearts of more than 400 children from 4 to 16 years of age the author computed 10 average measurements and ratios between measurements of the normal heart in childhood. Grouped in tables by age and by height these form a standard for differentiating normal from abnormal child hearts. The results of the study are also shown in charts. The author found that the ratio between the transverse diameter of the heart and the internal chest diameter diminishes slightly as the child develops, because of change in the position of the heart; that the right border of the heart does not extend relatively further to the right in childhood; that there is a constant ratio, approximately 50 per cent, between the median right and the median left diameters.

2. BLOOD

170 **Adelsberger, Lucie:** "Die Verdauungsleukocytose beim Säugling" [Digestive leucocytosis in the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 29 (1921), pp. 153–189.

Using Metz's apparatus for counting, the author studied digestive leucocytosis in infancy, giving in this article an account and table of each of 35 tests and concluding with a long bibliography. The text discusses the number of leucocytes after various diets and such factors in digestive leucocytosis as intestinal flora, ferments, heterologous albumin, and salts. After mother's milk leucopenia sets in and after artificial feeding, leucocytosis. But bacterial flora, though different, stand in no relation to this leucocytosis or leucopenia. Ferments do not affect the leucocyte reaction. The digestive leucocytosis falls usually in the second or third hour after a meal; it is probably due to an actual increase of white blood cells through a plastic stimulation of different substance on the leucopoietic system.

171 **Allaria, G. B.:** "Über die Molekülkonzentration des Blutserum bei nephritischen und nicht nephritischen Kindern" [Molecular concentration of blood serum in nephritic and nonnephritic children]. *Jahrb. f. Kinderh.* [Berlin], vol. 63 (1906), pp. 74–101.

Allaria studied molecular concentration of the blood serum of 19 children in the General Medical Clinic at Turin; 10 were nephritic and 9 had healthy kidneys. He took 50 to 80 cubic centimeters of blood from a vein. Cryoscopic point was determined by Beckman's thermometer and specific electrical conductivity by Wheatstone's bridge. The five tables contain data on the cryoscopic point, and the specific electrical conductivity, on albumin, sodium chloride, sodium carbonate, total of salts, erythrocytes, globular value, molecules, etc. A case history is given of each child. Average values for nonnephritic children were as follows: The cryoscopic point, 0.557°; the specific electrical conductivity, 110.15; sodium chloride, 5.67 grams; sodium carbonate, 1.5 grams; and total salts, 7.22 grams.

172 **Amberg, Samuel:** "The opsonic content of the blood of infants." *J. A. M. A.* [Chicago], vol. 48 (1907), pp. 304–308.

Examinations were made of the blood of 45 infants, according to the method of Simon and Lamar, which is briefly described. Since few of the infants (from a dispensary) were strictly normal, the author does not consider his results conclusive. They indicate that the opsonic content of the infant's blood does not follow the rules laid down by Moro for the bactericidal power of the blood; that the average values exceed those laid down by Simon for normal adults. A distinct advantage seems to exist in favor of the breast-fed infant.

173 **Appleton, V. B.:** "Determination of hemoglobin during infancy by the Palmer and Van Slyke methods." *Journal of Biological Chemistry* [Baltimore], vol. 34 (1918), pp. 369–372.

The blood of 103 children less than 2 years of age was studied by the Palmer method. All were normal, and about 90 per cent were breast fed. Blood was taken from the toe. The hemoglobin values, arranged in a table by age grouping, show an early rapid decrease and later more gradual decrease from 1 day to 23 months. Bibliography.

174 **Arneth and Nienkemper:** "Über das normale qualitative Leukocytenblutbild des Säuglings nach Arneth" [Qualitative picture of leucocytes in normal infant blood according to Arneth's method]. *Ztschr. f. Kinderh.* [Berlin], vol. 34 (1922–23), pp. 263–286.

A study of leucocytes of 10 normal infants during the first 10 days; 3 were breast fed, 3 bottle fed, and 4 on a mixed diet of human and cow's milk. The blood was taken between 11 and 12 a. m. and analyzed according to Arneth's method. One table gives a quantitative picture of total leucocytes, neutrophils, eosinophils, and mast cells; a second table gives neutrophilic and eosinophilic leucocytes, and the last table is the qualitative picture of lymphoid cells. The cells of infant's blood are remarkably sensitive to all influences, especially poisons. The article contains a detailed account of previous investigator's work

175 **Aschenheim, Erich:** "Der Einfluss der Sonnenstrahlen auf die leukocytäre Blutzusammensetzung" [The effect of the sun's rays on the leucocyte content of the blood]. *Ztschr. f. Kinderh.* [Berlin], vol. 9 (1913), pp. 87–98.

The author conducted 31 experiments during the summer at the forest station of an infant home, placing infants well and convalescent, for one hour in the sun, naked except for a head covering. The temperature varied between 30° C. and 38° C. The tests were begun three hours after meals, and the total number of leucocytes were counted before and after the tests. The results are presented in a long table. In 80 per cent of the cases the direct sunlight caused a general leucocytosis in the peripheral blood. The lymphocytes increased much more, relatively, than other kinds of leucocytes; there was a relative decrease of neutrophiles. The author believes the lymphocytosis partly accounts for the favorable influence of heliotherapy upon tuberculosis.

176 **Bahrdt:** "Demonstration zur Untersuchung der Lipämie beim Säugling" [Demonstration on the investigation of lipemia in the infant]. *Münchener Medizinische Wochenschrift*, vol. 55 (1908), p. 824.

The author tested lipemia in the infant by leaving a drop of blood to coagulate in a V-formed Neissen's tube and then centrifugalizing it. Lipemia begins one hour after a meal and lasts seven to nine hours. It is reduced in atrophy or enterocatarrh.

177 **Bakwin, Harry, and Helen Rivkin:** "The estimation of the volume of blood in normal infants and in infants with severe malnutrition." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 340–351.

Using a micromodification of the dye method of Keith, Rowntree, and Geraghty, by which blood volume can be determined with 4 cubic centimeters of blood, the authors made determinations of the blood, plasma, and corpuscular volume in a group of 30 infants under 8 months of age, normal for the purposes of this study, and in a second group of infants with severe malnutrition. Repeated determinations were made in 16 instances. Tables show total volume and volume per kilogram of body weight, grams hemoglobin per 100 cubic centimeters and serum protein per cent for both series of infants, and charts the volume of blood, plasma, and red cells per kilogram of body weight in relation to age in normal infants. The authors found that at birth the corpuscular volume is relatively high, falling rapidly so that the absolute volume of red cells is less at 8 weeks' of age than at birth. The average value of blood volume is 101 cubic centimeters per kilogram of body weight; of plasma volume, 61 cubic centimeters. The blood volume per unit of body surface in infants is much smaller than in adults. References.

178 **Bang, Ivar:** "Über Lipämie I" [On lipemia]. *Biochemische Zeitschrift* [Berlin], vol. 90 (1918), pp. 383–387.

At 10 a. m., before breakfast, the author tested the lipemia of 19 males, of whom one was 7 weeks old, one 9½ months, another 14 years, and six others students between 18 and 21. The average values were 0.02 per cent for fat, 0.09 per cent for cholesterin, 0.30 per cent for alcohol fraction; the values for ester lay between 0.12 per cent and 0.20 per cent, those for phosphatids between 0.13 per cent and 0.27 per cent. The author concluded that age plays no rôle in the lipoid content of blood. This article also gives results of tests on dogs.

179 **Bardach, Martha:** "Über die Suspensionsstabilität der Blutkörperchen im Kindesalter" [Suspension stability of blood corpuscles in childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 69–70 (1921–22), pp. 114–122.

Author tested suspension stability of corpuscles of blood by Plant's method in 113 boys and girls, normal and sick, between the first and fifteenth years. Data are shown in tables. In healthy children the lower limit was 10 millimeters, and the average was between 11 and 22. These values are higher than

in adults. No constancy was determined in speed of sinking, nor was any effect noticeable due to sex, age (except in first month), meals, motion, or hemoglobin content; but many diseases had a decided effect. It is to be assumed that the acceleration of sinking in childhood is the expression of a decreased stability of the blood fluid.

180 **Bass, Murray H.:** "The sugar content of the blood in childhood." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 63–69.

Blood-sugar determinations in 26 normal children, aged 2 to 14 years, showed a variation from 0.072 to 0.113 per cent; age and sex had no influence Methods are fully described. References.

181 **Bauer, J., and Kathe Neumark:** "Über den Gehalt des Säuglingsblutes an hämolitischen Normalambozeptoren" [Hemolytic normal amboceptors in infant blood]. *Arch. f. Kinderh.* [Stuttgart], vol. 53 (1910), pp. 101–122.

The manner of treating the serum and of noting the hemolysis and data as to age, diet, diagnosis, and hemolysis of about 86 children are given. The authors arrive at the conclusion that artificially fed children usually possess normal amboceptors sooner than breast-fed children. The probability that infection influences the formation of these antibodies is pointed out.

182 **Benjamin, Erich:** Die Beziehungen der Milz zu den Lymphocyten des kindlichen Blutes [Relation of Spleen to Lymphocytes in Children's Blood]. Leipzig, 1905. 36 pp.

Inaugural dissertation (University of Leipzig). The author studied the relation of the variation in the size of the spleen to the hematopoietic function. He used Gravitz's method in extracting a drop of blood. His subjects were 41 infants between 1 month and 1 year of age. Eight had a spleen of less than 5 by 6 centimeters, and 33 a spleen of more than 5 by 6 centimeters. Tables give findings in microlymphocytes, macrolymphocytes, neutrophils, and eosinophils. A direct relation between size of the spleen and the blood picture is not discernible, but the size of the spleen and number of small lymphocytes stand in direct proportion.

183 **Berggrün, Emil:** "Über Fibrinausscheidung beim gesunden und kranken Kinde, nebst Analysen normalen und pathologischen Blutes" [Fibrin elimination in the healthy and the sick child, with analyses of normal and pathological blood]. *Arch. f. Kinderh.* [Stuttgart], vol. 18 (1894–95), pp. 178–197.

For a year the author studied fibrin elimination in 30 normal and 40 sick children between 3 and 10 years of age. He determined fibrin quantitatively and also made a total blood analysis according to Alexander Schmidt, and presents a table relating to specific gravity, dry residue of defibrinated blood, etc. Other tables show the influence of digestion, and a comparison with adults is made. Children's blood is characterized by a rich elimination of fibrin, small water content, and high weight of red corpuscles. Elimination of fibrin increases during digestion.

184 ——— "Zur Kenntnis der Zusammensetzung des Blutes im Kindesalter" [Knowledge of composition of blood in childhood]. *Wiener Medizinische Blätter*, vol. 17 (1894), pp. 656–657.

The author, using Schmidt's method of determining dry residue of blood, discovered that fibrin elimination is greater in the healthy child than in the normal adult; the dry residue both of blood and of serum is very high in the child; the weight of the red corpuscles is greater than in the adult; but the percentage of residue of the red corpuscles is somewhat lower. The effect of various diseases on blood is traced.

185 **Biffi, U., and P. Galli:** "Recherches sur le sang et sur les urines des nouveau-nés et des nourrissons" [Researches in the blood and urine of the newborn and of nurslings]. *Journal de physiologie et de pathologie générale* [Paris], vol. 9 (1907), pp. 721–736.

About 40 infants under 1 year of age were examined. Descriptions of the subjects and the technique of studies are fully given. Tables show count of red corpuscles in 16 cases and the percentage of volume of corpuscles in ½ cubic millimeter of blood in 25 cases; count of white corpuscles in 15 cases; leucocytal formula in 29 cases; time of initial coagulation, 15 cases; time of complete coagulation, 52 cases; presence of yellow pigment in the blood, 40 cases; presence of bilirubin in filtered urine and urinary sediment, 40 cases. Bibliography.

186 ——— ——— "Ricerche sul sangue e sulle urine dei neonati e dei lattanti" [Studies of the blood and urine of newborn infants and nurslings]. *Rivista di clinica pediatrica* [Florence], vol. 6 (1908), pp. 1–27.

The author studied the blood and urine of 29 infants from several hours to 1 year old for the purpose of finding the amount of plasmochromin in the blood and its relation to the elimination of bile pigments in the urine. They give their results in several tables, quote a number of writers, and conclude that during fetal life and in the first days of extrauterine life there circulates in the blood a quantity of plasmochromin greater than in the adult. This

substance, often deposited in the cutaneous tissues, gives rise to jaundice of the newborn and is later eliminated entirely or partly in the urine. Bibliography.

187 **Bing, H. J., and O. Windeløv:** "Undersøgelser over Blodsukkeret hos Børn" [Investigation of blood sugar in children]. *Bibliotek for Laeger* [Copenhagen], vol. 105 (1912–13), pp. 181–194.

Methods and findings of previous investigators are given. Thirty-six infants in the public hospital of Copenhagen (15 well and 21 suffering from various disturbances) were observed. Data are given in six tables showing age, time elapsed since last feeding, type of feeding, weight, and disturbance, if any. It is concluded that the blood-sugar concentration of well infants is the same as that of well adults.

188 **Borland, Hugh H.:** "Coagulation of infantile blood." *Glasgow Medical Journal*, ser. 4, vol. 60 (1903), pp. 165–170.

The author tested the blood of a number of infants (exact number not given) from 5 minutes to 10 days of age, obtaining 5 cubic centimeters from the ear or the great toe, and using Wright's coagulometer in the test. The temperature at which the observations were made was 18.5° C.; hemoglobin was estimated by Oliver's hemoglobinometer by candle light; specific gravity was determined by Hammerschlag's method; red and white cells were enumerated by the Thoma-Zeiss hemocytometer. Results are reported largely by individual cases. The author found an unmistakable increase of coagulability with age, beginning with the first day of life.

189 **Bouchut and J. Dubrisay:** "De la numération des globules du sang à l'état normal et à l'état pathologique chez les adultes et chez les enfants" [The count of blood corpuscles in normal and pathological conditions of adults and children]. *Gazette médicale de Paris*, ser. 4, vol. 7 (1878), pp. 168–9, 178–9.

Includes observations of 15 "normal" children, 2 to 15 years of age. The highest red count was 5,502,000; the lowest, 2,160,000; average, 4,269,911. The highest white count was 12,181; the lowest, 761; average, 6,704.

190 **Breinl, A., and H. Priestley:** "Observations on the blood conditions of children of European descent residing in tropical Australia." *Annals of Tropical Medicine and Parasitology* [Liverpool], vol. 8 (1914–15), pp. 591–608.

Careful blood examinations were made in Townsville on 574 school children of European descent, between 7 and 15 years of age, of whom the majority had been born and had always resided in tropical Queensland. The results indicated: (1) That the average number of red blood corpuscles is not diminished when compared with analogous figures for children born and bred in a temperate climate; (2) that the average hemoglobin content of the blood is normal; (3) that the number of leucocytes is slightly increased; (4) that the average blood pressure does not show any difference from that of normal children in temperate climates. References.

191 **Brown, Muriel J.:** "The sugar content of the blood in normal and under-nourished children, and the effect of fat on the absorption of carbohydrate." *Quarterly Journal of Medicine* [Oxford], vol. 18 (1925), pp. 175–189.

Maclean's method (Maclean and deWesselow, Quarterly Journal of Medicine, 1920–1, vol. 14, p. 103) was used in blood-sugar estimations. A study of 35 normal children, whose ages ranged from a few hours to 1 year, showed that the sugar content of the blood of normal infants up to 2 weeks of age varies between 0.072 per cent and 0.097 per cent, and from 6 weeks up to 1 year from 0.086 per cent to 0.116 per cent. Findings are presented in tables and charts. References.

192 **Caronia, G., and L. Auricchio:** "Sulla genesi delle reazione leucocitarie durante la digestione nei lattanti" [On the development of leucocytic reactions during digestion in infants]. *La Pediatria* [Naples], vol. 28 (1920), pp. 1129–1134.

Study of leucocytic reactions during digestion in three infants. The author found that in the normal infant there are present leucolytic substances during the first hour after ingestion of food and at the same time there is a maximum decrease in leucocytes; later the leucocytic substances disappear and leucocytosis becomes manifest. In a dyspepsic infant leucolytic substances are absent or appear only in minimum traces at the various stages of digestion and at the same time the white corpuscles show no decrease or a very slight decrease and leucocytosis is absent or appears only in slight traces. Several charts are given.

193 **Carpenter, H. C., and J. C. Gittings:** "The coagulation time of blood in infants and children." *Am. J. Dis. Child.* [Chicago], vol. 5 (1913), pp. 1–17.

A critical review of previous work with emphasis on the report of Myer Solis-Cohen. No exact observations are reported. The general conclusion is that coagulation time in adults and in infants shows too wide a variation to be of diagnostic value.

194 **Carstanjen, Max:** "Wie verhalten sich die procentischen Verhältnisse der verschiedenen Formen der weissen Blutkörperchen beim Menschen unter normalen Umständen" [The percentage relations of the various forms of white blood corpuscles in mankind under normal conditions]. *Jahrb. f. Kinderh.* (Berlin), vol. 52 (1900), pp. 215–241, 333–359, 684–720.

The author studies the percentage in the blood of polynuclear leucocytes, lymphocytes, transitional forms, large mononuclear leucocytes, and eosinophilic cells. His subjects he chose from the healthiest of the poor people that visited his hospital. He divides them into the following groups: 5 newborn, whom he examined daily during the first 12 days; 5 infants from 1 to 6 months old and 5 from 6 to 12 months; 5 in each year from the second to the fifteenth; and 5 from 15 to 20 years. Preceding investigations are discussed for purposes of comparison. The results of the present study are as follows: Hemoglobin content is higher in the newborn than later. Polynuclear leucocytes show a high percentage (73.45) during the first 24 hours. They then sink to 36.12 by the ninth day, and so remain a half year. From the fifth year to old age they amount to 51.86 to 69.22 per cent. Lymphocytes have a low value (16.05 per cent) in the first 24 hours and a value of 45.6 per cent by the twelfth day. They vary between 19.33 and 33.25 per cent from fifth year to old age. The transitional forms show 18.66 per cent in the first week and fluctuate between 6.75 and 9.47 per cent from the age of 6 months to the end of life. Large mononuclear leucocytes seldom exceed 1 per cent at any period. Eosinophilic cells are not affected by age.

195 **Cherry, Thos. H., and Ed. G. Langrock:** "The relation of hemolysis in the transfusion of babies with the mothers as donors." *J. A. M. A.* [Chicago], vol. 66 (1916), pp. 626–627.

In 34 tests of agglutination with mothers' and their newborn infants' blood no agglutination was noted by the ocular method in any case. Hence these serologists conclude that all mothers can be used as donors for their infants if there is no contraindication in the mother's condition.

196 **Courtney, Angelia M., and Helen L. Fales:** "Variations in infants of total blood solids and the concentration of sodium chlorid in the plasma." *Am. J. Dis. Child.* [Chicago], vol. 14 (1917), pp. 202–209.

The authors made 79 determinations of blood solids and 81 of blood chlorid on 67 children, most of them under 2 years of age. Thirteen were well-nourished, normal children from 2 months to 6 years of age. A table of data on the normal children shows age, percentage of water in blood, total solids (percentage by weight) and chlorid in 1 cubic centimeter of plasma, computed as grams of sodium chlorid. The concentration of chlorid in the plasma was about the same as that of normal adults; the average for total solids in the blood was about 5 per cent lower than for adults. Bibliography.

197 **Drucker, Paul:** "Investigations on the normal values for the hemoglobin and cell volume in the small child." *Acta Pædiatrica* [Upsala], vol. 3 (1923–24), pp. 1–39.

The author describes in great detail his study of the blood of 146 healthy children between 2 weeks and 6 years of age, including for comparison studies of the blood of 124 children suffering from various maladies. Tables show the differences in hemoglobin value between heel and ear blood; between blood obtained by incision with a sharp cataract knife and with a blunter instrument; between blood obtained by a superficial and by a deep incision. Findings are compared with those of other investigators, with references. The great divergencies in reported results are attributed to technical and physiological errors, and to differences in racial characteristics. The author's examination of 85 healthy children from 2 weeks to 2 years of age showed a rapid initial fall in the hemoglobin curve, which reached a low level about the second or third month, remained level for the first year and rose again during the second year. The cell volume, except in the first few months, was found to be about the same as that of healthy adult women.

198 **Dupérié, P. L. André:** Globules du sang; variations physiologiques dans l'état anatomique du sang [Blood Corpuscles; Physiological Variations in the Anatomical Condition of the Blood]. Paris, no. 125, 1878. 91 pp.

Thesis (University of Paris). In chapters two and three (pp. 49–74) modifications of the blood according to age and sex are reported and also many observations of the blood of the newborn and of children at different ages.

199 **Durante, D.:** "Leucocitosi digestiva nei bambini in condizioni normali e morbose del tubo intestinale" [Digestive leucocytosis in children under normal and pathological conditions of the intestinal tract]. *Pediatria* [Naples], vol. 9 (1901), pp. 213–231.

After quoting from a number of writers on the pathological and physiological conditions affecting leucocytosis, the author gives an account of his own study of digestive leucocytosis of children under normal and pathological conditions. He gives in several tables the circumstances of each of the 38 cases and concludes that there is in children an increase of the white blood corpuscles during digestion, this increase being smaller when the child is on a milk diet than when the diet is mixed, and more abundant when child is on high protein diet. Diseases of the intestinal tract do not have a noticeable effect on leucocytosis; but when the general condition of the child is below par, digestive leucocytosis is less active than when he is in robust health.

200 **Duzár, J., and S. Rusznyák:** "Examination of plasma proteins in infants." *Am. J. Dis. Child.* [Chicago], vol. 28 (1924), pp. 441–446.

The authors describe their method of determination, and the results obtained by examination of healthy and sick infants. The number of subjects is not given. In normal infants they found that conditions characteristic of the newborn remain unchanged until the middle of the second month. The blood of the newborn is low in fibrinogen, rich in globulin and total albumin; erythrocytes drop very slowly in the Linzenmeier tube. The Frisch-Starlinger and Gorloczy reactions are negative, while the Daranyi is positive. The nature and extent of the changes normally completed during the second month are shown graphically by chart. References.

201 **Elder, George, and Robert Hutchison:** "Some observations on the maternal and foetal blood at birth." *Edinburgh Medical Journal*, vol. 41 (1895), pp. 105–113.

The author compares his observations with those of other workers. The fetal blood was taken from the umbilical cord at the time of birth. The maternal blood was collected from the ear in the first and second stages of labor. The red blood corpuscles were estimated on six infants and found 350,000 to 500,000 cells per cubic millimeter higher than the maternal count. Hemoglobin was recorded by Gower's method in nine infants; the average was 105.6; this was definitely above that of the hemoglobin of the seven mothers examined. The white count was made in 12 infants. The average was 17,884 (per cent of differential count also given), which was above the leucocytosis of pregnancy.

202 **van Emden, J. E. G.:** "Klinische Untersuchungen über die Blutplättchen" [Clinical investigations on the blood platelets]. *Fortschritte der Medicin* [Berlin], vol. 16 (1898), pp. 241–251.

In his general investigations on the number of blood platelets in the adult and in animals the author gives a table on the erythrocytes, platelets, and leucocytes in the blood of five newborn children. At first fewer platelets circulate in the infant's blood than in the adult's, but the number soon rises.

203 **Fehrsen, A. O. M.:** "The haemoglobin and corpuscular content of the blood of the newborn." *Journal of Physiology* [London], vol. 30 (1904), pp. 322–329.

The results are given of observations of the blood of 40 infants, examined on the first and the tenth day of life. Methods are described. Highest erythrocyte count, 7,250,000; lowest, 4,300,000. Highest leucocyte count, 32,500; lowest, 7,600. In counts of over 18,000 the author found a large increase of finely granular eosinophil cells; as the count decreased, there was an increase in the percentage of lymphocytes and mononuclear elements. Hemoglobin was 110 per cent to 115 per cent. Nucleated red blood corpuscles were invariably present up to the third hour after birth. A high color index was found in all cases. Bibliography.

204 **Filia, A.:** "Sul contenuto in colesterina del sangue di bambini" [The cholesterin content of the blood of children]. *Rivista di clinica pediatrica* [Florence], vol. 12 (1914), pp. 339–345.

The author studied the cholesterin content of human milk from 11 individuals; also the cholesterin content of the blood of 13 breast-fed infants from 8 days to 10 months old, and of 12 bottle-fed infants from 2 to 10 months old. The author gives his findings in two tables and two charts, and says that cow's milk does not seem to be richer in cholesterin than human milk, and that in the majority of cases studied the blood of the breast-fed children is richer in cholesterin than that of the bottle-fed children. The author believes more work is necessary before definite conclusions can be drawn.

205 **Findlay, L. R. Fua, and C. T. Noeggerath:** "Ist der hämolytische Komplementgehalt des Blutserums ein Mass der Säuglingskonstitution?" [Is the hemolytic complement content of blood serum a standard of an infant's constitution?]. *Jahrb. f. Kinderh.* [Berlin], vol. 70 (1909), pp. 732–751.

With comparatively large amounts of blood from the veins of 98 infants, the authors tested the serum with the usual titration in hemolytic series to distinguish the serum rich in complement from that poor in complement. In all 98 cases he employed ram's blood, and in 33 cases also, the erythrocytes of guinea pigs. There was usually good agreement; usually, but not always, the hemolytic influence of ram's blood is stronger. The children are designated as heteroentrophic, heterodystrophic, and as subject to alimentary intoxication. Case histories and curves are given in 11 cases. A constant relation between complement content and health is not to be accepted. When it does occur it is to be considered merely the expression of development or greater age of child. The author thinks it premature to base nutritive-physiological questions on the changing amount of complement in the blood.

206 **Fischl, Rudolf:** "Zur Histologie des kindlichen Blutes" [Histology of infant's blood]. *Zeitschrift für Heilkunde* [Berlin], vol. 13 (1892), pp. 277–299.

Among children only infants show a difference in the histology of the blood from adults. The author examined 50 newborn infants, of whom 7 were perfectly healthy and over 3,250 grams in weight. Of these, five showed no

erythroblasts. Of six premature infants, whose birth weight varied between 2,220 and 2,520 grams and length between 44 and 47 centimeters the erythroblasts were missing in three cases. But from other observations the author concludes that in infants below 2,000 grams and 40 centimeters many erythroblasts are to be found which belong almost entirely to the normoblast type and show no mitosis.

207 **Flusser, Emil:** "Untersuchungen über die Gerinnbarkeit des Blutes in den ersten Lebenswochen" [Investigations concerning the coagulation of the blood in the first weeks of life]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 12 (1913–14), pp. 705–13.

Flusser determined the blood-coagulation time in infants by Wright's method, with the Bürker and Schulz modifications, uniformly in a temperature of 19° to 20° C., between 5 and 6 p. m. In 50 experiments on healthy children in their second week he found the average time to be 8 minutes and 15 seconds; in the same number of experiments on infants slightly ill, 8 minutes and 10 seconds; and in 92 cases of icterus neonatorum 11 minutes and 40 seconds.

208 **Frank, Armando, and Lotte Mehlhorn:** "Über den Ablauf der Blutzuckerkurve unter dem Einfluss reiner Nahrungstoffe" [Course of blood sugar curve under influence of pure foods]. *Jahrb. f. Kinderh.* [Berlin] ser. 3, vol. 91–92 (1920), pp. 41–42, 313–346.

Using Bang's method the authors tested every one-half hour the curve of sugar in the blood of over 20 children in the first and second years of life after administration of cane sugar, dextrose, levulose, starch, casein, fat, and adrenalin. The article contains 37 curves and a list of seven conclusions. The fasting value of blood sugar is 0.086 per cent. All the sugar tests caused glycosuria. The hyperglycemia after different doses is described.

209 **Frank, Max:** "Beitrag zur Biologie der weissen Blutzellen in der Neugeburtszeit und im Säuglingsalter" [Contribution to the biology of white blood cells of the newborn and of infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 31–32 (1921–22), pp. 16–34.

The author discusses at length the change in the white corpuscles during the first two weeks of life to the condition prevailing throughout infancy. What was made up of myeloid elements consists later chiefly of lymphatic cells. The change usually begins on the third or fourth day, sometimes after 36 hours. In premature infants it may begin on sixteenth to twenty-first day. During this change the large mononuclear forms and so-called transition cells are especially interesting. On the first day the number of mononuclear leucocytes is highest, and on the second it has considerably decreased. Many phases are discussed in detail. The article contains four tables and a bibliography.

210 **Friedjung, Josef K.:** "Beiträge zur Physiologie und Pathologie des Blutes im Kindesalter" [Contributions to physiology and pathology of blood in childhood]. *Die Medicinische Woche* [Berlin], vol. 1 (1900), pp. 4–6, 10–14.

The author studied physiology of blood in 4 infants, 1 bottle fed and 3 breast fed, and in 10 other children up to 13 years. He used Jollés' method for determining iron in blood. Data given in a table are weight of child, number of red corpuscles in blood, hemoglobin content, and specific gravity. The author concludes that two periods of childhood—weaning and puberty—are characterized by rich iron content of blood.

211 **Funkenstein, O.:** "Über Temperatursteigerungen und Leukocytose bei Kindern nach Körperbewegungen" [Rise of temperature and leucocytosis in children after physical exercise]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 6 (1907–8), pp. 100–108.

The effect of physical exercise in increasing temperature and leucocytosis is discussed by Funkenstein in connection with his own experiments and those of other students. His own results are shown in tables giving age, weight, pulse, and temperature before and after 30 minutes of Swedish exercises or apparatus gymnastics or after 10 minutes of the former and 5 minutes of running. One table gives month, hour, temperature, number of leucocytes, polynuclear neutrophile leucocytes, large lymphocytes, small lymphocytes, mononucleates, mast cells, and polynuclear eosinophile leucocytes. His subjects were 13 healthy boys and girls from 4 to 12 years old. The temperature was taken in the rectum. After physical exercise the author ascertained a small but never-failing increase of temperature and also increase of leucocytes in the peripheral circulation. These two phenomena are not parallel, for the strongest leucocytosis accompanied a temperature increase of only 0.7 per cent and with the strongest temperature increase there was almost no increase of leucocytes.

212 **Gallo, Carmine:** "Ricerche sul contenuto in ferro nel sangue dei neonati" [Studies of the iron content of the blood of newborn infants]. *Pediatria* [Naples], vol. 32 (1924), pp. 606–610.

An account of a study made by the author of the iron content of the blood and the relation between the hemoglobin and the iron content. He studied 25 infants from 2 to 10 days old born of healthy mothers and without any hereditary defect. All the children, except two, were born at term, and were

well developed. The author gives in a table for each infant, the age, sex, weight, quantity of hemoglobin, and proportion of iron in the blood. He concludes that the iron in the blood of an infant born at term varies from 0.34 to 0.55 grams per thousand grams, which is a lower proportion than in the adult. In premature infants the iron content is not greater than the average for infants born at term. There is no relation between the weight, sex, and iron content of the blood; also no relation between the proportion of hemoglobin and the iron content of the blood. References.

13 **Gallo, Carmine:** "Sulla reazione leucocitaria nei neonati durante il pianto" [The effect of crying on the number of leucocytes in newborn infants]. *La Pediatria* [Rome], vol. 32 (1924), pp. 1265–1270.

The author studied 20 newborn infants from 1 to 9 days old, all but two of whom were born at term. The first leucocyte count was made after the child had been given an hour of complete rest, and the second, 10 minutes after intense crying caused artificially. He gives in a table for each case age, amount of hemoglobin, number of red and white blood corpuscles, and the leucocytic formula before and after crying. He concludes that in newborn infants an increase in leucocytes takes place after crying; it is proportional to the robustness of the child; it lasts for not over 10 minutes and is followed by a slight leucopenia.

14 **Garling, Karl:** "Über das leukocytäre Blutbild während der Menstruation" [Leucocytic blood picture during menstruation]. *Deutsches Archiv für Klinische Medicin* [Leipzig], vol. 134–135 (1920–21), pp. 353–357.

The author estimated leucocytes of 37 healthy subjects, young and unmarried, and 9 sick subjects during menstruation. The total number of leucocytes did not increase. Eosinophils increased in 15 of the healthy cases and decreased in 14, but only slightly. Lymphocytes increased in 17 cases and decreased in 11. Mononuclear leucocytes increased in 11 cases and decreased in 7. The author can not detect a constant relation between eosinophilia and menstruation.

15 **Götzky:** "Der physiologische Blutzuckergehalt beim Kinde nach der Mikromethode von Bang" [The physiological amount of sugar in the child's blood, according to Bang's micromethod]. *Ztschr. f. Kinderh. Originalien* [Berlin], vol. 9 (1913), pp. 44–63.

Götzky tests children's blood for sugar with the micromethod, which he discusses, as well as his apparatus. He extracted 150 to 250 milligrams of blood from more than 100 healthy infants from a few days to 13 years old. The resultant figures fill 14 pages. A table sums up the results for the first 12 days of life, first 12 months, and first 12 years. For these periods average values of sugar in the blood are 0.085, 0.095, and 0.102; that is, the sugar content increases with age.

16 **Grimm, G.:** "Der Einfluss subkutaner Adrenalininjektionen auf das Blutbild gesunder und kranker Kinder" [The effect of subcutaneous adrenalin injections on the blood of healthy and sick children]. *Jahrb. f. Kinderh.* [Berlin], vol. 89 (1919), pp. 442–460.

In connection with a study of the effect of adrenalin on the blood the author gives his findings regarding the relative proportions of the various kinds of white corpuscles before injecting adrenalin. His subjects were four infants, aged 9 months, 8 months (two infants), and 6 weeks.

17 **Grunewald, Elisabeth, and Erich Rominger:** "Weitere Untersuchungen über den Wassergehalt des Blutes" [Further investigations into the water content of the blood]. *Ztschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 65–84.

The authors studied the water content of blood in 109 children during 10 months in the university clinic of Freiburg, testing it at 6.30, morning and evening, with Pulfrich's refractometer. Data on refraction numbers and albumin content are given in three long tables, and fluctuations are represented in six graphs. In every individual there is a daily variation of values, with a thickening of blood in the evening, caused probably by muscular work. The curve for infants is far more irregular than that for older children. Bibliography.

18 **Gundobin, N.:** Über die Morphologie und Pathologie des Blutes bei Kindern" [Morphology and pathology of blood in children]. *Jahrb. f. Kinderh.* [Leipzig], vol. 35 (1893), pp. 187–218.

The author cites many details from his investigation of morphology of infants' blood based on 12 observations of newborn and 28 of infants up to a year. In the very young there are very many white corpuscles, and the red corpuscles vary greatly in number. In older infants the number of white corpuscles is 12,900 on an average, with individual variations from 14,000 to 10,000, whereas in adults they are 7,000 to 10,000. Red corpuscles average 5,100,000, almost as in the adult. Lymphocytes number 50 per cent to 66 per cent, neutrophiles 28 to 40 per cent. Children's blood becomes like adults' about the beginning of the third year. The number of white corpuscles is very constant. There are four tables, several case histories, and a bibliography.

219 **György, P:** "Über den Gehalt des Blutserums an Kalk und anorganischen Phosphor im Säuglingsalter" [Content of blood serum in calcium and inorganic phosphorus in infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 99 (1922), pp. 1–12.

The article contains five short tables. One table of findings, obtained by the simple method cited by Kramer and Tisdall, of calcium in the blood serum of 12 normal and sick children between the ages of 1½ and 12 months shows the average to be 10.1 milligrams per cent [sic]. Another table on inorganic phosphorus in blood serum of 13 children between ages of 2½ and 12 months shows the average to be 5.2 milligrams per cent [sic]. Table five shows the relation of calcium to phosphorus to be 1.95 under normal conditions. Bibliography.

220 **Haden, Russel L., and Frank C. Neff:** "The volume index and color index of the red blood corpuscles in new-born infants." *Am. J. Dis. Child.* [Chicago], vol. 28 (1924), pp. 458–463.

Data for this study were secured by examination of blood from the longitudinal sinus of 11 normal infants under 24 days of age. In 6 cases simultaneous counts were done, for comparison, on blood obtained by pricking the heel. The average red-cell count was found to be 3.96 millions per cubic millimeter, and the cell mass 112 per cent of the adult normal. Average hemoglobin was 17.37 grams per 100 cubic centimeters. Volume index ranged from 1.10 to 1.64; color index from 1.14 to 1.63. The actual percentage of hemoglobin per unit volume of cell was found to be the same as in the adult. A higher count was found in peripheral than in sinus blood. References.

221 **Hagner, Otto:** "Schwankungen in Eiweissgehalt und in der Leitfähigkeit beim Säuglingsblute" [Variations in protein content and conductivity of infant's blood]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 8 (1913), pp. 50–75.

On his tests upon 18 children at the University of Freiburg, the author gives a table showing age (1 to 10 months), refractometric protein value in per cent, difference in per cent, conductivity in terms of 10–4 difference, refractometric scale, and resistance in centimeters and at 18° C. He gives also case histories of these infants. Even the healthy infant is subject to daily variations in blood concentration according to its meal times, and any illness affecting the alimentary canal results in decided variations of osmotic pressure.

222 **Halban, Josef:** "Agglutinationsversuche mit mütterlichem und kindlichem Blute" [Studies in agglutinization with the blood of mother and child]. *Wiener Klinische Wochenschrift*, vol. 13, no. 24 (1900), pp. 545–548.

To obtain the mother blood and the fetal blood, the author in 14 cases took blood from the uterus and the umbilical cord near placenta, immediately after delivery. He found that the two samples of blood agglutinized in very different fashions, as if they came from quite different organisms. He gives a table of the action of the mother and child serum. The mother and fetal blood are therefore different in their percentage of agglutinins and lysins. Often the blood of a mother contains agglutinins of which her child has no trace. Therefore the fetus selects only certain albuminous substances from the mother body. Sometimes agglutinins are found in fetal and not in parental blood. The author discusses work on agglutinization done by other investigators.

223 **Hallez, G. L.:** "Le sang et les organes hematopoiétiques dans le premier âge" [Blood and hematopoietic organs in early childhood]. *Nourrisson* [Paris], vol. 7 (1919), pp. 102–113.

The author describes the red corpuscles in the embryonic, premedulary, and medulary periods, the white corpuscles, the blood serum, and the hematopoietic organs—the marrow, spleen, lymphatic system, liver, and thymus—of the young child.

224 **Happ, W. M.:** "Appearance of isoagglutinins in infants and children." *Journal of Experimental Medicine* [New York], vol. 31 (1920), pp. 313–333.

The isoagglutination reaction of 131 infants and children from birth to 10½ years was examined by testing their serum and washed corpuscles microscopically against the serum and corpuscles of each of the four adult groups (numbers as used by Moss). It was found that the grouping as present in adults is rarely present in blood from the umbilical cord; that isoagglutination, rarely present at birth, is always present after two years; that the grouping is established in the corpuscles before it is in the serum; that the early grouping in the corpuscles is liable to change by the acquisition of new receptors; that grouping, once established, does not change; that isoagglutinins are present in mother's milk grouped as in her blood, but these agglutinins are probably not transmitted to the nursing infant; that it is not safe to transfuse an infant from its mother without making the preliminary tests.

225 **Haselhorst, G., and A. Papendieck:** "Hämatin als physiologischer Bestandteil des Blutes in der Fötalperiode und bei Neugeborenen" [Hematin as a physiological component of the blood in the fetal period and in newborn infants]. *Klinische Wochenschrift* [Berlin and Munich], vol. 3 (1924), pp. 979–980.

Hematin has until recently been considered a by-product of certain pathological conditions; recently it has been found to be a physiological constituent of the blood of the umbilical cord. The authors of this article studied blood

of the umbilical cord of 118 infants for its hematin content. They found hematin present in 84 per cent of the cases. The hematin index varied from 1 to 4. Hematinemia is not limited to the confinement period, but also takes place during the second half of the fetal period, and in the first several days of extrauterine life the authors found it in seven out of eight infants under 1 week of age. The authors also tested the blood for bilirubin and found an abnormal quantity of it in the serum of the umbilical cord. The amount of bilirubin is known to be abnormally high during the entire period of pregnancy; it becomes still higher in the first week of extrauterine life, after which it slowly decreases. There is no regular relation between the content of hematin and of bilirubin.

226 **Hayem, G.:** Des caractères anatomiques du sang chez le nouveau-né pendant les premiers jours de la vie" [The anatomical characteristics of the blood of the newborn during the first days of life]. *Comptes rendus des séances de l'Académie des sciences* [Paris], vol. 84 (1877), pp. 1116–1169.

A summary of findings, descriptive only, without record of original observations.

227 ——— Du sang et de ses altérations anatomiques [Blood and Its Anatomical Alterations]. G. Masson, Paris, 1889. 1035 pp.

Pages 178 to 185 deal with the blood of the fetus, the newborn infant, and the child. In the newborn infant the red corpuscles at first increase and then decrease in number. The number seems to depend on the cutting of the umbilical cord, being 5,087,000 to the cubic millimeter in six children, whose cord was immediately cut and 5,576,000 in eight infants whose cords were cut after cessation of arterial beats. The pigment of the corpuscles (i. e., the proportion of hemoglobin determined by the chromometric process) is stronger in the infant than in the adult; the hemoblasts are fewer in number. The white corpuscles are 18,000 per cubic millimeter during the first 48 hours, whereas they are about 6,000 in the adult. They decrease thereafter, and the hemoblasts increase. After weaning, infant blood approaches that of adults.

228 **Heller, Fritz:** "Der Blutzuckergehalt bei neugeborenen und frühgeborenen Kindern" [Content of sugar in blood of newborn and prematurely born children]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 13 (1915–16), pp. 129–134.

Results of experiments on 12 full-term and 3 premature infants. Tables of eight or more tests with each child show weight, amount of food, time interval since last meal, and percentage of blood sugar. In general, neither age, amount of food, nor interval since last meal was found to exert much effect on the blood sugar content. No lactose was found in the blood of the newborn.

229 **Helwig:** "Neuere Untersuchungen über die Wirkung des Unterrichts auf den kindlichen Körper" [Recent investigations on the effect of school work upon a child's physique]. *Internationales Archiv für Schulhygiene* [Munich], vol. 7 (1911), pp. 218–243.

The author discusses blood tests made by him on boys in a private school, living under the most favorable conditions. The degree of degeneration or regeneration of the blood varied with the length and difficulty of the school work, the mentality of the child, the air conditions, and exercise. His results show that the effect of mental work is pathological, that of exercise, if not excessive, is physiological. He gives tables of his investigations on six boys and on himself.

230 **Hibberd, J. F.:** "Coagulability of the blood of infants." *Cincinnati Lancet and Observer*, new ser. vol. 2 (1859), pp. 473–474.

To test the coagulability of the blood of newborn infants the author procured six samples from the blood of the placenta and the umbilical cord. He found that in each case coagulation took place within 15 or 20 minutes.

231 **Hock, August, and Hermann Schlesinger:** "Blutuntersuchungen bei Kindern" [Blood investigations among children]. *Centralblatt für Klinische Medicin* [Leipzig], vol. 12 (1891), pp. 873–876.

The authors, using Hammerschlag's method, made 400 tests of the specific gravity of the blood of 150 healthy children. Values for the first two years were 1.048 to 1.052 and for the second to sixth year 1.052 to 1.056. The greatest deviation in 24 hours amounted to 0.0025. In eight observations on feverish children the specific gravity of blood serum showed very little variation. The most important results of microscopic investigation were that the number of eosinophile cells is often excessive in healthy as well as sick children; also that mitosis has been found, but oftener in newborn than older infants, and nuclear corpuscles—three phenomena that are physiological for children though not for adults

232 **Hoeffel, G. N., and Margaret E. Moriarty:** "Amino-acid content of blood of infants and children." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 64–66.

Tables show the results of studies made by the Folin method in 50 cases, selected to range from infancy to puberty, and normal as far as the requirements for this investigation were concerned. A variation from 3.92 to 7.14 milligrams in 100 cubic centimeters of normal fasting blood was found, with an average figure of 5.42 milligrams per hundred cubic centimeters of blood. References.

233 Howland, J., and W. McK. Marriott: "The calcium content of the blood in rachitis and tetany." *Transactions of the American Pediatric Society*, vol. 28 (1916), pp. 202–209.

With tables of the calcium content of the blood in cases of rickets and tetany the author includes a report of examination of the blood of five normal infants made for comparative study.

234 Japha, Alfred: "Die Leukocyten beim gesunden und kranken Säugling" [Leucocytes in the healthy and sick infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 52 (1900), pp. 242–270.

The author studied digestive leucocytosis in infancy at the Charité, Berlin. He is interested not only in the whole number of white blood corpuscles but also in the relation of the various kinds. The infant blood is taken from the finger or toe before and after the meal, which contains 1.1 to 4.6 grams of animal albumin. Descriptions are given of 14 tests on 12 healthy infants, also of tests on sick infants and adults, followed by a discussion of other literature on this subject. The author concludes that digestive leucocytosis can not be considered a constant phenomenon in infancy and certainly has no diagnostic value. In the healthy person beyond the nursling age there is usually leucocytosis after a meal containing animal albumin and following a period of fasting. The leucocytosis consists chiefly in an increase of polynuclear cells. Digestive leucocytosis is not an essential element in absorption, but only an attendant circumstance.

235 ——— "Die Leukocyten beim gesunden und kranken Säugling" [Leucocytes in the healthy and sick infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 53 (1901), pp. 179–198.

A study of leucocytes in the blood of 22 healthy infants and 31 with atrophy and other pathological conditions giving intestinal disturbances, the relative number of red and white corpuscles, proportion of different kinds of leucocytes, etc.; also, a comparison of the number and kind of leucocytes in infants and adults in health and disease.

236 Jones, B.: "I. Isoagglutinins in the blood of the newborn." *Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 586–597.

Earlier work on isoagglutinins is reviewed. The author describes his technique fully. Of 197 cases in which the blood was collected from the placental end of the umbilical cord, all could be placed in the four accepted groups. Of these, 78.7 per cent were confirmed by noting the agglutinating action of infant serum on cells of known groups. The percentage of newborn infants, here reported as having their group established, is much higher than has previously been reported. "The results seem to depend on a technique which permits the recognition of weak agglutinins. Isoagglutinins have been demonstrated in the blood of a seven-months' fetus. The demonstration of strong isohemolysins in the serum of newborn infants indicates the advisability of making proper test for compatibility before selecting a donor for transfusion in infants."

237 ——— "Isohemolysins in human blood, with especial reference to the blood of the newborn." *Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 598–605.

A study made at the Boston Lying-in Hospital. The literature of the subject is reviewed. The technique of this investigation is described, and possible errors of technique are noted. Although the properties of isoagglutinins and isohemolysins are closely related, and isohemolysins never occur independently of isoagglutinins, much less work has been done on isohemolysins than on isoagglutinins. In this study 121 specimens of blood from the newborn and 144 specimens of adult blood were examined for isohemolysins. They were found in 27.3 per cent of infants in blood of certain groups and in 88.5 per cent of adult specimens of the same group. Infants' serum was generally weaker and isohemolysin "a" predominated.

238 Jones, E. Lloyd: "On the variations in the specific gravity of the blood in health." *Journal of Physiology* [Cambridge], vol. 8 (1887), pp. 1–14.

The author measured the specific gravity of the blood of 362 healthy individuals of both sexes, varying in age from birth to over 92 years. The method is described. He found the specific gravity highest at birth, about 1,066 in both sexes. Within the first two weeks it began to fall, continuing to fall until the second year. The average in this period was for males, 1,048; for females, 1,050. From the age of 6 to 12 the average for males was 1,050.5; for females, 1,052. From the age of 12 it continued to rise to the period 35 to 45, more rapidly in the male than in the female.

239 Jones, Martha R.: "The calcium content of blood plasma and corpuscles in the newborn." *Journal of Biological Chemistry* [Baltimore], vol. 49 (1921), pp. 187–192.

A series of observations was made on the calcium content of the blood of normal infants ranging in age from 4 hours to 12 days. In 68 determinations on 22 infants (12 boys and 10 girls) the average values were as follows: Whole blood, 8.8 milligrams per 100 cubic centimeters; corpuscles, 5 milligrams; plasma, 12.3 milligrams. The 12 days were divided into six periods of two days each and the results of the analyses made during each period were averaged and plotted. The plasma values remained constant throughout, but the corpuscle averages tended to decrease and those of the whole blood to increase. Bibliography.

240 **Jones, Martha R., and L. L. Nye:** "The distribution of calcium and phosphoric acid in the blood of normal children." *Journal of Biological Chemistry* [Baltimore], vol. 47 (1921), pp. 321–331.

The alkali reserve of plasma, and the distribution of calcium and the compounds of phosphoric acid in the blood, were studied in 34 normal children, from 4 weeks to 14 years of age. The corpuscles were found to be richer in all types of phosphoric acid than the plasma. In general, calcium and phosphorus values for boys averaged slightly higher than those for girls. The average calcium content of corpuscles was found to be slightly less than that of the plasma, the values in milligrams per 100 cubic centimeters being as follows: Whole blood, 9.4; corpuscles, 8.7; plasma, 10. The carbon dioxid combining power of the plasma averaged 51.8 volumes per cent in 32 children. No relation can be established between the alkali reserve and the concentration of calcium and phosphoric acid in the blood. Bibliography.

241 **Karnitzki, A. O.:** "Die Zusammenzetzung des Blutes und die Konstitution des kindlichen Körpers in Zusammenhang mit seiner Ernährung und seinem Gewicht" [Composition of blood and constitution of the child's body in connection with nutrition and weight]. *Jahrb. f. Kinderh.* [Berlin], vol. 80 (1914), pp. 429–442.

The author bases his elaborate discussion on observations from 1886 to 1911 on ages up to puberty of his own seven children and the children in his private practice and hospital experience. He uses the physiological-clinical individualizing method. The article contains a long bibliography, two graphs of the hemoglobin content and of red corpuscles in healthy children at different ages, and ends with a list of the author's 12 conclusions, which embrace the following: Growth terminates at 17 or 18; it is affected by seasons; normally the weight and blood curves grow steadily; there is relation between the energy of a child and the composition of his blood.

242 ——— "Über das Blut gesunder Kinder" [The blood of healthy children]. *Arch. f. Kinderh.* [Stuttgart], vol. 36 (1903), pp. 42–79. *See also* Dissertation by the author. Kiev, 1901. 254 pp.

This article includes a historical survey, and throughout discusses the work done on blood by other investigators. The author studied 62 extremely healthy children from a few months to almost 14 years of age. He examined intestines (the condition of which he thinks greatly affects the blood) and the liver, spleen, glands, chest girth, weight, and growth. He investigated the composition of the blood, the number of form elements, the relation of the colorless blood cells to one another, the amount of hemoglobin, and the specific gravity. He takes up one constituent at a time, considers it in children of different ages, and lists his results on each constituent. The results are numerous, being 80 in the case of leucocytes and neutrophiles. Bibliography of 158 titles.

243 **Katzenellenbogen, Marie:** "Untersuchungen über den Blutkalkgehalt bei Kindern nach der Wrightschen Methode" [Investigations into the lime content of the blood of children by the Wright method]. *Ztschr. f. Kinderh.* [Berlin], vol. 8 (1913), pp. 187–204.

The author investigated the lime content of the blood of 62 children up to 14 years old, including 12 newborn, in a children's clinic in St. Petersburg. She made 200 tests by Wright's method, with varying factors of age, diet, rickets, and spasmophilia. Her results in some cases coincided with Neurath's and in others did not. The general conclusion is that the blood of normal children endeavors to maintain a lime content corresponding to an ammonium oxalate solution 1:1800, irrespective of age and diet. Newborn infants show a smaller lime content. Rachitis made no difference, spasmophilia caused a smaller content. The article contains six tables.

244 **Keating, John M., and William A. Edwards:** "Diseases of the heart and circulation in infancy and adolescence." *Arch. Pediat.* [Philadelphia], vol. 4 (1887), pp. 656–680, 705–737.

Largely pathological but containing (pages 712–715) a description of the blood of the newborn child.

245 **Kingsburg, F. B., and J. P. Sedgwick:** "The uric-acid content of the blood of newborns." *Journal of Biological Chemistry* [Baltimore], vol. 31 (1917), pp. 261–268.

An investigation to determine whether the high uric-acid excretion during the first few days of life is accompanied by a simultaneous increase of this substance in the blood. Examination was made, by methods fully described, of the blood of 31 infants and a separate series of analyses of uric acid in maternal and placental blood, for comparison. The authors found that during the first 3 or 4 days of life the uric-acid blood content of the newborn is higher than that of the placental and maternal blood. References.

246 **Koch, Herbert:** "Über Complementbestimmungen des kindlichen Serums" [Complement determinations in serum of children]. *Arch. f. Kinderh.* [Stuttgart], vol. 50 (1909), pp. 384–398.

In determining complement in serum of children the author used Moro's methods, except that he designates hemolytic value as zero, trace, slight, strong, and complete. Tables fill seven pages. Table 1 gives data on 21

children between 1 and 13 years of age, having no fever. Other tables give values on infants—7 artificially fed and 10 breast fed. Complement values can not be correlated easily with age, health, etc. Bibliography.

247 **Kochmann, Rudolf:** "Über die klinische Bedeutung der hämoklasischer Krise im Kindesalter" [Clinical significance of the hemoclastic crisis in childhood] *Arch. f. Kinderh.* [Stuttgart], vol. 72 (1922–23), pp. 242–250.

The author tested the hemoclastic crisis of Widal in 10 healthy and 10 sick infants and 10 healthy and 5 sick older children. All infants that are healthy and less than 6 months old show leucopenia after a meal following a fast of 4 to 5 hours. If, however, the fast is not so long, there may even be leucocytosis. Older healthy children, after drinking 200 grams of milk following a fast of 12 hours, reacted with leucocytosis. Therefore, in children over 6 months having healthy livers the hemoclastic crisis of Widal is negative. Bibliography.

248 **Kramár, Eugen:** "Über Colliagglutinine" [B. Coli agglutinins] *Monatschr f. Kinderh.* [Leipzig], vol. 24 (1923), pp. 799–809.

In investigating the B. Coli agglutinins of 53 infants between 8 days and 19 months old the author found that normal agglutination in infancy is a regular phenomenon. It appears in two great curves between birth and the third month and between the eighth and the nineteenth month. Eighteen tests proved a close relationship between the agglutinin content of the blood of the mother and child. Nine series of tests on the blood of the mother before delivery, on the blood of umbilical cord, and on the blood of the newborn showed that in all probability normal agglutination of the infant is inherited from the mother. Of 20 tests on infants between 8 days and 14 months of age before and after inoculation with colon bacilli only 5 presented large agglutinin values.

249 **Kramer, B., F. Tisdall, and J. Howland:** "The clinical significance of calcium concentration in the serum of children and possible errors in its determination." *Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 560–64.

These investigators attack the assertions made that the blood calcium concentration is variable in the normal child. They state that diet, exercise, etc., exert little influence on the calcium content of the serum. A normal child's blood contains a higher calcium concentration than an adult's. They fail to find any calcium in corpuscles. The average calcium concentration for normal children is 10 to 11 milligrams per 100 cubic centimeters of serum. A discussion of sources of error in technique follows.

250 **Krasemann, Erich:** "Blutalkaleszenzuntersuchungen bei gesunden und kranken (insbesondere intoxizierten) Säuglingen" [Investigations into the alkalinity of the blood of healthy and sick infants, especially such as have intoxication]. *Jahrb. f. Kinderh.* [Berlin], vol. 97–98 (1922), pp. 85–102.

Krasemann determines the alkalinity of the blood of 50 nurslings by the Rohony process, which expresses the degree of acidosis by the titration number, or carbonate number, "C," C, in normal adults, is 1.25–1.60; anything below 1.25 denotes an acidotic condition. The normal C for nurslings over 4 weeks is between 1.3 and 1.52; it rises with the age of the nursling. Great uniformity was found in healthy infants nourished on a milk mixture plus 5 per cent sugar, when the sinus puncture was made two hours after the second meal. A low C, i. e., an acidotic state, was ascertained in newborn infants, in the umbilical-cord blood and in premature infants, and always before death. Fat lowered the alkalinity of the blood more than carbohydrates did.

251 **Krüger, Friedrich:** Über das Verhalten des foetalen Blutes im Momente der Geburt [Reaction of Fetal Blood at Moment of Birth]. Dorpat, 1886. 44 pp.

Thesis (University of Dorpat). After giving a résumé of conclusions of former students on fetal blood at birth, the author describes his method of examining blood. He takes it from the umbilical vein, severing the cord immediately, collecting it in four receptacles for hemoglobin, fibrin test, etc. Ten cases are described in detail, with table. Water in infants' blood is 78.93 per cent, in mothers' blood 80.16 per cent. Fibrin content is much less than that of mothers. Hemoglobin is about the same in both but increases in the blood of the newborn. Sex and weight do not essentially affect constitution of blood. Blood at birth coagulates easily but slowly. Bibliography.

252 **Langer, Josef:** "Über Isoagglutinine beim Menschen, mit besonderer Berücksichtigung des Kindesalters" [Isoagglutinins in mankind, with special reference to childhood]. *Zeitschrift für Heilkunde, Abteilung für Innere Medizin* [Vienna and Leipzig], new ser. vol. 4 (1903), pp. 111–141.

The author writes at length on former investigations by other students and on his own extensive studies of physiological and pathological cases. His article contains 18 tables and a bibliography. As regards children, he decides that the serum of newborn infants rarely shows isogglutination, whereas their erythrocytes are as agglutinable as those of older children. The agglutinins

seem to appear in the first months of life. It is not yet certain whether isoagglutinin formation comes from the colostrum or from mother's milk through simple absorption by the child's organism, or from some other source.

253 **Leichtenstern, O.:** Untersuchungen über den Haemoglobulingehalt des Blutes, in gesunden and kranken Zuständen [Investigations into the Hemoglobulin Content of the Blood in Health and Sickness]. F. C. W. Vogel, Leipzig, 1878. 106 pp.

Ninety-one healthy persons from 36 hours to 20 years old, as well as 100 over that age, were examined. The blood of healthy newborn infants is richer in hemoglobin than that of any other period. At the age of 10 to 12 weeks the hemoglobin content is similar to that of adults. The minimum is reached between the age of 6 months and 5 years. There is a gradual increase of hemoglobin content from 6 to 15 years of age. The increase is more decided after the age of 15. In childhood up to 10 years there is 7 per cent more hemoglobin in the blood of boys than of girls.

254 **Lesné and Langle:** "La leucocytose digestive chez l'enfant" [The leucocytosis of digestion in the child]. *Bulletin de la Société de pédiatrie de Paris*, vol. 19 (1921), pp. 83–92.

A report of 95 examinations of the blood of children from 1 month to 16 years of age by methods carefully described. Six leucocytic curves are given for infants from 1 month to 1 year of age. The author found the leucocytic count of infants variable, changing even in the same infant from minute to minute. Each infant, however, has a curve peculiar to itself, which repeated examinations, even at long intervals, establish and confirm. The general character of this curve is variable. In the normal infant it varies with the amount of milk ingested, an increase of white corpuscles being evident after a small meal, a diminution after a large meal, the amount of milk at which the change takes place varying from 50 to 100 grams and differing for breast-fed and artificially-fed infants. Results with children from 2 to 16 years were difficult to reduce to a general law.

255 **Liefmann, E.:** "Über den Harnsäuregehalt des kindlichen Blutes" [The uric-acid content of children's blood]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 12 (1915), pp. 227–238.

It having been proved that the blood of every healthy person contains uric acid, the author undertook to test the blood of children with the Autenrieth-Königsberger calorimeter. She extracted 5 cubic centimeters of blood from the heel. One table gives the uric acid in 13 normal cases from 9 weeks to 21 years of age. The value for nurslings is 1.3 to 1.7 milligrams in 100 cubic centimeters of blood. The value rises with age to 2 to 4 milligrams (Steinitz) in adults. An abnormally high uric-acid value accompanies a purin diet and many diseases—not, however, the exudative diathesis.

256 **Light, Gertrude U.:** "The blood in infancy and childhood." *New York M. J.*, vol. 74 (1901), pp. 1000–1002.

A review of the knowledge of the blood of infants. The author gives full references and summaries from the data of eight investigators who found that at birth the red blood cells number 5,742,080; the white blood cells, 15,000; hemoglobin, 125 to 130 per cent. The blood assumes adult proportions about the twelfth year. Infants' blood tends to resume embryonal characteristics when clinical balance is disturbed, these changes being out of proportion to the cause.

257 **Lindberg, Gustaf:** "Über den Blutzuckerspiegel des Säuglings im Hunger" [The picture of sugar in the blood of fasting infants]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 15 (1916–17), pp. 71–83.

Lindberg used Bang's micromethod in his blood tests of 14 breast-fed babies from 3 to 9 months' old, some of whom had begun mixed feeding. Eight of them were entirely healthy, and six were healthy except for exudative diathesis. He took their blood in the evening three hours after they had eaten and just before their dinner; thereafter, for 60 hours, they received only saccharin and water. He noted weight and the samples of blood during this fast and after they returned to normal fare. Results are put in two curves and three tables. In weight the children lost on an average 6.5 per cent. They seemed to feel no discomfort from the fast. Sugar values in the healthy children were on an average 0.074 per cent after a fast of 24 hours; 0.073 per cent after 36 hours; 0.074 per cent after 48 hours; and 0.074 per cent after 60 hours. The exudative diathesis caused slightly lower values, except that five cases in the eruption stage showed hyperglycemia. According to these results healthy infants on a hunger diet have about the same amount of sugar in the blood as adults.

258 **Lippman, Hyman Shalit:** "A morphologic and quantitative study of the blood corpuscles in the new-born period." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 473–526.

The greater part of the previous literature on the morphology of the blood of the newborn is presented in condensed, outline form, with brief discussion. The author's own study was made on 71 newborn infants (31 girls and 40 boys). Examinations of blood from the heel were made as near birth as possible; at approximate six-hour intervals up to and including 36 hours; at 48 hours, and at 5 days. Counts were taken of red blood cells, leucocytes, and platelets. Differential studies included the examination of 500 cells in each blood smear. The statistical methods employed are fully discussed, and original data presented in 17 tables and 36 figures. The author finds that the

morphology of the blood at birth approximates that of the last part of fetal life, and the picture presented is far different from that seen at 6 hours, and again at 12 hours. The observations reported support the view that the neonatal changes are due to the increased stimulation of the blood-forming organs. References.

259 **Lucas, Wm. P.:** "Physiology of the blood in infancy and childhood." *J. A. M. A.* [Chicago], vol. 77 (1921), pp. 332–338.

Previous work on the study of blood is reviewed, and blood chemistry for the infant and adult are compared.

260 ——— **and B. F. Dearing:** "Blood volume in infants estimated by the vital dye method." *Transactions of the American Pediatric Society*, vol. 32 (1920), pp. 65–67. See also *Am. J. Dis. Child.* [Chicago], vol. 21 (1921), pp. 96–106.

Report of a study made at the University of California Medical School to determine the normal variations in blood volume during the first year of life. The history and method of use of the dye process are discussed, and the method of computing results. Tables show the blood-volume computations of 30 newborn infants aged 2½ hours to 15 days, grouped according to age and according to weight; of 11 fairly normal infants, aged 15 days to 1 year; and of 3 infants with fairly marked secondary anemia. The authors found a great variation of blood-volume percentage in newborn infants, ranging from 10.7 to 19.5 per cent of body weight, and from 107 to 195 cubic centimeters per kilogram, and the pigment volume from 304 to 899 cubic centimeters. The children from 15 days to 1 year showed a greater uniformity and a tendency to stabilize the blood volume during the first few months.

261 ——— ——— **Hoobler, Cox, Jones, and Smyth:** "Blood studies in newborn infants." *Transactions of the American Pediatric Society*, vol. 33 (1921), pp. 20–58.

The article reviews previous literature and gives technique and data in full. The blood of 150 infants from birth to 14 days old was studied. Usually the blood was collected on alternate days from the longitudinal sinus. Comparisons are made between the peripheral and deep blood. Hemoglobin tests, red and white differential counts, and platelet counts were made. A quantitative analysis was made of the nonprotein nitrogen, urea nitrogen, uric acid, creatinin, sugar, carbon dioxide, calcium, and phosphorus. The coagulation time was estimated, and the presence of prothrombin in the platelets was tested. The stools and blood plasma were examined for urobilin.

262 **Lust, F.:** "Die Viscosität des Blutes beim gesunden und kranken Säugling" [The viscosity of blood in the healthy and sick infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 54 (1910), pp. 260–278.

With Hess's viscosimeter Lust tested the viscosity of blood in 11 newborn infants, 16 infants from 2 to 13 months old, and 15 children from 1½ to 11 years old, all normal and healthy. The viscosity and water content for these three periods he found to be, respectively, as follows: 6.3 and 77.7 per cent; 3.8 and 82 per cent; 4.1 and 80.6 per cent. The viscosity of blood in men Hess had determined to be 4.7 and for women 4.4. Lust also discusses the effect upon viscosity of food, salt infusions, and various illnesses.

263 ——— "Über den Wassergehalt des Blutes und sein Verhalten bei den Ernährungsstörungen der Säuglinge" [The water content of blood and its action in nutritional disturbances in infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 73 (1911), pp. 85–100, 179–214.

Believing that a constant relation exists between body weight and the concentration of blood, the author determined the water content of blood by measuring the dry residue. The blood was taken three hours after meals. The average value of water in the blood of nine newborn infants from 1 hour to 30 days old was found to be 77.7 per cent, as compared with 78.14 per cent for the adult man and 79.7 per cent for the adult woman; it was also evident that a close relation exists between body weight and blood concentration and that in the initial loss variations of the water content are involved. From further tests on nine infants over a month old, the water content in the blood was found to be 81.9 per cent for breast-fed children and 82.2 per cent for artificially-fed children. Tests on 16 children from 1¼ to 11 years gave a percentage of 80.62. Carbohydrates were found to increase weight and water content. The experimentation extended also to salts and to the effect of diseases. The article contains 9 tables, 20 curves, a list of 14 conclusions, and a bibliography.

264. ——— "Über die antiproteolytische Substanz im Blutserum gesunder und kranker Säuglinge" [Antiproteolytic substance in the blood serum of healthy and sick infants]. *Münchener Medicinische Wochenschrift*, vol. 56, pt. 2 (1909), pp. 2047–2051.

The author tested the antiproteolytic substance in the blood serum of 10 healthy and many sick infants, by Fuld and Gross trypsin method. Tests on healthy infants showed that 0.2 to 0.25 cubic centimeter of a 0.2 per cent ferment solution of pancreatin phenania was necessary to neutralize 0.5 cubic centimeter of serum. The youngest infant, 14 days old, had the same content in antitrypsin as infants over 1 year old. The author concludes that anti-

ferment values can not be explained and determined easily. The article contains two tables and two curves. Bibliography.

265 **Macciotta, G.:** "Il comportamento delle reazioni del sangue nei bambini in rapporto all età ed alla alimentazione" [Nature of reaction of blood in children in relation to age and food]. *Clinica pediatrica* [Modena], vol. 6 (July, 1924), pp. 385–406.

With the aid of the Engels-Lowy method (titration with N/75 solution of tartaric acid) the author studied the effect of age and food on the reaction of blood in infants. He studied 39 infants ranging in ages from 8 days to 1 year. He found that the alkalinity of the blood was slightly lower in infants than in adults; the younger the infant the greater the difference. Breast-fed children show a greater alkaline reaction than those fed artificially. Feeding with diastatic polysaccharides raises the alkalinity. In hunger the latter goes down. The decrease of alkalinity is particularly great on a diet rich in fats.

266 **McClanahan, H. M., and A. A. Johnson:** "A brief report of sixty-eight blood examinations in infancy, with a review of the recent literature of the blood in infants." *Arch. Pediat.* [New York], vol. 33 (1916), pp. 757–771. See also *Transactions of the American Pediatric Society*, vol. 28, 1916, pp. 65–79.

Abstracts of the articles upon the blood of infants in 16 leading medical journals (American) for the years 1910 to 1915, inclusive, are followed by a report of blood examinations of 68 normal infants. Procedure is described. Determinations are listed by individual cases. No new facts were developed. The blood of the infant was found to vary from that of the adult in the high proportion of the lymphocytes. A second count on 14 infants showed a considerable variation from the first. A gradual but irregular increase in the polymorphonuclear cells is apparent during the first year of life.

267 **McKellips, G. M., I. M. De Young, and W. R. Bloor:** "The distribution of phosphoric acid in the blood of normal infants." *Journal of Biological Chemistry* [Baltimore], vol. 47 (1921), pp. 53–58.

Data for this study were obtained by examination of the blood of 21 normal infants from birth up to two weeks of age. Tables show the phosphoric-acid compounds in the blood of these infants and averages and variations in the phosphoric-acid compounds in the blood of infants and of adults. Very little difference was noted in the sexes. In infants gaining weight the phosphoric-acid values were higher than the average in the plasma and somewhat lower in the corpuscles, whereas in those losing weight the reverse was the case. The corpuscle values as a whole are remarkably similar in the infant and the adult. In the plasma the organic phosphorus is regularly much higher in the infant than in the adult.

268 **McLean, Stafford, John P. Caffey, et al.:** "Blood platelet counts in infants and in young children." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 810–828.

Platelet counts were made on the blood of the following subjects, normal for the purposes of this study: Fifteen newborn infants, none more than 5 days of age; 10 premature infants, from 2 days to 9 weeks of age; 17 infants, from 3 weeks to 1 year of age; 9 children, from 1 to 6½ years of age. The average count in the newborn infants was 278,000; in the premature 246,000; in the age group from 3 weeks to one year 359,000; and in young children 341,000. Tables.

269 **Manning, John B.:** "Blood of infancy and early childhood." *Northwest Medicine* [Seattle], new ser. vol. 4, (1912), pp. 146–148.

Contains a résumé, with references, of studies of other investigators. No original observations.

270 **Marriott, W. McK.:** "The blood in acidosis from the quantitative standpoint." *Journal of Biological Chemistry* [Baltimore], vol. 18 (1914), pp. 507–517.

A revised technique for determination of acetone bodies in small samples of blood is described and results in 25 analyses, 6 of which were of the blood of normal children 5 to 10 years old, are tabulated. Expressed in milligrams per 100 grams of blood, the acetone and acetoacetic acid in children varied from 0.5 to 0.8; the oxybutyric acid, from 1.4 to 4.4.

271 ——— **and Warren R. Sisson:** "Variations in the lipoid (fat) content of the blood of infants under certain nutritional conditions." *Am. J. Dis. Child.* [Chicago], vol. 16 (1918), pp. 75–82.

A study to determine whether the amount of subcutaneous fat of an infant is in any way proportional to the blood fat. Fifty-two determinations of blood fat were made from 48 infants, 14 of the infants being considered normal. Data, in tabular form, show age, weight, nutritional state, nutritional trend, food, calories per kilogram, hours after feeding when test was made, blood fat per cent, and clinical condition. The authors found that subcutaneous fat does not necessarily bear any relation to circulating fat. In general, an infant who is gaining weight, no matter what the state of his nutrition, will have a higher average blood fat than one who is not gaining. Breast-fed infants gaining weight have high blood-fat percentages.

272 **Martin, Ed.:** "Isoagglutination beim Menschen nebst einer Bemerkung zur Marx-Ehrenroothschen Blutdifferenzierungsmethode" [Isoagglutination in mankind with a comment on the blood differentiation method of Marx Ehrenrooth]. *Centralblatt für Bakteriologie und Parasitenkunde* [Jena], 1st div., vol. 39 (1905), pp. 704–712.

In the Woman's Clinic at Greifswald Martin conducted experiments on agglutination and isoagglutination. He tested the blood of mothers before, during, and after birth, and of young infants, examining the reaction of the mother's and the infant's blood on each other and on his own corpuscles. He found that illness produced no effect, and by comparing the variations that occur in like experiments with the serum and corpuscles of healthy men that pregnancy and birth act like purely physiological functions. He believes that the Marx-Ehrenrooth method is not sufficiently reliable for forensic practice and that Uhlenruth's method is safer. Three tables give the details of his work. Animal experiments also are described.

273 **Mayer, Rudolf:** "Kalziumbestimmungen im Serum Gesunder, Rachitischer, und Spasmophiler, sowie nach Adrenalinvorbehandlung" [Calcium determinations in the serum of healthy, rachitic, and spasmophilic children; also after use of adrenalin]. *Arch. f. Kinderh.* [Stuttgart], vol. 70 (1921–22), pp. 170–184.

In this investigation into the calcium content of the serum of healthy infants Table 1, which gives age of 10 infants, titration numbers, and milligrams of calcium per 100 cubic centimeters of serum, shows an average of 11.25; Table 2, on seven children between 4 and 10 years, shows an average of 11.38. In both cases variations are very slight. Two other tables prove independence of calcium content of diet and its great constancy. The normal value in the adult is not much higher—12.2. It seems that the value in the infant below 6 months is a little higher than later. Bibliography.

274 **Mayers, Laurence H.:** "A study of the erythrocyte curve at various ages and its relationship to hemoglobin curve." *Archives of Internal Medicine* [Chicago], vol. 30 (1922), pp. 478–484.

Blood samples for this study were obtained from 41 apparently normal infants by incision of the right great toe with a sharp cataract knife. The second drop was used. Thirty-seven samples were taken at time of delivery and four within two hours after delivery. In 10 cases counts were made on the second, eighth, and fourteenth days. The red blood count for the 41 cases, taken within two hours of delivery averaged 7,630,000; the average of the 10 cases taken on second, eighth, and fourteenth days, was 6,260,000. Study of available data on hemoglobin content and erythrocyte count showed that, in childhood, the curves are not parallel, and that the norm employed in determining the color index of adults does not apply in determining the color index of children under 10 years of age. References.

275 **Menicanti:** "Über das specifische Gewicht des Blutes und dessen Beziehung sum Hämoglobingehalt" [The specific gravity of blood and its relation to hemoglobin content]. *Arbeiten aus dem Medicinisch-Klinischen Institute der K. Ludwig-Maximilians-Universität zu Muenchen* [Leipzig], vol. 3, 1st half, 1893, pp. 490–505.

This article refers principally to adults. In health, specific gravity stands in a constant relation to hemoglobin content with only small individual variations. A table gives these two values for nine boys from 9 to 16 and six girls from 3 to 11. The blood was taken from the fingers between 9 and 10 a. m. and 4 and 6 p. m. In comparison with the hemoglobin content, specific gravity is less than in the adult. Both values grow greater with increasing age.

276 **Mertz, Albrecht, and Erich Rominger:** "Experimentelle Blutzuckeruntersuchungen bei Kindern" [Experimental investigations of the sugar in the blood of children]. *Arch. f. Kinderh.* [Stuttgart], vol. 69–70 (1921–22), pp. 81–106.

The author tested the sugar in the blood of infants by Bang's micromethod as given in this monograph of 1916–17. The sugar value for healthy infants after a fast of four hours was on an average 0.081 per cent. Age and nutrition showed no influence. In a series of double experiments on five children after administering dextrose alone and after administering it with 5 grams of tannin, he ascertained a considerable checking of intestinal absorption through the tannin. A long table gives full data on the blood-sugar content of 25 children with 30, 50, and 20 grams of dextrose. The concentration of dextrose at time of entering the blood and not the absolute amount in the alimentary canal is significant for hyperglycemia.

277 **Mitchell, A. Graeme:** "Leucocyte counts during digestion, in bottle-fed infants." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 358–373.

Following a résumé of previous investigations on this subject, the author reports a study of 50 practically normal children on whom over 700 blood counts were made. The blood was removed from the toes and counts made immediately before feeding, immediately after feeding, 15 minutes after feeding, one-half hour after, and so on every half hour until the next feeding. Tech-

nique of the counts is described, and tabular record given of the individual cases. Several illustrative case histories are given in detail. The author found that bottle-fed infants do not constantly show digestive leucocytosis. The majority show a smaller number of leucocytes in the superficial blood after taking food than before, the decrease being greatest from one to two and a half hours after food. When a rise does occur, it is most frequently soon after feeding, and a decline begins in a half hour. Crying, struggling, and chilling of the part from which the blood is extracted increase the count. References.

278 **Modica, O.:** "Sul diametro dei globuli rossi del sangue fissato dell'uomo e sulle percentuali delle varie grandezze globulari nei primi tre mesi di vita estrauterina" [On the diameter of red blood corpuscles in the human being and on the percentages of the various sizes of these corpuscles in the first three months of extrauterine life.] *Archivio di farmacologia sperimentale e scienze affini* [Siena], 1911–12, pp. 325–384.

The author studied the blood of 37 infants under three months old and 3 adults in a clinic of the University of Parma. He found that in breast-fed infants born at term the average diameter of the red blood corpuscles in the first day of life is greater than in adults; it increases slightly in the next four days; on the sixth day there is a rapid decrease, which continues very slowly through the first three months, at the end of which the average diameter is that of the adult blood. The author also found that the number of small-size red blood corpuscles increases with age; that of the larger ones decreases.

279 **Mogwitz, G.:** "Über den Blutzucker der Säuglinge" [Sugar in the blood of infants]. *Monatschr. f. Kinderh.* Originalien [Leipzig and Vienna], vol. 12 (1913–14), pp. 569–585.

The author investigated the amount of sugar in the blood of infants, using Ivar Bang's method. He obtained the results 0.07 to 0.11 per cent from 22 healthy children, one 12 years old, one 3 years old, and the others ranging from 7 hours to 13 months, all of whom had received no food for 3½ to 4 hours. In seven experiments he found nothing abnormal in premature infants, and in seven further experiments no difference between arterial and venous blood. Six experiments on an accentuated carbohydrate diet showed hyperglycemia, and four on a hunger diet showed hypoglycemia. Psychical disturbances showed no influence. Thirty-eight experiments on sickly children proved that though fever and alimentary intoxication cause a tendency to hyperglycemia yet in general disease produces little effect on the percentage of sugar in the blood.

280 **Monti:** Über Veränderungen der Blutdichte bei Kindern" [Changes in the concentration of children's blood] *Arch. f. Kinderh.* [Stuttgart], vol. 18 (1894–95), pp. 161–178.

For two years the author studied in a children's hospital the concentration of children's blood between birth and 10 years of age. For the most part he used Hammerschlag's method, but in a small series of 23 children he used both Hammerschlag's and the pyknometer method. One table gives minimal, medium, and maximal values; another compares thickness of the blood with the hemoglobin content. Blood density is highest in the newborn. It varies directly with weight, varies also with time of day and muscular action, and is positvely correlated with hemoglobin.

281 **Moore, Fred:** "Acetone bodies in the blood of children." *Am. J. Dis. Child.* [Chicago], vol. 12 (1916), pp. 244–253.

The blood of 16 normal children was examined quantitatively for acetone bodies. Expressed as milligrams of acetone per 100 grams of blood, this was found to vary from 1 to 13, with an average of 6.3. The blood of a normal child after 48 hours of voluntary starvation was found to contain 39.5 milligrams of acetone bodies per 100 grams of blood. References.

282 **Moro, Ernst:** "Vergleichende Studien über die Verdauungsleukocytose beim Säugling" [Comparative studies on digestive leucocytosis in the infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 40 (1904–5), pp. 39–50.

Moro defines digestive leucocytosis, cites prior investigators on the subject, and mentions his own method of study. He took blood from the ear or great toe of infants, before and after meals, at half-hour intervals. From a series of experiments on two to four infants in each case he studied leucocytosis in the healthy breast-fed child, the healthy artificially-fed child, and the breast-fed child who was being weaned to cow's milk. In normal cases he discovered not a leucocytosis but leucopenia, beginning during the nursing and at its maximum 1 to 2½ hours afterwards. Then the leucocytes begin to increase and three to four hours after the meal have attained the normal number. On the other hand, when a new kind of albumin is introduced into the system, leucocytosis accompanies digestion. The results appear in tables.

283 **Morse, Mary E.:** "The blood platelets in normal women, in obstetrical patients, and in the newborn." *Bost. M. & S. J.*, vol. 166 (1912), pp. 448–452.

Platelet counts made with 12 infants during the first 19 days of life indicated that the number, which varies widely at birth, tends to become stable at the end of the first week.

284 **Müller, Erich:** "Die Blut- und Hämoglobinmenge und die Sauerstoffkapazität des Blutes bei gesund- und bei blassaussehenden Kindern" [The amount of blood and hemoglobin, and the oxygen capacity of the blood in healthy looking and pale children]. *Jahrb. f. Kinderh.* [Berlin], vol. 72 (1910), supplement, pp. 176–208.

Müller tested between 11 and 12 a. m. the blood of 30 children between 6 and 16 years of age in the Rummersburg Orphanage. Twenty of the children had a healthy, fresh color and 10 were pale. The tests were made by the CO method as used by Zuntz and Plesch. In the 20 healthy children the average specific gravity was 1.0435, less than that of adults; the amount of blood was 6.92 per cent of body weight, greater than that of adults; the hemoglobin (determined by method of Tallquist, Sahli, and Fleischl-Miescher) was 80 per cent of body weight, greater than in adults; and the oxygen capacity was 15.6 volume per cent, less than in adults. The 10 pale children were free from kidney and other grave complaint. The specific gravity was 1.0410, the amount of blood 7.12 per cent of body weight, the hemoglobin 79 per cent, and the oxygen 15.3 per cent; that is, practically the same as in the healthy children. Therefore the great majority of pale children are not anemic. The amount of blood, the hemoglobin content, and the oxygen capacity present compensatory phenomena, in that the oxygen brought to the tissues is approximately the same. Müller presents his own figures and those of other students in 14 tables. Bibliography.

285 ——— "Untersuchungen über die Arbeitsleistung des Blutes und des Herzens bei blassen Kindern in 6 bis 12 Lebensjahre" [Investigations on the working capacity of the blood and heart in pale children between 6 and 12]. *Jahrb. f. Kinderh.* [Berlin], vol. 34 (1916), pp. 251–258.

The author gives the results of his studies of the blood and heart of six pale children between 6 and 12 years old and compares therewith similar investigations upon healthy children. The two sets of results showed little difference. The six pale children were not anemic in the ordinary acceptance of the term. Aside from the appearance of the children and the percentage of hemoglobin he found two distinct groups according to relations between oxygen capacity of the blood and oxygen consumption on the one hand and on the other hand the minute-volume and the speed of the flow of blood.

286 **Muggia, Aldo:** "Sul contenuto di glucosio nel sangue della prima infanzia" [On the sugar content of the blood in infancy]. *Rivista di clinica pediatrica* [Florence], vol. 22 (1924), pp. 1–11.

In order to determine the sugar content of the blood of infants, the author analyzed samples of placental blood in four cases; also the blood of 22 normal children ranging in age from 6 days to 2 years, and of 8 sick children from 1 month to 1 year old, using the micromethod of Fontes and Thivolle, with blood taken 3½ hours after the child had been fed. The placental blood contained on an average 0.102 per cent of glucose; in well children under 1 year old the glucose content varied from 0.105 to 0.155 per cent, and during the second year of life from 0.081 to 0.126 per cent.

287 **Nast, Eberhard:** "Über den Eiweissgehalt des Blutes im Kindesalter mit besonderer Berücksichtigung der Tuberkulose" [Protein content of blood in childhood with special reference to tuberculosis]. *Ztschr. f. Kinderh.* [Berlin], vol. 11 (1914), pp. 92–110.

The author determined refractometrically the protein content of the blood of more than 200 children from 1 month to 12 years of age, healthy children and tuberculous. The blood was taken when subjects were lying quiet in bed. Findings are put in two long tables giving age, albumin content in normal and tuberculous cases, etc. The content is 5.3 to 6.8 for the first three months and 5.5 to 7 for the third to the eighth month. The change to the higher value of adults comes about the tenth month. Bibliography.

288 **Neurath, Rudolf:** Über die Bedeutung der Kalksalze für den Organismus des Kindes unter physiologischen und pathologischen Verhältnissen" [The significance of lime salts for the child organism in physiological and pathological conditions]. *Ztschr. f. Kinderh.* [Berlin], vol. 1 (1910–11), pp. 3–42.

The author is much interested in Wright's method of determining the oxalate-precipitable calcium combinations in the blood of children. He made control tests with other methods and found that the two series of results tally. His experiments were on 4 healthy nurslings and 12 sick children from 1½ to 9 years; on the effect of different diets on 16 children from 15 days to 10 months old; on the effect of lime upon 10 children; and also on various pathological cases. He concluded that in normal human beings the nursling period shows relatively high values in lime and that they fall with increase of age. Breast-fed children show in their blood a higher content in oxalate-precipitable lime salts than artificially-fed children. More lime in the food only occasionally produces an excess of lime in the blood. Long bibliography.

289 **Nicloux, M.:** "Sur la présence de l'oxyde de carbone dans le sang du nouveau-né" [On the presence of carbon dioxide in the blood of the newborn]. *Comptes rendus hebdomadaires des séances de l'Académie des sciences* [Paris], vol. 132 (1901), pp. 1501–1504.

Ten experiments with the blood of the newborn (methods described) show the presence of carbon dioxide in average amount of 11 cubic centimeters for 100 cubic centimeters of blood.

290 **Nobécourt, P., and Sevin:** "Le ferment amylolytique du sérum sanguin chez l'enfant normal et chez l'enfant malade" [The amylolitic ferment of the blood serum in normal and sick children]. *Revue mensuelle des maladies de l'enfance* [Paris], vol. 20 (1902), pp. 25–37.

The authors studied the serum of 37 normal infants from 2 days to 2 years of age, and of 9 individuals from 2 years 7 months to 29 years. Methods are described and results tabulated by name, age, date of examination, weight, and quantity of sugar produced by 1 cubic centimeter of serum. In the normal state this amount was: First month, generally, 0.005 gram to 0.0199 gram; second month, same average limits, seldom falling below the lower; 2 months to 2 years, same average limits, never falling below the minimum, occasionally reaching 0.0290 gram; 2 years to adult life, 0.02 gram to 0.0299 gram.

291 **Norman, G. F.:** "Studies on the cholesterol and fatty acid content in the blood of normal and icteric infants." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 21 (1923–24), pp. 211–214.

Cholesterol and fatty-acid studies on blood were undertaken primarily to determine the relation of these substances, if any exists, to icterus neonatorum, and to establish average values for infants. About 100 determinations were made on the blood of infants and of older children varying in age from 1 to 4½ years. Low values for cholesterol seemed quite constant in the blood of infants. A gradual rise to normal adult values was observed before the second year of life. Adult fatty acid values obtained throughout infancy. Tables.

292 **Nystén, Einar:** "Om blodsockerhalten hos dibarn" [Blood sugar in nurslings]. *Finska Läkaresällskapets Handlingar* [Helsingfors], vol. 60, pt. 2 (1918), pp. 1061–1081.

The author discusses findings of other investigators, and after examining the blood of 42 infants in the children's home in Helsingfors (21 well infants and 21 infants suffering from intestinal disturbances) he concludes that the sugar content of the blood of normal children was much less than that of persons at the age of puberty. Bibliography.

293 **Ogata, Matsutaro:** Blutbefunde im Kindesalter [Blood Findings in Childhood]. Greifswald, 1908. 63 pp.

Inaugural dissertation (University of Greifswald). Data on red corpuscles, white corpuscles, specific gravity, hemoglobin content, quantitative values of various kinds of leucocytes, and alkalinity. The author's studies involve 17 healthy children from infancy to 9 years. The newborn showed the highest numbers of erythrocytes and leucocytes and the highest hemoglobin content. Red corpuscles varied between 4,656,000 and 5,392,000 and white corpuscles between 15,700 and 6,730, but the latter increased with age. The specific gravity averages 1.0553, and hemoglobin content 80 to 91 per cent. Alkalinity is 426.4 to 479.7 milligrams of sodium hydroxid. Bibliography.

294 **Opitz, Hans:** "Über Blutregeneration bei Kindern, insbesondere bei Säuglingen" [Blood regeneration in children, especially infants]. *Monatschr. f. Kinderh.* [Leipzig], vol. 24 (1923), pp. 112–204.

The text is divided into discussions on physiological peculiarities of childhood, general comments on blood regeneration, effect on blood regeneration of food, of such physical agents as light, natural and artificial, of endocrines, and of extravascular and intravascular blood transfusion. Subjects were free from syphilis and tuberculosis. Many pages of case histories and tables of findings are given. Bibliography.

295 **Orland, Ferdinand:** "Beitrag zur Untersuchung des neutrophilen Blutbildes beim gesunden und beim kranken Säugling" [Contribution to investigation of the neutrophil blood picture in the healthy and sick infant]. *Medizinische Klinik* [Berlin], vol. 3 (1907), pp. 1491–1493.

A study in mothers' consultations and women's clinic in Bonn of the blood picture of 14 healthy breast-fed infants, varying in age from 3 days to 7 months, brought to a clinic in Bonn. Values for normal adults are also given. The tables give percentages of nuclear forms from one to five. No observations were made before the third day after birth. From then till the eighth month there was little variation, nor did change in diet produce any real modification.

296 **Otto, Oscar:** "Über Blutkörperchenzählungen in den ersten Lebensjahren [The Blood Count during the Early Years of Life]. Halle, 1883. 30 pp.

Inaugural dissertation (University of Halle). After a long account of previous literature on blood corpuscles in adults and children the author presents the figures he obtained from counting corpuscles in blood taken from the fingers of 10 normal children, 10 rachitic, 8 scrofulous or tubercular, 15 with

diarrhea, and 6 others in pathological condition. Among the 10 normal infants between 10 hours and 1 year 2 months in age only 3 had fewer red corpuscles than adults. The usual effect of illness was to increase the white corpuscles.

297 **Parouty, Raymond-Marie-Léonard:** Étude clinique de la coagulation du sang de l'enfant à l'état normal et dans certains états pathologiques [A Clinical Study of the Coagulation of the Blood of the Child in Normal Health and in Certain Pathological Conditions]. Bordeaux, no. 44, 1910. 114 pp.

Thesis for medical degree (University of Bordeaux). Following a lengthy discussion of methods of determining the time of coagulation of the blood, the author records, by individual cases, the results of three series of observations made by himself, as follows: Infants, born at term, from 1 day to 18 months of age, 23 observations, 11 minutes, 15 seconds, to 12 minutes; children from 18 months to 5 years, 26 observations, 9 minutes 15 seconds to 9 minutes 40 seconds; children from 5 to 15 years, 27 observations, 9 minutes 40 seconds. The rest of the thesis concerns pathological conditions. Bibliography.

298 **Peiper, Erich:** "Das specifische Gewicht des menschlichen Blutes" [Specific gravity of human blood]. *Centralblatt für Klinische Medicin* [Leipzig], vol. 12 (1891), pp. 217–224.

Peiper's tests by means of Schmaltz's capillary pyknometer were made with 11 healthy children—8 boys between 7 and 10 years of age and 3 girls between 6 and 13. The specific gravity for the boys was 1.0522 and for the girls 1.0501—values lower than those for adults.

299 **Perlin, Anna:** "Beitrag zur Kenntnis der physiologischen Grenzen des Hämoglobingehaltes und der Zahl der Blutkörperchen im Kindesalter" [Contribution to the knowledge of the physiological limits of the hemoglobin content and the number of corpuscles in the blood in childhood]. *Jahrb. f. Kinderh.* [Berlin], vol. 58 (1903), pp. 549–571.

The author examined the blood of 155 healthy and 31 sick children from 1 day to 16 years old and from the poorer classes. She used Frank's needle in taking the blood, determined the hemoglobin with Fleischl's hemometer as improved by Miescher, and often, in addition, used Gower's hemoglobinometer. The number of red corpuscles was determined by the apparatus of Thoma-Zeiss, and the white corpuscles were determined by the apparatus of Thoma. The results obtained are shown in one table for the first three days, in another table for the fourth to the thirtieth day, and in other tables for 2 to 18 months, 2 to 4 years, 4 to 8 years, and 16 to 18 years. The figures are compared with those of other investigators. The author found a higher content in the well to do and a lower in sick children, but no difference caused by sex. The content of hemoglobin and of red corpuscles is highest in the newborn and lowest in the first year and rises to the sixteenth year. That of the white corpuscles is highest in the newborn and sinks to the sixteenth year. Bibliography.

300 **Pettibone, C. J. V., and F. W. Schultz:** "Amino acid nitrogen in the systemic blood of children in health and disease." *J. A. M. A.* [Chicago], vol. 67 (1916), pp. 262–263.

Observations on the amino acid content of the blood of more than 60 children from 1 month to 13 years of age, among whom were 10 normal subjects. Blood was drawn by hypodermic from the median basilic vein of the arm or by Tobler's method from the superior longitudinal sinus. Analysis was done by the method of Van Slyke and Meyer. The results as tabulated show in normal children 2.05 to 6.97 millimeters of nitrogen per 100 cubic centimeters of blood.

301 **Pfaundler, Meinhard:** "Physikalisch-chemische Untersuchungen an Kinderblut" [Physicochemical investigations of children's blood]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 21–22 (1904–5), pp. 24–40.

Pfaundler believes that the most promising way to study the blood physically and chemically is through the determination of its alkalinity, which is related to the blood content in hydroxyl ions. He uses Farka's method as modified by Hober, whereby the electromotive power is measured by the compensation method after charging the chain by a very sensitive galvanometer. It takes less time and is better than the titration method. Blood was taken from a vein or from a heart puncture directly after death, the two methods giving almost the same results; 100 measurements were made on 40 children. The concentration of the hydroxyl ions in the blood serum varied between 0.2 by 10^{-7} and 3.4 by 10^{-7} grams equivalent per liter. Values increased after first year on to maturity.

302 ——— "Über die actuelle Reaction des kindlichen Blutes" [Actual reaction of child's blood]. *Arch. f. Kinderh.* [Stuttgart], vol. 41 (1905), pp. 161–184.

After a long theoretical discussion of the lessened alkalinity of blood as a biochemical criterion for acidosis, the author presents a table on ion concentration and reaction of serum of blood of 28 children, some dead, some alive. Blood was taken from the latter while fasting and in bed. Ages ranged from 2 days to 13 years. In 6 cases there was an acid reaction, in 14 an alkaline reaction, in 8 an almost neutral reaction. High alkalinity is rare in the infant; neutral reaction is rare in the older child. Bibliography.

303 **Pollitzer, R.:** "Stato del sangue e degli organi ematopoietici nel neonato" [State of the blood and of the hematopoietic organs of the newborn infant]. *La Pediatria* [Rome], vol. 32 (1924), pp. 1144–1154.

The author studied the most important hematopoietic organ, the bone marrow, in 32 normal newborn infants from 8 hours to 6 days old. In each case he examined the peripheral blood and made a puncture in the tibia for the hematopoietic examination. He gives his findings in two tables; in one the data on the analysis of the peripheral blood for each infant; in the second table the contents of the bone marrow in each case. The blood of the newborn is abnormally rich in cellular elements and in hemoglobin; and even in the first few days it contains some erythroblasts. In the marrow at the time of birth immature red corpuscles are more numerous than the white ones; a few days later the proportion is reversed. The more intense proliferation of the white medullary elements coincides chronologically with the diminution of the polynuclears in the blood. There exists, in general, an inverse relation between the number of the fully formed blood corpuscles, white or red, in the blood and the number of the immature elements in the marrow.

304 **Rabinowitsch, Dina:** "Die Leukocyten verschiedener Altersstufen. Untersuchungen über die Leukocyten gesunder Kinder" [The leucocytes at various ages. Investigations on the leucocytes of healthy children]. *Arch. f. Kinderh.* [Stuttgart], vol. 59 (1912–13), supplement, pp. 161–172.

The author tested the blood of 150 healthy boys and girls from 1 to 16 years of age, and arranged in tables the maximum, minimum, and average number of total leucocytes and various forms of leucocytes in 1 cubic millimeter of blood according to age. The total number was on an average 6,000–7,000, as in adults. The neutrophils were 30 per cent of total white corpuscles at 1 and 2 years and 70 per cent at 15, as in adults. The lymphocytes were 60 per cent at 1 and 2 years and 30 per cent at 16, as in adults. The eosinophils were 4 to 6 per cent. The transitional forms were 2 to 3 per cent. The mast cells were 0.3 to 0.6 per cent. The large mononuclear cells were 1 to 3.3 per cent. Sex did not affect the leucocytes.

305 **Reiss, Emil:** "Die refraktometrische Blutuntersuchung und ihre Ergebnisse für die Physiologie und Pathologie des Menschen" [Refractometric blood tests and their bearing on human physiology and pathology]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 10 (1913), pp. 531–634.

This article, containing 34 tables, discusses refractometric blood tests in general, types of refractometer, manner of taking blood, etc., and their uses and results in both the physiological and the pathological state. Many pages are devoted to the calculation of the albumin content from the coefficient of refraction. Albumin content of blood serum is between 7 and 9 per cent in the adult and between 5.6 and 6.6 per cent up to fifth month in the infant. Table 20 gives these findings in 40 cases between the ages of 1¼ days and 18 years. Breast-fed children are indicated with an asterisk. The method used gives exact results for water loss and water retention in nutritional disturbances of infants. Bibliography.

306 ——— "Untersuchungen der Blutkonzentration des Säuglings" [Investigations into the concentration of the blood of infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 70 (1909), pp. 311–362.

By the concentration of the blood in infancy the author means not the osmotic concentration but the combined content of all dissolved substances. The author took the blood from the great toe three hours after the last meal and examined the blood serum refractometrically. The child's weight was determined at the same time. A table for 38 healthy children (17 infants and the others ranging from 1 to 18 years) shows refractive index and protein content. The latter is 5.6 per cent to 6.6 per cent for the infants and 7.5 per cent to 9 per cent for the older child, as for adults. Twenty-one case histories are presented.

307 **von Reuss, A.:** "Über den Antitrypsingehalt des Serums beim Säugling" [Antitrypsin content of serum in the infant]. *Wiener Klinische Wochenschrift*, vol. 22 (1909), pp. 1171–1172.

The author presents a table on antitrypsin value of serum in 43 infants. Results are usually negative in the breast-fed infants, positive in sick infants, and slightly positive in healthy artificially-fed infants.

308 **Riesenfeld, E. A., A. R. Rose, and I. Handelman:** "The distribution of inorganic phosphorus in the blood of the newborn." *Am. J. Dis. Child.* [Chicago], vol. 29 (1925), pp. 611–617.

In conjunction with examinations of the whole blood of the umbilical cord simultaneous examinations were made of: (a) Arterial blood of the cord, (b) venous blood of the cord, (c) blood from the superior longitudinal sinus, and (d) venous blood from the mother. Decided differences and variations were found in the samples from these sources. The difference between the phosphorus values in whole blood of the umbilical cord and in arterial and venous cord blood was found to be very slight. The phosphorus of maternal blood was usually lower than that of cord blood. The cases in which the phosphorus of fontanel blood exceeded that of cord blood were about equal in number to those in which the cord blood exceeded fontanel blood. A close parallelism was found, in blood from all five sources, between the concentration of blood phosphorus and the percentage of cell mass.

309 **Riesenfeld, E. A., Isidore Handelman, and Anton R. Rose:** "Inorganic phosphorus in the blood of the newborn; its seasonal variation and its relation to rickets." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 646–658.

One thousand four hundred and thirty-nine inorganic phosphorus determinations were made on the blood of mothers and their newborn infants. Nearly 80 per cent of the subjects were of the negro race. The original Tisdall method of analysis was used. The child's blood was obtained by severing the litigated pulsating cord and permitting the blood to drip into a test tube. The infant's blood averaged 4.12 ± 0.028 milligrams inorganic phosphorus per 100 cubic centimeters. No significant variations were found due to race, previous habitat of the mother, or time the mother spent out of doors during gestation, but variations with diet of the mother, season, relative humidity, and available sunlight were apparent. The article contains six tables, four charts, and a reference list.

310 **Rominger, Erich:** "Über den Wassergehalt des Blutes des gesunden und ernährungsgestörten Säuglings" [The water content of the blood of the healthy and dyspeptic infant]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 26 (1920), pp 23–64.

Bang's method was used. Five pages of tables give the water content of the blood of 64 healthy infants (including 4 premature infants) for the first year. Results are also given of tests upon 32 healthy infants fed weak fennel tea. The effects of fasting upon water content of the blood are also noted. A high concentration was found during the first month. After the fifth month there was little fluctuation. No difference was found between breast-fed and artificially-fed infants.

311 **Rosenstern, J.:** "Über alimentare Leukocytose" [Alimentary leucocytosis]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 8 (1909–10), pp. 9–23.

On the basis of previous tests and those described in this article, the author feels convinced that all constituent parts of milk except water, but especially sugar and salts, can call forth fever and leucocytosis, and that this is not due to bacteria or catarrhal condition. With human milk as well as cow's milk there appear substances that can in certain circumstances work chemotactically; appearing in normal digestion, they lose their toxic effect in circulation unless too concentrated, as in case of 3 per cent sodium chlorid dose per os, or unless given parenterally. Since albumin and fat play but a small part in this connection, the author's experiments involve ingredients of whey, milk sugar, and salts, in weak and strong doses, by mouth and subcutaneously, but not intravenously, given to three healthy babies and many more dyspeptic ones. Results are put in tables and curves.

312 **Rusz, Emerich:** "Die physiologischen Schwankungen der Refraction und der Viskosität des Säuglingsblutes" [Physiological variations of the refraction and viscosity of infant blood]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 10 (1911), pp. 360–372.

The author tested viscosity of infant blood by Determann's apparatus and refraction of plasma by Abbé's refractometer. Only healthy subjects were used. Tables give age, body weight, viscosity, and refraction. Table I on 108 infants follows the generalizing method for ages from 3 hours to 14 months. Tables II and III follow the individualizing method on seven and three subjects during first few days of life. Two curves show weight, refraction, and viscosity for first month and for 14 months. Tables IV and V show the influence of time of day, and the final table, VI, gives viscosity and refraction before and after meals for 24 subjects. Viscosity and refraction vary widely in infants. They rise during first few days, then sink. The viscosity sinks gradually during the whole first year and refraction rises gradually. Bibliography.

313 **Samelson, S.:** "Über Fettspaltung im Säuglingsblut" [Splitting of fat in infant blood]. *Ztschr. f. Kinderh.* [Berlin], vol. 4 (1912), pp. 205–207.

Author investigates the fat-splitting power of blood in 14 infants between 3 months and 2 years of age. A table shows the presence of a fat-splitting ferment in the serum in every case. This is evidently a means used by the organism to bring fat into blood circulation and also to remove it.

314 **Scheer, Kurt:** "Der Chlorspiegel im Blutserum des Säuglings und seine Abhängigkeit von der Magensaftsekretion" [Chlorin picture in the blood serum of the infant and its dependence on secretion of gastric juice]. *Jahrb. f. Kinderh.* [Berlin], vols. 91–92 (1920), pp. 347–356.

The author studied relations of body weight, albumin, and chlorin in the serum of blood taken hourly between 9 a. m. and 6 p. m. from the heels of nine infants from 2 to 4 months old. Diets were mother's milk, milk gruel, protein milk, buttermilk, and tea. Bang's micromethod was used. The article contains nine curves. Bibliography.

315 ——— "Untersuchungen über den Chloridgehalt des Serums beim Säugling unter verschiedenen Bedingungen" [Investigations on the chloride content of infant serum under various conditions]. *Jahrb. f. Kinderh.* [Berlin], vol. 44–46 (1921), pp. 295–314.

By Bang's micromethod the author tested the percentage of chloride in the blood serum of 70 infants, taking the blood from the heel. Results are put

In eight curves and in tables. The content in the resting organism was found to be 0.50 to 0.59 per cent. It is closely related to digestion, falling after meals. This phenomenon is not to be found after the third or fourth year. Salt temporarily causes a high chloride content. Bibliography.

316 **Scherenziss, David:** Untersuchungen über das foetale Blut im Momente der Geburt [Investigations on Fetal Blood at Moment of Birth]. Dorpat, 1888. 36 pp.

Inaugural dissertation (University of Dorpat). The author studies blood of the infant at birth as compared with that of adults. At outset he describes his methods of determining specific gravity of blood 9 times and of serum 5 times, of determining fibrin content of blood 9 times, content of insoluble salts in blood 6 times and in serum 4 times, chlorin content in blood 6 times and in serum 4 times, and his methods in 4 potassium and sodium determinations and 10 spectrophotometric hemoglobin determinations. The average specific gravity of the blood of the newborn is 1.0592, of adults 1.0607. Average hemoglobin is 76.8 for infants, 100 for adults. Fibrin content of infants stands in relation to mother's blood as 2 : 7. Infant blood is richer in salt and in sodium but poorer in potassium than is adult blood. Sex and weight appear to have no effect on the quantitative composition of blood of the infant at birth. Tables are given.

317 **Schiff, Ernst:** "Beiträge zur Chemie des Blutes der Neugeborenen" [Contribution to the chemistry of the blood of the newborn]. *Jahrb. f. Kinderh.* [Berlin], vol. 64 (1906), pp. 409–441, 540–575.

The author studied the chemistry of blood during the first 10 days of infancy, noting also temperature, weight, and stools. He determined dry residue, ash, albumen, and specific gravity of serum in a large series of cases. Results are tabulated and discussed.

318 ——— "Neuere Beiträge zur Hämatologie der Neugeborenen mit besonderer Rücksicht auf die Abnabelungszeit" [More recent contributions to the hematology of newborn infants with special reference to the time of cutting the navel cord]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 34 (1892), pp. 159–201, 459–481.

The theories of other authors are discussed. The author's own observations are 500 in number upon 27 infants, of whom 18 had the cord cut 10 minutes after birth and 9 at birth. At birth the nurse held the cord and the doctor took a drop of blood from the great toe; he took another drop when the cord was cut. On succeeding days of sojourn in the hospital blood tests were made and also determinations of weight, temperature, urine, chlorides, urates, and specific gravity of the blood. The very numerous tables contain data on the red corpuscles of the blood, according to immediate or late cutting of cord and age, on daily amount of urine, percentage of urea, etc. The author believes that the infant gains in weight through gain of blood during birth and through retention of umbilical cord some minutes after birth, but that this excess of blood is lost during the first three or four days.

319 ——— "Neuere Beiträge zur Haematologie der Neugeborenen" [New contributions to the hematology of newborn infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 54 (1901), pp. 1–23, 172–212.

The author made 834 tests of the specific gravity of the blood of 58 infants; 25 he did not consider in this study because they were not perfectly healthy. He also made 259 observations for hemoglobin upon 20 infants and 63 observations for the number of red corpuscles. All this experimentation covered the first 10 days of extrauterine life. The direct or pyknometric method and the indirect method are described, of which the author prefers the former. The prick was made in the great toe always in the same circumstances. Full notations were kept of the infant's condition. Whereas the specific gravity of the blood in the adult and older child remains approximately the same, that of the newborn varies for the individual and by day and by hour. The limits for the first 10 days are 1.0813 and 1.0590. There is a decrease of about 0.001 per day and 0.01 from birth until the tenth day. The high specific gravity at birth the author ascribes to initial difficulties of circulation and to rapid cooling. The specific gravity is higher by day than by night, higher in sturdy than weak infants, and in those whose umbilical cord is cut late. Sex and order of birth seem to have no influence. Nor does the specific gravity appear to vary with the number of blood corpuscles nor the hemoglobin content. This long article contains many tables.

320 ——— "Über das quantitative Verhalten der Blutkörperchen und des Haemoglobin bei neugeborenen Kindern und Säuglingen unter normalen und pathologischen Verhältnissen" [The quantitative content of the corpuscles and hemoglobin in the blood of newborn children and nurslings in normal and pathological conditions]. *Zeitschrift für Heilkunde* [Berlin], vol. 11 (1890), pp. 17–88.

The author discusses in detail the methods and results of his investigations on the red corpuscles, white cells, and hemoglobin in the blood of young infants. He obtained the blood, usually twice a day, by pricking the great toe with a needle and used Thoma-Zeiss's apparatus in counting. He presents comprehensive tables and in many cases curves of his tests on about a dozen infants. The red and white corpuscles and hemoglobin are all greater in quantity during the first three or four days of life and decrease with irregular fluctuations.

321 **Schiff, Ernst, and E. Roser:** "Über das quantitative Verhalten der Albumine und Globuline im Blutserum des Säuglings" [Quantitative proportion of albumin and globulin in blood serum of the infant]. *Monatschr. f. Kinderh.* [Berlin], vol. 19 (1920–21), pp. 15–20.

The author gives data on albumin and globulin content of blood serum, hemoglobin, and number of red and white corpuscles in 49 infants. Albumin tends to have highest values in healthy and in young infants.

322 **Schippers, J. C.:** "Bestimmung der Blutlipoide nach Bang" [Determination of blood lipoids after the method of Bang]. *Jahrb. f. Kinderh.* [Berlin], vol. 93 (1920), pp. 151–159.

After discussing Ivor Bang's two methods of determining blood lipoids the author lists a number of results he obtained from his own investigations concerning the blood content in neutral fat, cholesterin, cholesterinester, and phosphates and fatty acids of infants and older children. The tests were made in the morning after a fast of 10 hours. There was great variation among different individuals and slight variation among various tests on the same subject. From comparison of above figures obtained from infants, older children, sick children, and children with eczema the author concludes that there is probably a relation between the ester content of blood and resistance to disease.

323 ——— **and Cornelia de Lange:** "Verdauungsleukocytose und Verdauungsleukopenie bei Kindern" [Leucocytosis and leucopenia in children during digestion]. *Ztschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 169–183.

To study action of leucocytes during digestion in healthy childhood the authors studied the effect of fasting on 9 subjects, cow's milk on 11 infants, mother's milk on 7 infants, cow's milk on 12 children between 1½ and 8 years, pancreatin solution on 4, and effect of lying and standing on 6. Data are shown in five curves and many tables. Among the conclusions the authors state that Widal's method of testing function of liver by hemoclastic reaction is not practicable in infants and young children. Number of leucocytes in fasting children is very varied, even in the same child. There is also great variation during digestion, which may be due to difference in time of day, to excitement, exertion, static and chemical influences, etc.

324 **Schloss, O. M.:** "The normal percentages of the different varieties of leukocytes in infants and children." *Archives of Internal Medicine* [Chicago], vol. 6 (1910), pp. 638–645.

The blood of 80 children, 3 days to 12 years old, was examined; causes of eosinophilia as eczema or helminthiasis were eliminated. In making the differential white counts the results of the cover slip and slide smears tallied well. Repeated counts were made on each child. The technique is described. The conclusion was that there is no physiological eosinophilia in childhood; 5 per cent is the upper limit of normal. There is considerable fluctuation in the eosinophile percentage.

325 ——— **and Helen Harrington:** "Comparison of the carbon dioxid tension of the alveolar air and the hydrogen-ion concentration of the urine with the bicarbonate of the blood plasma." *Am. J. Dis. Child.* [Chicago], vol. 17 (1919), pp. 85–94.

In estimating the carbon-dioxid tension of the alveolar air and the bicarbonate of the blood plasma in 21 infants at the Bellevue Hospital, New York, the average value of $\frac{\text{plasma bicarbonate (carbon dioxid, volume per cent)}}{\text{carbon-dioxid tension of alveolar air}}$ was 1.5. The factor by which the carbon dioxid of the plasma bound as bicarbonate must be multiplied to be converted into terms of carbon-dioxid tension of alveolar air, was found to be 0.66. These factors (1.5 and 0.66) are identical with those found for adults. The estimation of alveolar air was unreliable in infants with shallow respiration The hydrogen-ion concentration of the urine varied with diet. Tables.

326 **Schlutz, F. W., and C. J. V. Pettibone:** "Quantitative determinations of nonprotein nitrogen in the blood of the new-born." *Am. J. Dis. Child.* [Chicago], vol. 10 (1915), pp. 206–211.

The result of 26 blood analyses in children under 12 days of age are tabulated and discussed. The age, weight, hours after feeding, total nonprotein nitrogen, urea nitrogen by both the Folin-Denis and Van Slyke methods, ammonia nitrogen, and amino-acid nitrogen are stated.

327 **Schmal, S.:** "Blutzuckerwerte bei Frühgeborenen" [Amounts of sugar in the blood of newborn infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 38 (1924), pp. 597–598.

An original study of sugar in the blood of 11 prematurely born children weighing from 1,600 to 2,875 grams and from 12 hours to 51 days old. The amount of sugar in the blood varied from 0.0513 to 0.0812 per cent, which is considerably lower than that in infants born at term. This agrees with Rumpf's theory that the younger the individual the smaller the amount of sugar in the blood.

328 **Schücking, Adrian:** "Die Blutmenge der Neugeborenen. Ein neuer Beitrag zur Abnabelungstheorie" [Amount of blood in the newborn. A new contribution to theory of cutting umbilical cord]. *Berliner Klinische Wochenschrift*, vol. 16 (1879), pp. 581–583.

The author emphasizes that the umbilical cord should not be cut until the infant has received the maximum of blood. He refers to writings on the subject by himself and others and describes his tests on five infant cadavers, in three of which, where cord was cut after several minutes, the total amount of blood equaled one-ninth of body weight, and in two, where cord was cut immediately, blood equaled only one-fifteenth of total weight.

329 **Schulz, Paul:** "Ein Beitrag zur Frage der Verdauungslipämie" [A contribution to the question of digestive lipemia]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 4 (1912), pp. 63–91.

To determine lipemia the author uses Schelble's method of classifying the blood serum as very slightly cloudy, cloudy, very cloudy, and expressively cloudy. To do this he draws a few drops of blood from the heel or great toe and centrifuges it at the rate of 3,000 revolutions a minute, removing the fibrin from the serum. The fat in the nourishment is determined. The children tested included healthy infants breast fed and artificially fed and atrophic children without fever. Full details are embodied in case histories, curves, and tables. The clouding appears two to three hours after the meal, disappears in seven to nine hours, and is strongest two to four hours after. A feces test proved that the fat was well assimilated. The author concludes that a part of the fat ingested goes into the blood through the ductus thoracicus, and another part by way of the blood capillaries through the cystic veins into the liver. How much is retained there is not known. The fat in butter caused the greatest cloudiness, that in mother's milk and cow's milk much less; next in order come sesame oil and cod-liver oil.

330 **Scipiades, Elmer:** "Beiträge zur Physiologie des Blutes der Neugeborenen in den ersten 10 Lebenstagen" [Contributions to physiology of the blood of the newborn in first ten days of life]. *Archiv für Gynaekologie* [Berlin], vol. 70 (1908), pp. 630–655.

Scipiades tests the blood of eight newborn healthy infants, using Thoma-Zeiss's apparatus for counting the red and white corpuscles and Lacker's for drawing blood from the great toe. Tables give findings for each of the first 10 days, or tests made upon five infants bathed only once after birth and upon three that received daily baths. The only distinction between the two types was that the number of red and white corpuscles was somewhat higher in the children bathed every day than in the others. This may have been due to chance. The number of red corpuscles at birth is unusually large; later few are needed and produced. White corpuscles also decrease.

331 **Sedgwick, J. P., and F. B. Kingsbury:** "The uric-acid content of the blood in the new-born." *Transactions of the American Pediatric Society* [New York], vol. 29 (1917), pp. 51–57. See also *Journal of Biological Chemistry* [Baltimore], vol. 31 (1917), pp. 261–268.

Report of an investigation to determine whether the high uric-acid excretion during the first few days of life is accompanied by a simultaneous increase of this substance in the blood. The Myers-Fine and Lough modification of the original Folin-Denis method for the determination of uric acid was used with minor changes. Daylight was used whenever possible in reading the colorimeter. The uric-acid content of the blood of 31 newborn infants, from content of placental blood to that 10 days after birth is tabulated; also, for comparison, the uric-acid content in 18 tests of maternal and placental blood. The authors think their finding of parallelism of high uric-acid content and high excretion of this substance during the first three or four days is indirect support of the theory that human fetal tissues possess no micolytic power. References.

332 ——— **and M. Ziegler:** "The nitrogenous and sugar content of the blood of the newborn." *Am. J. Dis. Child.* [Chicago], vol. 19 (1920), pp. 429–432.

Analysis of the blood of 51 normal infants 3 to 43 days old shows that the values for creatin plus creatinin and nonprotein nitrogen are high during the first days of life. The creatinin and sugar values are essentially the same as for normal adults. The urea nitrogen is near the maximum for normal adult value.

333 **Sherman, Dewitt H., George W. Pucher, and Harry R. Lohnes:** "Blood chemistry of the newborn in health and in inanition fever." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 496–503.

A detailed account of a comparison of the blood chemistry of normal newborn infants with that of infants suffering from inanition fever. In the study of 23 normal infants the authors state that "the values on the first day were on cord blood, while the data on the third and fifth days were obtained from the fontanel." Analysis showed urea nitrogen varying but little during the period studied; carbohydrate falling slightly after the first day; sodium chlorid definitely higher on the first day than later, and reaching a constant level on the third; amino acids high in cord blood and coming to a constant level on the third day; carbon dioxide combining power expressed in

millimeters, low in the cord blood and increasing up to the fifth day; percentage of water almost constant, the average being 79.3 per cent. The blood chemistry of the normal newborn, after the third day, is within the range of the averages reported for the normal adult.

334 **Silbermann, Oscar:** "Zur Hämatologie der Neugeborenen" [Hematology of the newborn]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 26 (1887), pp. 252–257.

A study of the blood of 60 newborn infants. It was found that the decomposition of corpuscles during the first days of life releases hemoglobin, and that the blood of newborn infants is richer in fibrin ferment than that of adults.

335 **Slawik, Ernst:** "Studien über die physiologischen Verhältnisse des Blutes beim Neugeborenen mit besonderer berücksichtigung der Blutplättchen" [Studies on physiological condition of blood in the newborn, with special reference to blood platelets]. *Ztschr. f. Kinderh.* [Berlin], vol. 24–25 (1919–20), pp. 212–226.

Erythrocytes in 82 countings on young infants averaged 5,580,000. After great variation during the first 10 days the excess of erythrocytes ceased, the number falling in one case from 8,200,000 to 6,400,000. For nine premature infants the average was 5,950,000. White corpuscles in 82 countings averaged 11,200. Glass cover-slip preparations were made after the method of Sahli for blood platelets of 20 healthy 10-day-old infants. The number varied from 202,000 to 616,000. (It was 230,000 in premature infants.) There was great variation in structure and size. By the fourth week the giant platelets were no longer found. Bibliography.

336 **Stoeltzner, Wilhelm:** "Bestimmungen der Blutalkalescenz an rachitischen und nichtrachitischen Kindern" [Determinations of blood alkalinity in rachitic and nonrachitic children]. *Jahrb. f. Kinderh.* [Leipzig], vol. 45 (1897), pp. 29–44.

In 1896 Stoeltzner tested alkalinity of the blood of 200 children, using the method of Löwy as modified by Berend. The lowest value found was 35.4 and the highest 468. Alkalinity is not dependent on diet and is not correlated with rachitis. A table gives detailed data on 25 infants. Bibliography.

337 **Strathmann, Herweg H.:** "Untersuchungen über den Cholesteringehalt des Blutserums" [Investigations on cholesterin content of blood serum]. *Monatschr. f. Kinderh.* [Berlin], vol. 19 (1920–21), pp. 20–27.

The author presents a table giving cholesterin content of serum and age and nutrition of 28 persons between 3 weeks and 28 years of age, a few of whom were healthy. Values for healthy infants fell between 0.13 and 0.16 (values for adults are 0.11 to 0.24). The author concludes that diet does not affect cholesterin value in the healthy infant. Bibliography.

338 **Strzelbicki, J.:** "Przyczynek do nauki o morfologii i patologii krwi dziecięcej" [Morphology and pathology of children's blood]. *Gazeta Lekarska* [Warsaw], ser. 2, vol. 17 (1897), pp. 718–727, 749–754, 781–785.

After quoting a number of writers the author gives an account of his own study of the blood of 63 normal children varying in age from 10 minutes to 13 years. He gives in tables for each case the number of red and white blood corpuscles and the proportion between the two.

339 **Tagliamuro, P.:** "Contributo clinico-sperimentale sul contenuto in ferro del sangue dei bambini in condizioni normali e patologiche" [Clinico-experimental data on the iron content of children's blood in normal and pathological conditions]. *La Pediatria* [Naples], vol. 15 (1907), pp. 561–575.

After quoting a number of writers the author gives an account of his study as to whether there is a relation between the quantity of hemoglobin and iron in children's blood under normal and pathological conditions. For this purpose he studied 6 normal children from 17 months to 6 years old, and 41 sick children from 7 months to 5 years old. He gives for each case the age, hemoglobin, and iron content of the blood and concludes that there is no constant relation between the hemoglobin and iron content under either normal or pathological conditions.

340 **Takasu, K.:** "Blutuntersuchungen bei den japanischen Kindern" [Investigations of blood of Japanese children]. *Arch. f. Kinderh.* [Stuttgart], vol. 39 (1904), pp. 346–354.

The author tested the blood of 48 Japanese children—30 that were 2 hours to 10 days old and 18 older children. Findings appear in two tables. Examining two groups from 1 to 3 days old and from 4 to 10 days old, he found averages to be, respectively, for hemoglobin, 130.2 per cent and 121.1 per cent; for red corpuscles, 4,843,000 and 4,656,000; for white corpuscles, 19,300 and

14,700; for polynuclear neutrophiles, 68.4 per cent and 58.5 per cent; and for lymphocytes, 26 per cent and 34.5 per cent. Contrary to Schiff, Takasu concludes that race does not affect composition of the blood.

341 **Tileston, Wilder, and C. W. Comfort:** "The total nonprotein nitrogen and the urea of the blood, and the phenolsulphonephthalein excretion in children." *Am. J. Dis. Child.* [Chicago], vol. 10 (1915), pp. 278–287.

A study of the blood and urine in various pathological conditions, containing also a record of five practically normal cases. The blood of two children, over 2 years of age, taken before breakfast after a fast of 12 hours or more, showed 24.4 and 26 milligrams of nitrogen and 9.5 and 10.9 milligrams of urea nitrogen per 100 cubic centimeters, respectively. The phenolphthalein excretion in normal children, when the period of observation was extended to two hours, was within the limits of 78 to 81 per cent.

342 **Tisdall, Frederick F., T. G. H. Drake, and Alan Brown:** "The carbohydrate metabolism of the normal infant." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 675–682.

The authors determined the fasting blood-sugar concentration in 68 normal infants, varying in age from 1 to 18 months. Blood was taken from the longitudinal sinus at least four hours after feeding, and tested by the Schaffer-Hartmann method. An average value of 0.085 per cent was found, the normal variation appearing to be from 0.075 to 0.095 per cent. Subcutaneous injections of 10 cubic centimeters per pound of body weight of a 5 per cent solution of glucose produced only a slight rise in blood-sugar concentration; of 10 and 15 per cent solutions, after one-half hour, a rise to about 0.225 per cent. Intravenous administration of a 10 per cent solution of glucose produced a greater rise in blood-sugar concentration, but the original level was more quickly reached. Charts are presented and references given.

343 **Trumpp:** "Viskosität, Hämoglobin- und Eiweissgehalt des kindlichen Blutes" [The viscosity, hemoglobin, and albumin of children's blood]. *Münchener Medizinische Wochenschrift*, vol. 56, pt. 2 (1909), pp. 2145–2147.

With Hess's viscosimeter the author studied for two years the viscosity, hemoglobin, and albumin of children's blood. For the albumin he took blood from the vein, for the other two purposes from the toe. He tested 152 children, 7 women, and some animals. The viscosity of blood in healthy infants is 3.2 to 3.6; in children between 7 and 13 years, 3.75 to 4.1; in adults (according to Hess), 45. In mothers it is one-third less than in their newborn infants. The author discusses viscosity theoretically: It is, he says, the content of the plasma in viscous substances, not crystalloids but colloids. From experiments in vitro he concludes that the water content can be traced in the thickening or thinning of the blood and that viscosity shows approximately the carbonic-acid content of the blood. The hemoglobin content by Sahle's method was 70 in healthy older children and very much higher in newborn infants.

344 **Tunnicliff, Ruth:** "Observations on the anti-infectious power of the blood of infants." *Journal of Infectious Diseases* [Chicago], vol. 7 (1910), pp. 698–707.

A study of the phagocytic power of infants' leucocytes. Experiments were made with the blood of a small number of healthy institutional children from birth (blood from the umbilical cord) to 3 years of age. The bacteria employed were streptococci, pneumococci, and staphylococci. Technique is fully described. The author concludes that at birth the opsonic power of the blood serum toward these bacteria is a little less than that of adult serum; that it falls lower during the first months and reaches adult power at about the second year; that the phagocytic activity of the leucocytes follows a similar course; that the phagocytic power of the whole blood drops during the first two months and does not reach that of adult blood until about the third year; that during the first and second years of life the anti-infectious power of the blood is far below that of the blood in adult life.

345 **Unger, L. J.:** "Precautions necessary in the selection of a donor for blood transfusion." *J. A. M. A.* [Chicago], vol. 76 (1921), pp. 9–11.

The author tested for the presence of agglutinins and receptors 119 children from less than 1 day to 4 years of age and found that agglutinins are present in 13 per cent of newborn infants, and that only 25 per cent of newborn infants have cells that can be agglutinated. The full quota of agglutinins and receptors is acquired between the third and the fourth year of life.

346 **Utheim, Kirsten:** "A study of the blood and its circulation in normal infants and in infants suffering from chronic nutritional disturbances." *Am. J. Dis. Child.* [Chicago], vol. 20 (1920), pp. 366–392.

This article represents a large amount of original research conducted at the St. Louis Children's Hospital. References are made to similar earlier work. Comparisons are made for normal and athreptic infants and infants suffering from various other illnesses as to blood protein, blood flow, capillary and venous hemoglobin, and numerical blood counts and blood pressure. Control estimations were performed on healthy and starving animals.

347 **Veeder, B. S., and M. Johnston:** "The creatinin and creatin content of the blood of children." *Am. J. Dis. Child.* [Chicago], vol. 12 (1916), pp. 136–144.

Report from the department of pediatrics of the Washington University Medical School and St. Louis Children's Hospital. The method of Folin and Denis was used in determining the nonprotein nitrogen, the creatinin, and creatin in 75 children. Each case is tabulated for age, sex, condition of health, creatinin, creatin, and nonprotein nitrogen. Group tabulations are given for nephritis, and also various diets.

348 ——— **and Meredith:** "The creatinin and creatin content of the blood in children." *Am. J. Obst.* [New York], vol. 74 (1916), pp. 357–359.

A brief report of determinations made by the methods of Folin and Denis on 70 children, some of whom were normal. The creatinin figure for normal children varied between 0.58 and 3.44 milligrams per 100 cubic centimeters. The creatin figure was rarely over 5 milligrams per 100 centimeters. No specific relationship was found between the amount of creatin and creatinin, nor any relation between the amount of creatin and the clinical condition.

349 **Warfield, L. M.:** "The differential leukocyte count in the new born." *American Medicine* [Philadelphia], vol. 4 (1902), pp. 457–459.

A review of previous literature giving tables of differential white counts from Lundobin and Carstanjen. Differential white counts on newborn at birth and on the third and eleventh days were made in 10 cases by the author.

350 **Weiss, Julius:** "Die Wechselbeziehungen des Blutes zu den Organen, untersucht an histologischen Blutbefinden im frühesten Kindesalter" [Correlation of blood to organs, tested by histological state of blood in very early childhood]. *Jahrb. f. Kinderh.* [Berlin], vol. 35 (1893), pp. 146–186.

From November, 1891, to April, 1892, in the Karolinen Children's Hospital at Vienna, Weiss investigated histology of blood in infants. He first gives findings in case of five healthy subjects between 6 days and 10 weeks in age. He says, "The preponderance of mononuclear leucocytes, which varied considerably in size and shape of cell bodies, was definite in all cases; likewise, transitional forms were much more numerous than in healthy adults. We could not ascertain any particular increase in eosinophilous cells, accepted as typical of childhood by other authors." He discusses leucocytosis and presents tables on number of eosinophiles and other leucocytes. The work of Maragliano and Neusser is also discussed; though differing from the latter in many respects the author agrees that "the blood is a direct representation of all the organs." Bibliography.

351 **Wernstedt, Wilhi:** "Zur Kenntnis der physiologischen Schwankungen des Leukocytengehaltes im Blute der Brustkinder" [Knowledge of the physiological fluctuations of the leucocyte content in the blood of breast-fed children]. *Monatschr. f. Kinderh.* [Leipzig], vol. 9 (1910–11), pp. 343–344.

The author, to study the leucocytosis of infant blood, tested many infants with raw breast milk, boiled breast milk, and boiled cow's milk, after a water diet of 12 to 34 hours, after an absolute fast of 5 to 8 hours, and at the usual intervals of 2½ to 4 hours. These diets and fasts, etc., produced no variation in the leucocytosis. However, when very frequent measurements were made, the apparently lawless variations showed leucopenia during and after sleep and a high leucocytosis accompanying motion, crying, and unrest.

352 **Widowitz, J.:** "Hämoglobingehalt des Blutes gesunder und kranker Kinder" [Hemoglobin content of the blood of healthy and sick children]. *Jahrb. f. Kinderh.* [Berlin], vol. 27 (1887–88), pp. 380–395; vol. 28 (1888), pp. 25–60.

This long article on the hemoglobin of infant blood, based upon 747 tests by the author, concerns chiefly pathological conditions. Warning is given that Fleischl's hemometer is subject to much inaccuracy and that blood concentration is affected by many factors. The physiological section involves only 19 healthy children from 3 months to 15 years of age. A table compares Widowitz's results with Leichtenstern's. The hemoglobin content is of little aid in clinical diagnosis, for whereas it never falls below 60 per cent in the healthy, it sometimes reaches 110 per cent in the sick.

353 **Williamson, C. S.:** "Influence of age and sex on hemoglobin; a spectrophotometric analysis of 919 cases." *J. A. M. A.* [Chicago], vol. 65 (1915), pp. 302–307. See also *Archives of Internal Medicine* [Chicago], vol. 18 (1916), pp. 505–528.

Following a discussion of the work of Leichtenstern in blood analysis the author reports the results of the examination of 919 specimens, 485 from subjects 1 day to 20 years of age. His instruments and methods are minutely described and the curve of hemoglobin percentage depicted in two charts, the second showing the influence of sex as well as age. The hemoglobin content was found highest at birth, with an irregular descent to the age of 1 year, a gradual ascent to the age of about 20 years, and but slight variations to the age of 76 and over. Sex differentiation was slight, beginning to show plainly in the sixteenth or seventeenth year and continuing during the age of child bearing, with slight variations thereafter.

354 **Wimberger, Hans:** "Beziehung zwischen Nahrungskonzentration und Blutbeschaffenheit" [Relation between food concentration and quality of blood]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 25 (1920), pp. 64–82.

After a long introduction concerning previous investigators Wimberger describes his studies of food concentration, daily weight, serum concentration by means of refractometer at 17.5° (Centigrade), hemoglobin content, and number of red corpuscles. Subjects were seven children between 7 months and 15 years, five of them healthy. The study on each lasted from 4½ to 15 weeks. Each case is discussed with a graph and table of findings. The concentration of the blood maintains great constancy with differences in amount of fluid taken. The blood is independent of water in surrounding tissue. Bibliography.

3. FUNCTIONAL DEVELOPMENT

355 **Alvarez, W. C., Rosalind Wulzen, Fletcher B. Taylor, and Esther Starkweather:** "Blood pressure in university freshmen and office patients." *Archives of Internal Medicine* [Chicago], vol. 26 (1920), pp. 381–404.

A study of the average blood pressure for normal individuals of both sexes, based on examination of 8,737 University of California freshmen and 1,000 office patients. Technique is fully described. The authors emphasize the necessity for further study, but reach the general conclusions that the average blood pressure in girls rises between ages 16 and 17, drops to age 25, then rises again rapidly. They draw no conclusions for men, because of disturbances in sampling owing to the war, but from clinical experience they state that high pressure appears earlier and to a greater degree in young men than in young women.

356 **von Anrep, B.:** "Über die Entwicklung der hemmenden Functionen bei Neugeborenen" [The development of inhibition functions in the newborn]. *Archiv für die Gesammte Physiologie des Menschen und der Thiere* [Bonn], vol. 21 (1879–80), pp. 78–80.

Since it has been determined that the inhibitory reflexes in the newborn are at first passive and then develop with amazing rapidity, the author concludes that the greater pulse frequency of small children depends not only on lack of vagus tone but on more energetic metabolism, greater frequency of breathing, and smaller mass.

357 **Balard, P.:** "Des variations du pouls et de la tension artérielle chez le nouveau-né, étudiées comparativement à l'état de veille et pendant le sommeil par l'oscillométrie" [Variations of the pulse and blood pressure of the newborn, studied comparatively by the oscillometer when the infants were awake and when they were asleep]. *Comptes rendus des séances et mémoires de la Société de biologie* [Paris], vol. 72 (1912), pp. 998–999.

Report of observations of pulse rate and blood pressure of 10 normal infants, aged 10 days and under, all blood pressures having been taken by the Pachon oscillometer at the upper arm, three successive examinations in each case. Table. A definite increase in systolic blood pressure was evident when the infants were awake, the diastolic remaining practically constant. In 9 of the 10 cases the pulse rate was higher when the infants were awake than when they were asleep. The element in blood pressure which varies, the difference between systolic and diastolic pressure, predicates increased cardiac activity.

358 ——— "Des variations du pouls et de la tension artérielle chez le nouveau-né étudiées comparativement pendant le repos et pendant la tétée par l'oscillométrie" [Variations of pulse and blood pressure of the newborn studied comparatively in repose and during nursing, by the oscillometer]. *Comptes rendus hebdomadaires des séances et mémoires de la Société de biologie* [Paris], vol. 72 (1912), pp. 999–1000.

Report of observations of pulse rate and blood pressure of 10 normal infants, aged 10 days and under, all blood pressures having been taken by the Pachon oscillometer, and results recorded in tabular form. The author found an increased pressure doing nursing greater in the systolic than the diastolic values; also an increase in frequency of pulse. Blood-pressure results predicate increased cardiac activity.

359 ——— "La tension artérielle et l'oscillométrie chez le nouveau-né" [Arterial blood pressure and oscillometry of the newborn]. *Nourrisson* [Paris], vol. 9 (1921), pp. 304–319.

Discussion of the value of the oscillometer and its use with a brief résumé of the studies of arterial blood pressure in the newborn. In 40 observations the author found that at birth pressure varies from 3 centimeters 5 hydrogen to 5 centimeters 5 hydrogen. Examinations of the pulse frequently repeated (number of subjects not stated) showed a rate of 150 at birth, decreasing in the first day to 100 or less, regaining 150 in the second day. A chart gives curves of pulse, temperature, weight, and arterial pressure for the first 10 days of life. References.

360 **Balard, P.:** "Le pouls et la tension artérielle de l'enfant et du nouveau-né" [The pulse and arterial blood pressure of the child and the newborn infant]. *Gazette des hôpitaux* [Paris], vol. 86 (1913), pp. 837–841.

A résumé, with references, of the work of Seux, Eminet, Vierordt, Von Basch, Pachon, Koessler, Martinet, Belot, and of the author's own investigations.

361 ——— "Modifications évolutives du pouls et de la tension artérielle chez le nouveau-né, dans les premiers jours de la vie, étudiées par l'oscillométrie" [Progressive modifications of pulse and blood pressure of the newborn, in the first days of life, studied by the oscillometer]. *Comptes rendus hebdomadaires des séances et mémoires de la Société de biologie* [Paris], vol. 73 (1912), pp. 483–485.

A report of examination of 10 normal infants whose pulse and blood pressure were taken the minute after birth and the first cry, again at the end of the first quarter hour and the first hour, then every 2 hours for the first 12 hours, then once a day to the end of 10 days. Weights are recorded and results tabulated. The author found much variability in the pulse during the first day. The systolic and diastolic blood pressure increased regularly, though with slight oscillations in the curve of the systolic.

362 ——— "Sur la cause de la diminution de fréquence du pouls chez le nouveau-né dans les premières heures de la vie" [The cause of diminution in pulse rate of the newborn in the first hours of life]. *Comptes rendus hebdomadaires des séances et mémoires de la Société de biologie* [Paris], vol. 73 (1912), pp. 486–488.

To discover, if possible, a relationship between diminution of pulse rate and lowering of temperature in the first hours of life, the author observed the rectal temperature of 10 normal infants, the minute after the first cry, at the end of a quarter hour, an hour, at 2-hour intervals for the first 12 hours, then once a day to the end of 10 days. The lowering of temperature was found to be roughly parallel with the diminution of pulse rate. Table and curves are given.

363 **Becquerel, A.:** "Du pouls chez les enfants, depuis la fin de la première dentition (2 ans à peu près) jusqu'à la puberté (15 ans)" [The pulse of children from the end of the first dentition (about 2 years) to puberty (15 years)]. *La clinique des hôpitaux des enfants* [Paris], vol. 1 (1841), pp. 227–231.

A report of 150 observations of the pulse of normal children, grouped in four series: 2 to 6 years, 6 to 9, 9 to 12, and 12 to 15. The pulse rate was taken both while the children were awake and while they were asleep.

364 **Beretta, L.:** "Della sfigmomanometria in generale; della tensione arteriosa nei bambini sani nelle loro diverse eta" [On sphygmomanometry in general; on the blood pressure of healthy infants of various ages]. *La clinica medica italiana* [Milan], vol. 42 (1903), pp. 100–135.

The author gives in a table for each of his 241 cases (children from 2 days to 13 years old) age, weight, height, pulse, respiration, and blood pressure; in a separate table the blood pressure of seven cases of pneumonia and bronchitis with detailed histories of these cases is given and conclusions are presented as to the physiology and pathology of blood pressure in children and the differences in this respect between children and adults.

365 **Beyer, Walter:** Untersuchungen über das häufige Vorkommen von systolischen Herz-Geräuschen bei Kindern; nebst Bemerkungen über die physikalische Natur der Pulmonal-Geräusche, über Accentuation der II Töne, über unreine Töne und Nonnensausen in den grossen Venen [Investigations on Frequent Presence of Systolic Heart-Murmurs in Children; with comments on the physical nature of the pulmonic murmurs, on accentuation of the secondary sound, on impure sounds and venous hum]. Leipzig, 1907. 46 pp.

Inaugural dissertation (University of Leipzig). Author studied systolic heart murmurs of 830 boys and girls between the ages of 6 and 14 years in Dresden during the summer of 1906. He took notes on constitution, form of thorax, color of skin and mucous mebranes, quality of pulse, position and nature of apex beat, and auscultation. He also made examinations after club swinging. Systolic murmurs were found in 38.7 per cent of the boys and in 45.5 per cent of the girls.

366 **Boenheim, Felix:** "Untersuchungen über accidentelle Herzgeräusche bei jugendlichen Gesunden" [Investigations on accidental heart murmurs in healthy young people]. *Deutsches Archiv für Klinische Medizin* [Leipzig], vol. 124 (1917–16), pp. 118–133.

The author discusses, with support of 10 tables, accidental heart murmurs in healthy school children between 8 and 14 years of age. These murmurs occur in 172 out of 279 girls and 94 out of 169 boys—they are usually heard at the pulmonic area. The first heart sound is usually heard, too. No correlation was found with the form of thorax nor with pulse and breathing. Amplitude

of blood pressure is greater where accidental murmurs are present than where they are absent. Accidental murmurs seem not to be pathological before puberty. Bibliography.

367 **Buggs, Jens:** "Undersøkelser over albuminuri, blodtryk, etc., hos skolebarn" [Investigations on albuminuria, blood pressure, etc., in school children]. *Norsk Magazin for Laegevidenskaben* [Christiania], ser. 5, vol. 11 (1913), pp. 1601–1696.

In 13 tables the author gives the results of blood pressure and albuminuria tests under various conditions in 550 boys and 526 girls 7 to 16 years of age. Two tables show the onset of puberty in both sexes as compared with results of albuminuria tests.

368 **Burlage, Stanley Ross:** "The blood pressures and heart rate in girls during adolescence. A statistical study of 1,700 cases." *Am. J. Physiol.* [Baltimore], vol. 64 (1923), pp. 252–284.

Data for this article were obtained from blood-pressure readings taken on 837 girls in the Ithaca public schools, aged from 9 to 20 years, heart rate, weight in pounds, height in inches, age, and menstrual condition also having been recorded; and from similar records on 847 young women students in Cornell University between the ages of 16 and 26. Technique is fully described. Statistical treatment of this material led to the following conclusions: (1) These data for school girls and college girls must be correlated separately. Data for school girls must be considered separately for those who have reached puberty and those who have not. (2) When systolic pressure is correlated with weight, height, and age (*a*) nonmenstruating school girls show the greatest correlation with weight, height, and age in the order named; (*b*) menstruating school girls show correlation with weight and height but none with age; (*c*) college girls show significant correlation only with weight. (3) When diastolic pressure is correlated with weight, height, and age (*a*) nonmenstruating school girls show the greatest correlation with the factors weight, height, and age in the order named; (*b*) menstruating school girls show correlation in the same order as (*a*), but in less degree; (*c*) college girls show correlation with weight only. (4) When pulse pressure is correlated with weight, height, and age (*a*) the nonmenstruating school girls show correlation with the factors in the order named; (*b*) the menstruating school girls and college girls show no significant correlation. (5) When pulse rate is correlated with height, age, and weight (*a*) the nonmenstruating school girls show correlation with the factors in this order; (*b*) the menstruating school girls show a correlation with age and weight in this order; (*c*) the college girls show no significant correlation. Bibliography.

369 **Buttermilch, Wilhelm:** "Puls und Blutdruck bei kranken Säuglingen" [Pulse and blood pressure in sick infants]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 23–24 (1906–7), pp. 113–118.

In discussing pulse and blood pressure of sick children the author mentions many facts applicable also to the normal infant. He used Gärtner's tonometer in his measurements in the Berlin and Weissensee Infants' Clinic, greasing with vaseline the ring for the finger, and choosing a time after meals when subjects were quiet. He found a great individual variation in pulse; the blood pressure he believes is independent of pulse. It was on an average 80 millimeters in healthy infants below 6 months and 84 after 6 months. In 200 cases the pressure in right and left hands was the same 138 times, higher in the left 43 times, and higher in the right 19 times; the difference amounted to 5 to 10 millimeters. The pressure in sleep is less than in nursing. The bath increased it in 34 cases out of 50 and decreased it in 7 cases.

370 **Churchill, Fleetwood:** "On the rhythm of the heart of the fetus in utero and of the infant after birth." *Dublin Quarterly Journal of Medical Science*, vol. 19 (1855), pp. 326–332.

Comparing the rhythm of the sounds of the heart of the fetus and of the infant shortly after birth the author found a distinct change, the two sounds after birth being of equal strength and loudness and dividing the period of each pulsation equally. This peculiarity of rhythm persists for about a year and a half and then gradually changes to that of the adult.

371 **Clerk, F. E.:** "A study of the cardiovascular index in elementary-school children." *Pedagogical Seminary* [Worcester], vol. 23 (1916), pp. 135–152.

Following a discussion of the value of the cardiovascular index and methods used in its determination the author reports the results of studies made in the schools of Clinton, Mass. The number of examinations (22 subjects) was too small for the establishment of standards, but results showed interesting tendencies, especially when compared with the work of Doctor McCurdy and of Judson and Nicholson. Bibliography.

372 **Curschmann, Hans:** "Über den Blutdruck im Kindesalter" [Blood pressure in childhood]. *Medizinische Klinik* [Berlin], vol. 15, pt. 2 (1919), pp. 1281–83.

In 1917 the author studied blood pressure in 169 boys and 279 girls between 8 and 14 years of age, using the Riva-Rocci apparatus. One table gives his findings as to diastole, systole, and amplitude, and another table data collected

by Eckert, Oppenheimer, Kaupe, et al. The author found that height and weight played no rôle in blood pressure; musculature, size of heart, and thorax played a greater part.

373 **Dearborn, George Van Ness:** "The blood pressure in the leg in various positions; the brachial pressure after short maximal exercises and the normal pressure in physically trained individuals, with an appended preliminary note regarding the blood pressure's autonomic rhythm." *American Physical Education Review* [Springfield], vol. 20 (1915), pp. 337–352.

Original work was done at Harvard Summer School—39 cases observed, 28 female and 11 male, aged 11 to 60. Stanton apparatus was used. A table gives case, age, sex, brachial blood pressure, and posttibial pressure with leg horizontal, vertical, and standing, with percentage of relation of tibial to brachial pressure. The average vertical leg pressure was 60.8 per cent of the brachial pressure, and the average standing leg pressure was 133 per cent. Separate tables for various types of exercise give heart rate and blood pressure before and after exercise.

374 **Durand-Viel, P.:** Des variations de la pression artérielle au cours de quelques maladies chez les enfants [Variations in Arterial Pressure in the Course of Certain Illnesses of Children]. Paris, no. 156, 1903. 99 pp.

Thesis for medical degree (University of Paris). Largely pathological, but introduced by one chapter on blood pressure of normal children, and containing a small number of original observations.

375 **Eminet, P. P.:** "Sphygmographie und Tonometrie bei gesunden Kindern im Alter von 7–15 Jahren" [Sphygmography and tonometry in healthy children from 7 to 15 years old]. *Arch. f. Kinderh.* [Stuttgart], vol. 46 (1907), pp. 328–356.

After commenting briefly on the work of Schatilow and Troizky, the author describes his own work in taking pulse and blood pressure of 200 healthy children between 6 and 15 years of age, from the upper, middle, and lower classes. Children of well-to-do families have a higher blood pressure and a sphygmogram closer to the normal type than poor children. Pulse frequency is greater with a low pressure than with a high. In the school age monocrotism is not observed; there is a tendency to predicrotism rather than to dicrotism—there are two maxima of blood pressure, one in the sixth and the other in the eleventh year. The pulse curve of children is usually unequal; in many cases arhythmia is noticed. By the age of 15 it is more constant and of dicrotic character, like that of the adult. The size of the sphygmogram is directly proportional to the blood pressure.

376 **Epstein, Al.:** Beitrag zur Kenntnis des systolischen Schädelgeräusches der Kinder. [Contribution to Knowledge of Systolic Murmur in Children's Skulls]. Prague, 1878. 35 pp.

This pamphlet of 35 pages contains one long table at end, giving data on 13 boys and 9 girls between 5 months and 3½ years, tested by author for physical condition, condition of skull, auscultation, and glands. Murmur in children's skulls is an expression of murmurs in the carotid and larger intracranial arteries. The most favorable age for its presence is second half of first year and second year; it may occur between third month and sixth year. Although it is considered physiological by some writers, Epstein thinks it is not physiological.

377 **Faber, H. K., and C. A. James:** "The range and distribution of blood pressures in normal children." *Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 7–28.

A careful study in which 2,710 observations of systolic and diastolic pressures were made on 1,101 normal children. The previous literature on the subject is reviewed and found not suitable for comparative tables. Data are fully given and technique described. The authors' summary states that: (1) The standard of deviation is more important than the actual sphygmographic reading; (2) such standard must be based on the statistical method of frequency distribution; (3) normal means and standard deviations for systolic and diastolic pulse pressures and for pulse and pulse pressure (pulse product) have been compiled for girls and boys separately, by year, between the ages of 4 and 16 years; (4) reference tables for clinical application are given; (5) mean systolic, diastolic, and pulse pressures show no significant sexual differences, but standard deviations are in practically all cases greater for girls, indicating a normally greater variability in female children, which is particularly marked during adolescence; (6) illustrative examples of the method of measuring deviations in various pathologic states are given; (7) in children hypotension is more frequent than hypertension; (8) the method of applying the authors' standards, though involving the use of reference tables, requires only a few seconds to use.

378 **Farge, Émile-François:** Du pouls chez l'enfant, à l'état physiologique [The Pulse of the Normal Child]. Paris, no. 128, 1847. 34 pp.

Thesis for medical degree (University of Paris). The original work recorded consists of 57 observations of the pulse rate of infants from 4 to 20 hours old (12 observations); from 1 to 8 days (31 observations); from 8 to 15

days (5 observations); and from 5 days to 1 month (9 observations). All observations were made while the subject was quiet and in a horizontal position. The author found the pulse extremely variable at the beginning of life, remaining between 125 and 130 during the first month. The influence of seasons, temperature, hour of the day, position, sleep, wakefulness, and digestion are discussed.

379 **Findlay, Leonard:** "The systolic pressure at different points of the circulation in the child and the adult." *Quarterly Journal of Medicine* [London], vol. 4 (1910–11), pp. 489–497.

Observations were made on healthy and sick individuals of both sexes, their ages varying from 2½ to 50 years. Methods are described and 95 individual readings recorded. The author found that during childhood and youth the systolic arterial pressure is fairly uniform at different points of the circulation.

380 **Friberger, Ragnar:** "Några iakttagelser angående utvecklingen af puls och blodtryck under den senare barnaåldern" [Some observations on the pulse and blood pressure in later childhood]. *Upsala Läkareförenings Förhandlingar* [Upsala], new ser. vol. 18 (1912–13), pp. 147–56.

Pulse frequency and blood pressure of 305 children of Upsala 6 to 14 years of age are given in four graphs. Pulse frequency in girls 5 years or older is higher than that of boys. The systolic blood pressure of girls rises sharply, reaching a peak at 12 years; that of boys remains stationary from 8 to 12 and then rises sharply. Bibliography.

381 ——— Über Arhythmie bei gesunden Kindern" [Arrhythmia of healthy children]. *Arch. f. Kinderh.* [Stuttgart], vol. 58 (1912), pp. 30–72.

A thorough study of arrhythmias in 321 children between ages of 5 and 14 from the public schools of Upsala. A table arranged according to age gives separately for boys and girls the most common pulse frequency; the maximum, minimum, and average frequency; and the percentage of arrhythmias with usual and with high and low pulse frequency. Not one of the 321 children showed a perfectly regular pulse. Arrhythmia decreased from the fifth to the twelfth year and increased somewhat in the thirteenth and fourteenth years. It is more frequent in girls than boys. Height, weight, and muscular development seem to have no influence. Arrhythmia is, then, physiological in children. Arrhythmia was present in 73 per cent of children with an unstable nervous system, whereas of all the children studied, 62 per cent showed arrhythmia. Nineteen curves on the respiration and pulse are given. Bibliography.

382 ——— Über die Entwicklung von Puls und Blutdruck im späteren Kindesalter" [The development of pulse and blood pressure in later childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 60–61 (1913), pp. 331–339.

Doctor Friberger examined the pulse and blood pressure of 305 boys and girls from 6 to 14 years old, most of them Upsala school children. Both pulse and blood pressure were taken when the children were lying down, the latter with the Riva-Rocci apparatus. From the fifth year on pulse frequency was found to be higher in the girls than in the boys. The systolic blood pressure was highest in girls in the eleventh year, in boys in the thirteenth year—at the beginning of puberty. Pulse and blood pressure do not have parallel courses. The author presents four graphs illustrating his findings and discusses the work of other investigators.

383 **Gaujoux, E.:** "Recherches sur la tension artérielle normale chez l'enfant" [Researches in normal arterial blood pressure in childhood]. *Annales de médecine et chirurgie infantiles* [Paris], vol. 12 (1908), pp. 435–439.

From more than 500 readings of arterial blood pressure of normal children of different ages, sexes, statures, and degrees of development (methods described) the author concludes that: (1) There exists a fairly definite average pressure for the healthy infant which increases proportionately with the age of the subject; (2) at puberty there is a marked increase in average pressure; (3) in certain physiological processes, menstruation, digestion, physical and intellectual effort, etc., the pressure is appreciably modified.

384 **Gunzburg, L.:** "Einfluss des Wachstums auf Herz und Lungen" [Effect of growth on heart and lungs]. *Wiener Medizinische Presse*, vol. 20 (1879), pp. 908–910.

Theoretical description of the development of the heart and lungs from the embryological state to the end of growth. Immediately after birth the heart changes its position and form because of breathing. The changes in the lungs are still greater and affect their color, weight, consistency, and capacity. From birth to puberty the growth of the heart and lungs proceeds rather slowly for a period. From puberty to the age of 20 a more rapid development of the breathing and speaking apparatus takes place. The lungs are then very sensitive and have a low power of resistance. The normal relation of the heart and lungs to each other is often affected by various factors. The purpose of the article is to point out two conditions observed by the author at the time of puberty (number of cases not given): (1) Hemorrhages of the lungs; (2) accelerated heart action often combined with stinging pains. Both symp-

toms he saw in the absence of any definite disease of the lungs or heart. The author attributes these symptoms to the great sensitiveness of the heart and lungs at that age.

385 **Hecht, Adolf F.:** "Der Mechanismus der Herzaktion im Kindesalter, seine Physiologie und Pathologie" [The mechanism of heart action in childhood, its physiology and pathology]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 2 (1913), pp. 324–441.

This article of 117 pages, embracing many tables and 21 plates of 109 graphs, after an introduction on the electrocardiographic method and the heart-experiment station in the Children's Clinic of the Royal University at Vienna, takes up first the physiology of the child's heart and then its pathology. The author studied 70 healthy children of many ages, from the newborn infant to the child of 13 years, and 300 sick children. In his study of healthy children he considers the absolute size of the electrocardiogram, the influence of position, effect of breathing, physiological arrhythmia, time of transfusion, duration of systole, and heart pause.

386 **Hennig:** "Über die bei Kindern am Kopfe und am oberen Theile des Rückgrats vernehmbaren Geräusche" [Murmurs perceptible in head and upper part of spine in childhood]. *Archiv für Physiologische Heilkunde* [Stuttgart], 1856, pp. 411–440.

The author discusses five questions concerning murmurs perceptible in head and upper part of the spine of children, where and by what means they are heard, when and how long they are heard, what kind they are, how they are explained, and what is their diagnostic value. Thirty pages of discussion without tables are devoted to answering these questions. The number of observations is not given, but many special cases, particularly of pathological character, are described.

387 **Hensen, H.:** "Beiträge zur Physiologie und Pathologie des Blutdrucks" [The physiology and pathology of blood pressure]. *Deutsches Archiv für Klinische Medicin* [Leipzig], vol. 67 (1900), pp. 436–530.

The author made his numerous tests of blood pressure at Leipsic and Kiel with the Riva-Rocci apparatus. He prefers to use the brachial rather than the radial pulse; pressure is 3 to 15 millimeters higher in the former than in the latter. His long discussion he devotes to three topics: Pulse and blood pressure; blood pressure in normal circumstances; blood pressure in pathological conditions. The average blood pressure of 25 normal children 3 to 15 years old was found to be 116 millimeters; the maximum and minimum were 80 and 150. The average for 8 children from 4 to 6 years was 107, and of 8 from 11 to 12, 122. The author presents 27 curves and 7 tables and a bibliography.

388 **Hess, R., and S. Gordin:** "Plethysmographische Untersuchungen an gesunden und kranken Kindern" [Plethysmographic investigations on healthy and sick children]. *Ztschr. f. Kinderh.* [Berlin], vol. 10 (1914), pp. 353–364.

The authors attempted to estimate the volume of the limbs, the blood volume in them, and its change according to temperature in the case of children by use of the plethysmograph but found the restlessness of their subjects a great hindrance. Morawitz's process for short experiments was successful and gave similar values to those obtained for adults. With it they ascertained the change of volume in the vessels according to change of temperature in the surrounding water.

389 **Heubner, O.:** "Das Elektrokardiogramm des Säuglings und Kindes" [The electrocardiogram of the infant and child]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 7 (1908–9), pp. 6–12.

The findings of a study made by the author and Fumaro upon 17 infants and some older children, a few of whom were diseased; a comparison of the electrocardiogram for children of different ages and for children as compared with adults; a description of the method, using Einthoren's string galvanometer; and a brief summary of the work of previous investigators.

390 **Hooker, D. R.:** "The influence of age upon the venous blood pressure in man." *Am. J. Physiol.* [Baltimore], vol. 40 (1916), pp. 43–48.

A report of a series of observations on men of different age groups, summarized in decades and in half decades from 5 to 85 years of age. The boys were found in orphan asylums, schools, and shops. Observations were made in trunk-vertical position, the venous-pressure readings being expressed in centimeters of water and referred to the heart level. Tables and a curve show the rise in pressure from youth to old age.

391 **Hotz, A.:** "Dynamische Pulsuntersuchungen bei Kindern im Vergleich mit Erwachsenen" [Investigations of dynamic pulse in children in comparison with adults]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 81 (1915), pp. 313–333.

Hotz investigated dynamic pulse in adults and 40 children between 3 months and 15 years of age in the Children's Hospital of Zurich. He used Christen's energometer, with an air sack 5½ by 11 centimeters for the children and one of 9 by 15 centimeters for the adults. The article contains a discus-

sion of pulse during rest and work. Dynamic qualities of pulse are approximately proportional to body weight. Normal values show great variation but differ considerably from pathological values. Fourteen curves and six tables are given. Bibliography.

392 **Hotz, A.:** "Weitere dynamische Pulsuntersuchungen bei gesunden und kranken Kindern" [Further dynamic-pulse investigations of healthy and sick children]. *Jahrb. f. Kinderh.* [Berlin], vol. 84 (1916), pp. 407–440.

The author made Christen's dynamic-pulse diagrams with the energometer of 20 healthy and 15 sick children between 9 and 16 years of age. He also made a few tests of the effect of digitalis, adrenalin, caffeine, etc. The collar of the instrument was always applied to the upper arm. Of Christen's three pulse types—sufficient, insufficient, and hypersufficient—the last named was not found in these 35 children. The investigation concerned filling, energy, power, specific filling, specific raising, diastolic blood pressure, flexion coefficient, net energy, and ventricular systole. Results are shown in 2 tables and 13 curves. The author comments on the great constancy of the pressure at which the variation of volume reaches its maximum. In healthy children between 9 and 15 years it was always between 100 and 110 centimeters.

393 **Hutchinson, Robert, and George Elder:** "Some observations on the movements of the fontanel in children." *Edinburgh Hospital Reports* [Edinburgh and London], vol. 3 (1895), pp. 268–290.

A report of observations made on children (number not given) with the fontanels still open, by means of Marey's sphygmograph, and of the cardiograph writing on a revolving cylinder. Tracings are reproduced in 26 figures. The authors found that the fontanel has a double pulsation, arterial and respiratory; that the arterial intercranial pulse is anacrotic in type; that the respiratory pulsation takes the form of depression of the whole fontanel with inspiration and bulging with expiration; that the fontanel pulse is readily affected by sleep, chloroform, posture, movement, and inhalation of nitrite of amyl. References.

394 **Judson, C. F., and P. Nicholson:** "The blood pressure in normal infants." *Am. J. Dis. Child.* [Chicago], vol. 8 (1914), pp. 257–269.

To find a standard of blood pressure in children about 2,300 observations were made on children, aged 3 to 15, at public schools, the Foster Home, and the Southern Home. Records were made with subject reclining; the widest cuff available in proportion to the arm was used. Different types of manometers were used and compared. Diastolic pressure was taken in the fourth phase. Table I by the authors gives age, width of cuff, circumference of arm, systolic, diastolic, and pulse pressure by three methods, and pulse rate. Number of cases is not cited. Table II gives pulse pressure from various observers. Table III gives age, systolic, and diastolic pressure. The technique and physiology of blood pressure are discussed. Conclusion: The systolic pressure is higher than is generally taught and does not increase from year to year. Diastolic pressure changes very little. Pulse pressure increases most and is the most important determination in children.

395 **Jurasz, Anton:** Das systolische Hirngeräusch der Kinder [Systolic Cerebral Murmur]. Habilitationsschrift. Heidelberg, 1877. 96 pp.

Thesis (University of Heidelberg). This work on systolic cerebral murmur of children contains 96 pages and many tables and is divided into a historical section on the work of other investigators and clinical and anatomical sections based on the author's own investigations. Sixty-eight healthy and sick children between 5 months and 4 years were examined. The murmur occurs only between ages of third to fourth month and fourth to sixth year and is closely connected with development of skull base, especially carotid canal, and probably with foramen spinosum. It is a physiological phenomenon and can not be used in diagnosis of disease.

396 **Katzenberger, Armin:** "Puls und Blutdruck bei gesunden Kindern" [Pulse and blood pressure in healthy children]. *Ztschr. f. Kinderh.* [Berlin], vol. 9 (1913), pp. 167–195.

The author determined the frequency of pulse in 112 boys and 100 girls from 6 months to 14 years old, using the Riva-Rocci sphygmomanometer and a stethoscope. He found that the pulse and pressure vary widely in children, the pulse being higher and the pressure lower than in adults. The results of his own investigations and those of other students are tabulated, and the effects upon pulse and blood pressure of weight, sex, sleep, position of body, time of day, mental excitement, meals, motion, breathing, and bath are discussed. Bibliography.

397 **Kaulen, Gustav:** "Untersuchungen über die Intensität der Herztöne im Kindesalter mit Hilfe des Bockschen Differentialsthethoskops" [Investigations on intensity of heart tones in childhood with help of Bock's differential stethoscope]. *Jahrb. f. Kinderh.* [Berlin], vol. 97–98; ser. 3, vol. 47–48 (1922), pp. 141–152.

With Bock's differential stethoscope the author studied intensity of heart tones in 248 children between 1 month and 14 years of age. Results are tabu-

lated. With M standing for mitral, Tr for tricuspid, P for pulmonic, and A for aortic, tones in order of strength are, for first two years—

M	M	P	A	P	Tr	A	Tr
I	II	I	I	II	I	II	II

and for ages 3 to 14—

M	P	M	A	Tr	P	Tr	A
I	II	II	II	I	I	II	I

There are great individual differences. The first two years form a unit as compared with later years. In the first two years the first tones over pulmonic and aortic are lounder than the second; afterwards the relation is reversed. Sex does not affect intensity of heart tones. Physical exercise strengthens them. Bibliography.

398 **Kaupe, Walther:** "Der Blutdruck im Kindesalter" [Blood pressure in childhood]. *Monatschr. f. Kinderh.* [Leipzig], vol. 9 (1910–11), pp. 257–263.

The author determined the diastolic and systolic blood pressure of 144 healthy children, 123 of them girls, between 3 and 13 years of age, with the Riva-Rocci apparatus. In his tables, besides the blood pressure, he gives the age of each child and its general health and in some cases the hemoglobin content. One table shows the average difference between the systolic and diastolic value. Sex seems not to affect blood pressure. Usually but not always a powerful pulse is found in a strong child. The pressure gradually rises after the seventh or eighth year, except that it is low in girls 12 years old.

399 **Keating, J. M., and W. A. Edwards:** "Clinical studies on the pulse in childhood." *Arch. Pediat.* [Philadelphia], vol. 5 (1888), pp. 727–740.

A paper read before the College of Physicians in Philadelphia, general for the most part but containing a table showing the pulse beat of a number of infants, asleep and awake, and of a smaller number during active muscular movement or mental excitement. Details of method of obtaining the data are not given, and the article has no definite conclusions. References.

400 **Kilborn, Leslie G.:** "Blood pressure of Szechwanese students." *China Medical Journal* [Shanghai], vol. 40 (1926), pp. 1–7.

During the physical examination of students in the West China Union University and associated schools, the writer recorded the blood pressures of 741 students, of whom 443 were under 21 years of age. Pressure was taken with a Nicholson "Princeps" mercury sphygmomanometer, with cuff 12 centimeters wide, applied to the right arm while the subject was in a sitting posture. The auscultatory method was used throughout. Systolic pressure was read on the first appearance of sound on lowering the pressure in the cuff; diastolic pressure at the fourth point. About one-fourth of the records were taken in April and May, 1924; the remainder in September of the same year. All examinations were made between 2 p. m. and 5 p. m. For comparison the blood pressures of nine Canadian and United States boys, 14 to 17 years of age, were also taken. These boys, with one exception, were born in Szechwan and, except for furlough periods, had lived there continuously. Mean systolic and diastolic pressures for the entire series were lower than the standards for Anglo-Saxons of corresponding ages. The pulse pressure was as high as that of the white races. Systolic and diastolic pressures of the nine Canadian and United States boys were higher than those of the Chinese; pulse pressure was about the same. The records showed no marked variation of blood pressure with age. Tables and references.

401 **Koessler, *Mlle.* L.:** L'oscillométrie appliquée à l'étude de la tension artérielle chez les enfants [Oscillometry Applied to the Study of the Arterial Tension of Children]. Paris, no. 144, 1912. 192 pp.

Thesis for doctor's degree (University of Paris). Following a discussion of the significance of systolic, diastolic, and variable pressures, and a résumé of work already done by investigators of this subject, the author reports her own observations on 229 boys and 213 girls aged 5 days to 15 years. All methods are described, and results are tabulated in groups by age. Pressure as related to age, weight, and height is illustrated by tables and curves. The author concludes that in the study of arterial tension knowledge of the diastolic pressure and of the "pulse pressure" is of the greatest importance; that in the normal child arterial tension increases regularly from birth to adult age, except for variation at about 5 years in girls and 7 years in boys; that in normal children the systolic and diastolic pressures increase equally with weight and stature. Bibliography.

402 **Kolossowa, Anna:** "La pression sanguine chez les enfants dans les conditions physiologiques et pathologiques" [The blood pressure of children in physiological and pathological conditions]. *Archives de médecine des enfants* [Paris], ser. 1, vol. 5 (1902), pp. 421–423.

Blood-pressure examinations of more than 340 normal children aged 1 to 13 years, taken with Gärtner's tonometer and here described, gave the following results: Ages 1 and 2, 80 to 85 millimeters; 3 and 4, 85 millimeters; 5 to 7, 90 to 95 millimeters; 8 to 10, 95 to 100 millimeters; 11 to 13, 100 to 110 millimeters.

403 **Krumbhaar, E. B., and H. H. Jenks:** "Electrocardiographic studies in normal infants and children." *Heart* [London], vol. 6 (1917), pp. 189–196.

Electrocardiograms were taken by the authors on 42 normal infants and children (methods described) in age from 1 minute to 12 years. They found that the ventricular complexes associated with preponderance of the right ventricle are constantly found from birth to the second or third month, and that the modifications of this phenomenon that occur in the different age period are produced with remarkable constancy in the individuals of each group; that the initial downward deflection of the ventricular complex is abnormally large in the infants' electrocardiogram; that the T wave is practically absent in the first week and reaches normal size about the third week; that the actual size of the units of the ventricular complex is greater than in the adult; that the P–R (P–Q) interval is both actually and proportionately shorter than the P–R (P–Q) interval of adults, and that sinus arrhythmia, seen only once in the first year, became increasingly frequent from the sixth year to puberty.

404 **Lee, R. I.:** "Blood-pressure determinations, urinary findings, and differential blood counts in a group of 662 young male adults." *Bost. M. & S. J.*, vol. 173 (1915), pp. 541–543.

A report of the entrance physical examinations of the Harvard freshman class. Average age was 18, height 5 feet 8 inches, weight 143 pounds. Average systolic pressure, approximately 120 millimeters of mercury; average diastolic pressure, 80 millimeters. Blood counts showed no deviation from accepted standards; albuminuria was present in 5 per cent of the subjects, with no apparent pathological significance.

405 **Leipoldt, C. Louis:** "Blood pressure in the school child." *Brit. M. J.* [London], no. 3399 (1926), p. 347.

From examination of his own records of blood-pressure estimation in Transvaal school children, more than 12,000 in number, the author concludes that no definite standard can be established from such records.

406 **Leitão, Mello:** "Pressão arterial na infancia" [Blood pressure in children]. *Archivos Brasileiros de Medicina* [Rio de Janeiro], vol. 1 (1911), pp. 729–748.

A study of blood pressure in 200 children from 1 month to 5 years old. The author gives in several tables the blood pressure of the child in the morning and evening, according to the method of feeding, for each month of age under 1 year, for those over 1 but under 2 years, and for those from 2 to 5 years old. In a separate table he gives all combined findings, also blood-pressure figures obtained by several other writers. He concludes that blood pressure in normal children is between 62 and 100 in the first seven months; in the eighth month it goes down to 78; from then until the age of 5 years it remains almost stationary; artificially-fed children have a lower blood pressure than breast-fed children. Bibliography.

407 ——— "Pression artérielle chez l'enfant" [Arterial blood pressure of infants]. *Archives de médecine des enfants* [Paris], vol. 16 (1913), pp. 102–116.

The author tested and recorded the blood pressure of 200 children from 1 month to 5 years of age, at a Children's Hospital, using the sphygmomanometer of Erlanger and Hooker. Systolic and diastolic pressures were taken at 9 a. m. and 3 p. m. during April, May, and June, the subjects being normal children who had not been ill for at least 30 days preceding the examination. Pressure was taken at the femoral artery; pulse at ankle. The author found the systolic pressure mounting from 62 millimeters hydrogen in the first month to a maximum of 100 in the seventh, dropping to 78 in the eighth month, when all the infants observed were artificially fed, and mounting slowly from that age to 5 years. In general infants artificially fed showed a lower pressure than those nursed. Bibliography.

408 **Letourneau, Charles, J. M.:** Quelques observations sur les nouveau-nés [Some Observations on the Newborn]. Paris, no. 35, 1858. 46 pp.

Thesis for medical degree (University of Paris), largely pathological, but containing one table of pulse rate as observed in 72 infants, from less than 10 minutes to 31 days of age, from which the author found an average during the first month of 124; two tables of bodily measurements for 50 infants born at term; one table of weight of the viscera of infants born at term; and a small number of measurements of premature infants.

409 **Lüthje, H.:** "Beitrag zur Frage der systolischen Geräusche am Herzen und der Akzentuation des II. Pulmonaltons" [Contribution to question of systolic murmurs of the heart and accentuation of second pulmonic tone]. *Medizinische Klinik* [Berlin], vol. 2 (1906), pp. 404–406, 433–435.

After an examination of 445 girls between 6 and 20 years of age and 409 boys between 6 and 13, the author decided that "functional murmurs" are almost a rule in childhood. Pulmonic murmurs occur most frequently from ages 10 to 14 when growth is rapid and the chest is flat. Systolic murmurs

among girls occurred in 70 per cent of cases and among boys in 76 per cent. Accentuation of second pulmonic tone was found in 70% of the 854 children. The one table contains findings on systolic murmur over pulmonic area, systolic murmur at mitral area, systolic murmur over other areas, accentuation of second pulmonic tone and of second aortic tone.

410 **McCurdy, J. H.:** "Adolescent changes in heart rate and blood pressure." *American Physical Education Review* [Springfield], vol. 15 (1910), pp. 421–432.

Thesis for a provisional master's degree (Clark University, Worcester, Mass.). The original work consists of blood-pressure and heart-rate tests of 58 normal boys, aged 10 to 20 years, the tests made both in the horizontal position and standing, blood pressure by the Erlanger sphygmomanometer. Results are recorded for prepubescent, pubescent, and postpubescent groups. The author found from his data and careful medical examination that a high heart rate indicates poor muscular adjustment; a low blood pressure (below 100) shows lack of vigor; an abrupt pubertal rise in pressure is neither proved nor disproved. References.

411 **Milvin, G. Spencer, and J. R. Murray:** "Blood-pressure estimation in children." *Brit. M. J.* [London], vol. 1 (1915), pp. 669–670.

The results of blood-pressure estimations made on 40 children between 4 and 14 years of age are shown in a table giving age, pulse rate, auditory systolic, auditory diastolic, and pulse pressure. Methods are described. The systolic pressure was found to be slightly lower in children than in adults, the average diastolic level decidedly higher, the pulse pressure lower.

412 **Michael, May:** "A study of blood pressure in normal children." *Am. J. Dis. Child.* [Chicago], vol. 1 (1911), pp. 272–275.

The literature of the subject is reviewed. One hundred and twenty-eight cases were examined and the blood pressure tabulated by the child's height, by his weight, and by the method of Sallom.

413 **Monti, A.:** "(Propaedeutische Vorlesungen des Prof. A. Monti) Über den Puls der Kinder" [(Propaedeutic lectures of Professor A. Monti) Pulse of children]. *Allgemeine Wiener Medizinische Zeitung*, vol. 34 (1889), pp. 80, 91–92.

In a small space the author presents extensive data on the pulse of normal children. He presents a table compiled from many authors on maximum, minimum, and average pulse of children between 1 and 12 years and notes his corrections. Averages range from 110 to 84. He gives pulse of the average newborn as 134. He also presents findings of Mayr and of Guy on children of various ages. Pulse frequency decreases with age of the child; time of diastole is relatively greater than time of systole. Effect of length, rate of growth, sex, time of day, posture, digestion, sleep, breathing, and emotion is discussed.

414 **Müller, Erich:** "Untersuchungen über die Arbeitsleistung des Blutes und des Herzens bei gesunden Kindern vom 6. bis 11. Lebensjahre" [Investigations into the functions of the blood and of the heart in healthy children from the sixth to the eleventh year]. *Ztschr. f. Kinderh.* [Berlin], vol. 7 (1913), pp. 266–281.

In investigating the functions of the blood and of the hearts of children the author is particularly interested in the minute volume; i. e., the amount of blood that is pumped from the heart in a minute. He determines this for 19 healthy children between 6 and 11 years of age, as well as the volume of the heart throb, time of circulation, the pressure, oxygen capacity, specific gravity, and iron content of the blood, and lifting power of the heart. The author describes his technique in examining the children between 10 a. m. and 1 p. m. after they had breakfasted at 6.30, and compares his findings (minute volume of the blood 3184 cubic centimeters, heart-throb volume 39.04 cubic centimeters, and circulation time 30.41 seconds) with the corresponding values from Plesch for adults.

415 **Nicholson, O. H.:** "The sphymographic appearances of the pulse in infancy; a preliminary note." *Scottish Medical and Surgical Journal* [Edinburgh], vol. 8 (1901), pp. 419–426.

An article based on the author's original observations in the Children's Hospital for 10 years. Number of cases is not stated. Seven figures of pulse tracings are given. The author concludes that the infant's pulse is not a simple type of curve. He elaborates on its peculiarities and discovers similarity between the newborn infant's pulse and that of certain diseased states in adults.

416 **Nizzoli, A.:** "Sul valore del rapporto sfigmo-viscosimetro in pediatria" [On the value of the relation between blood pressure and blood viscosity in pediatrics]. *La Pediatria* [Naples], vol. 28 (1920), pp. 368–386, 419–434.

The purpose of the author's work was to verify the theory advanced by Martinet that in healthy children a constant relation exists between blood pressure and blood viscosity. After quoting numerous writers the author tells of his study of the blood pressure of 2,278 normal children ranging in age from a few hours to 11 years. He also obtained the age, blood pressure, viscosity, proportion of blood pressure to viscosity, weight, and height for 28 children with normal viscosity, 25 children with hypoviscosity and 22 with

hyperviscosity. He concludes that Martinet's theory has no greater practical value than the consideration of blood pressure and viscosity separately. Bibliography.

417 **Oppenheimer, K., and S. Bauchwitz:** "Über den Blutdruck bei gesunden Kindern" [Blood pressure of healthy children]. *Arch. f. Kinderh.* [Stuttgart], vol. 42 (1905), pp. 415–38.

In the belief that blood pressure should be measured in therapeutics the authors tested it in the case of 68 healthy children. They took only the systolic pressure and estimated it at least three times on each occasion (the first measurement being ignored on account of child's nervousness); after the first doctor made an estimation the second made a control estimation. A very full description is given of apparatus of von Bosch, of Gärtner, and Riva-Rocci. In studying one child seventy-five times and another sixty times the blood pressure, the authors found, varied within 10 millimeters of mercury. The results are compared with those of other students. The pressure rose according to increase in years, after the partaking of food (except in case of infants) and of drink, usually after exercising, and always as sequence of nervous excitement.

418 **Payan, L., and Ed. Giraud:** "La tension veineuse normale chez l'enfant" [The normal venous tension of the child]. *Comptes rendus des séances de la Société de biologie* [Paris], vol. 94 (1926), pp. 344–345.

The authors present a table of observations on 81 children, normal for the purposes of this study, the ages ranging from birth to 15 years.

419 **Pertot, S.:** "Beitrag zur Blutuntersuchung am Krankenbette" [Contribution to blood investigation at the sick bed]. *Wiener Klinische Wochenschrift*, vol. 14 (1901), pp. 779–782.

The author describes specimens of blood taken from healthy people of various ages, including newborn infants, and explains his technique.

420 **Popoff, A. M.:** Materiali k voprosu o krovianom davlienii u zdorovikh dietiei [Data on Blood Pressure of Well Children]. St. Petersburg, 1913. 202 pp.

For this dissertation (University of St. Petersburg) the author studied the blood pressure of 800 well children ranging in age from a few hours to 16 years. He gives by very detailed age groups the average weight, height, chest circumference, circumference of head, pulse, breathing, and blood pressure on the right and left arm as obtained by the methods of Korotkov, Riva-Rocci, and Gärtner. His discussion treats of the constancy of blood pressure and its fluctuations as affected by physiological conditions, such as age, weight, height, and sex; the relation between pulse and blood pressure, the effect of breathing, crying, anger, joy, muscular effort, mental effort, sleep, feeding at the breast, and eating; also the effect of premature birth and congenital debility. The data are given in numerous tables and compared with those obtained by other writers.

421 **Rucker, M. Pierce, and J. W. Connell:** "Blood pressure in the newborn." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 6–24.

Blood pressures were taken at birth of 32 white and 20 negro infants. The arm was used in all instances. The arithmetical averages for the 52 infants were as follows: First day, 55/40; second, 58/41; third, 54/39; fourth, 58/42; fifth, 60/42; sixth, 63/43; seventh, 61/44; eighth, 63/44; ninth, 64/43; tenth, 64/41. Six case histories of unusual subjects are given, and the literature of the subject is collected in a bibliography of 67 references.

422 **von Salle:** "Über Blutdruck im Kindesalter" [Blood pressure in childhood]. *Jahrb. f. Kinderh.* [Berlin], vol. 73 (1911), pp. 273–283.

With the Riva-Rocci-Recklinghausen apparatus the author tested the blood pressure, systolic, and diastolic of 75 normal children from 3 to 11 years old. There were variations in each age and individual, but a steady increase of blood pressure could be discerned according to age, weight, and size. The blood pressure of four normal nurslings was found to be 80 millimeters hydrogen. The pressure was lower in status lymphaticus and higher in neuropathy and nephritis. Results are presented in two tables and a curve.

423 **Schlieps, Wilhelm:** "Über Herztöne kranker und gesunder Säuglinge" [Heart sounds of sick and healthy infants]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 10 (1911), pp. 450–456.

In examining six healthy, breast-fed children the author found that only in two was the first sound the louder at the base of the heart; in the others the stronger sound coincided at the base with the diastole of the heart. In 10 so-called healthy, bottle-fed children the second sound at the base was in eight cases louder than the first, and in two cases no difference was to be noted. Bibliography.

424 ——— Über pseudokardiale und kardiale Geräusche im Kindesalter ohne pathologische Bedeutung" [Pseudo-cardiac and cardiac murmurs in childhood without pathological significance]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 76, supplementary volume (1912), pp. 247–282.

After a survey of previous work on the subject the author describes his own studies of the hearts of 273 children. Each one was tested several times as to pulse, blood pressure, hemoglobin, urine, and by auscultation and some by

X-rays, while standing, lying, and after exercise. Of the 273, 100 had functional systolic murmurs. Among other findings the author concludes that anemia and heart murmurs have no causal connection in childhood. One-third of functional murmurs are due to lowering of tone in the heart muscle, for which the term "atonic" is proposed. It disappears on improvement of general health. The article contains 10 figures and concludes with two pages of bibliography.

425 **Seham, Max:** "The electrocardiogram in normal children." *Am. J. Dis. Child.* [Chicago], vol. 21 (1921), pp. 247–281.

The author reports and shows characteristic electrocardiographs for normal children from a collection of 101 electrocardiographs on children 1 hour to 12 years old.

426 ——— **and Grete Egerer-Seham:** "Physiology of exercise in childhood. Part I. A study of normal children of school age." *Am. J. Dis. Child.* [Chicago], vol. 25 (1923), pp. 1–45.

After summarizing the work of previous authors on pulse rate and blood pressure in children during exercise the authors record the results of about 600 determinations carried out on 100 children between the ages of 6 and 15 years, systolic and diastolic pressures and pulse rate having been taken in standing, sitting, and reclining postures. Normal values having thus been determined, experiments were carried out with an especially devised ergometer, with dumbbells, and with staircase exercises; and numerous tables were constructed showing the effect of different types of exercise on the circulatory reactions, reaction of pulse and blood pressure to measured amounts of work, effect of various amounts and kind of work on pulse and blood pressure at different ages, relation between weight and capacity for work in normal children, etc. References.

427 **Seux, V.:** "Du pouls chez les nouveau-nés" [The pulse of the newborn]. *Union médicale* [Paris], vol. 9 (1855), p. 522.

Not an original article but a résumé with lengthy quotations of an investigation made by M. Seux. An early contribution to studies of the infant pulse rate.

428 **Smith, J. Lewis:** "The infantile pulse in health." *American Medical Times* [New York], vol. 7 (1863), pp. 275–277.

This article contains the following original observations: 57 on the pulse in healthy infants during the first half hour of life; 42 during the first week, wakefulness, sleep, or condition of excitement being noted after the first six hours; 24 from the close of the first week to the close of the first month; 38 from the close of the first month to the close of the third month; 37 from the close of the third month to the close of the sixth month; 29 from the close of the sixth month to the close of the first year. The author found a marked diminution of the pulse in sleep except in the first week of life, and a gradual diminution when the infant was awake but quiet during the entire first year.

429 **Stowell, W. L.:** "Blood pressure in children." *Arch. Pediat.* [New York], vol. 25 (1908), pp. 88–94.

Following general observations on variations in adult blood pressure the author quotes the results of 216 observations made on children. From these he derived the average pressure in healthy children from 3 to 17 years inclusive, showing the lowest, 89 millimeters, at 4 years, and the highest, 117 millimeters, at 16 years. Many observations on children with various diseases are also recorded. Bibliography.

430 **Stocks, Percy, and M. Noel Karn:** Blood Pressure in Early Life: A statistical study. Cambridge University Press, 1924. 88 pp.

An investigation to determine normal blood pressure during puberty and adolescence; to ascertain the normal range of systolic and diastolic blood pressure and pulse pressure at ages from 5 to 40; to examine the interrelation between these pressures, and their correlation with pulse rate, physical development, muscular strength, respiratory and psychological functions, social class and athletic habits. Data were obtained from 1,633 subjects, as follows:

540 boys in London County Council elementary schools.
560 boys in London secondary schools.
69 boys of Merchant Taylors' School.
154 boys of Bristol secondary schools.
42 men on the staff of the Virol Company's factory.
154 male students of University College, London.
114 female students of University College, London.

Methods are fully described as a contribution toward establishing a standard technique. Twenty-two figures and 44 tables (including two which summarize the findings of various observers as to mean systolic and diastolic pressures of males at different ages) accompany the text, which concludes with a list of 72 references.

431 **Sutliff, W. D., and Evelyn Holt:** "The age curve of pulse rate under basal conditions." *Archives of Internal Medicine* [Chicago], vol. 35 (1925), pp. 224–241.

From data of many investigators, the authors derived charts showing the curve of basal pulse rate in relation to age for both sexes between ages 1 and 80, and the curve of basal pulse rate for males compared with the curve (Aub

and Du Bois) of basal metabolism per square meter of body surface hourly for males. Average basal pulse rate at 1 year was found to be 116 for males and 122 for females. The curve drops rapidly for the first three years, then less rapidly to the adult level, reached at 20 years of age. Variability is greater in children than in adults; in females than in males. An extended discussion of previous studies is accompanied by a list of 45 references.

432 **Tavastsjerna, A.:** "Zur Kenntnis der individuellen Schwankungen des Blutdruckes beim gesunden Menschen" [Knowledge of individual variations of blood pressure in healthy man]. *Skandinavisches Archiv für Physiologie* [Leipzig], vol. 21 (1908–9), pp. 405–430.

The author took blood pressures of 500 males and females, of whom 246 were school children between 7 and 19 years. The data of other students are extensively discussed. The author's own findings are shown in 14 tables and 3 figures. Maximal, minimal, and mean values are given for blood pressure and pulse frequency.

433 **Trousseau, A.:** "Sur le pouls des enfants à la mamelle" [The pulse of nurslings]. *Journal des connaissances médico-chirurgicales* [Paris], vol. 9, pt. 1 (1841–42), pp. 23–29.

Two series of observations were made by the author. In the first series no distinction was made as to the state of activity, sleep, nursing, or excitement. In the second, these distinctions were included, and observations were made of the same infant under varied conditions. The first series consisted of 27 boys and 27 girls, aged 15 days to 21 months; the second, of 59 boys and 47 girls, aged 8 days to 21 months. Subjects were divided into several age groups and minimum, average, and maximum pulse rates were recorded for each group. The author found that the pulse in the third month has the frequency which it preserves to the twenty-first month; that from the third month through the twenty-first the pulse of girls is more rapid than that of boys; that the pulse is more rapid when the infants are awake than when they are asleep. Normal variations were as follows: In the second half of the first month, 120 to 164; from 1 to 2 months, 96 to 132; from 2 to 6 months, 100 to 162; from 6 months to one year, 100 to 160; from one year to 21 months, 96 to 140.

434 **Trumpp, J.:** "Blutdruckmessungen an gesunden und kranken Säuglingen" [Blood-pressure measurements of healthy and sick infants]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 21–22 (1904–5), pp. 207–224. See also *Jahrb. f. Kinderh.* [Berlin], vol. 63 (1906), pp. 43–59.

Trumpp measured the blood pressure of healthy and sick infants 1,300 times. Some of the work was done in Munich; but 1,062 measurements on 56 infants were made at the Children's Asylum, Berlin. Gärtner's tonometer was used. The newborn showed values no different from older children. The healthy, breast-fed infant showed a blood-pressure curve almost horizontal, between 75 and 90 millimeter hydrogen; 60 was reached only in sleep or in cases of premature birth. Muscular and nervous stimulation and the taking of food increased blood pressure. Three hundred tests on the hands resulted in a higher pressure 122 times for the left hand and 97 times for the right hand, and no difference 81 times. Sixteen tables give temperature weight and blood-pressure curves for 1 healthy infant and 15 sick ones.

435 **Valleix:** "Recherches sur la fréquence du pouls chez les enfants nouveaunés et chez les enfants âgés de sept mois à six ans" [Observations of pulse rate in newborn infants and in children aged 7 months to 6 years]. *Mémoires de la Société médicale d'observation de Paris*, vol. 2 (1844), pp. 300–380.

Data were obtained from three series of observations: One of 4 children observed for 24 days, one of 6 children for 24 days, one of 33 children for 25 days. The total number of observations was 567. The author found that the pulse is less rapid in the newborn than in infants of 6½ months; that rise in temperature increases pulse rate; that the pulse of girls is more rapid than that of boys; that during sleep the pulse is sensibly retarded; that from 7 to 27 months the number of pulsations does not change noticeably, remaining at about 126 when the child is in a state of ordinary activity.

436 **Wilson, May G.:** "The circulatory reactions to graduated exercise in normal children." *Am. J. Dis. Child.* [Chicago], vol. 20 (1920), pp. 188–198.

To assist in finding a criterion of cardiac function applicable to children an investigation was conducted at New York Nursery and Child's Hospital, and at the Department of Pediatrics, Cornell University Medical College, N. Y. Twenty normal children aged 6 to 13 years were observed at two-day intervals for two to eight weeks. A total of 500 observations were made. Pulse, systolic blood pressure, character, duration and rate of exercise, and clinical reactions of subject were recorded. Typical pulse and blood-pressure charts are shown. The complete data of one experiment in each of the 20 cases are tabulated. The author's conclusions are that the circulatory response to exercise in children is similar to that of adults and reasonably constant. The pulse returns to normal within two minutes after exercise to the clinical limit of tolerance. The type of blood-pressure curve is the best criterion of exercise tolerance and therefore of cardiac function. A delayed rise and summit with a prolonged fall indicate the limit of tolerance.

437 **Wolfensohn-Kriss, *Mrs.* P.:** "Über den Blutdruck im Kindesalter" [Blood pressure in childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 53 (1910), pp. 332–348.

The author tested the blood pressure with the Riva-Rocci and Sahli methods on about 350 healthy children in a polyclinic at Berne. She discusses results obtained by other investigators and describes her own methods. Seven tables show age, size of children, and the minimum as well as maximum pressure. Conclusions are that blood pressure rises with increasing age, with greater height, and with greater weight. No relation to sex could be established.

438 **Zamkin, Harry O.:** "The size of the liver and the spleen in apparently normal children." *Arch. Pediat.* [New York], vol. 43 (1926), pp. 169–185.

The author reports his own study of 2,100 apparently normal infants and children. The findings recorded were determined in greater part by palpation. Monthly examinations were made during the first year; annual examinations to and including the twelfth year. Significant changes in size appeared in four groups: 10 days to 1 year, inclusive, 531 cases; 2 years to 4 years, inclusive, 458 cases; 5 years to 9 years, inclusive, 835 cases; 10 years to 12 years, inclusive, 276 cases. With reference to the costal margin in the mid-clavicular line, the liver varied from just palpable to 6.5 centimeters below; it was found 3.5 centimeters, 4.5 centimeters, and 5.5 centimeters below as late as 9 years of age, and fairly often as low as 3.5 centimeters below up to 12 years. Neither the state of nutrition nor the type of diet affected the height of the liver. The spleen was palpated below the free border of the ribs in 25 per cent of the series, the frequency being greatest during the first year. Neither type of feeding during the first year, race, nor nationality of parents had any appreciable effect on the size of the spleen. The article has a comprehensive review of the literature, with references, and several tables.

C. RESPIRATORY SYSTEM

439 **Andral and Gavarret:** "Recherches sur la quantité d'acide carbonique exhalée par le poumon dans l'espèce humaine" [Researches into the quantity of carbonic acid exhaled by the lung in the human species]. *Annales de chimie et de physique* [Paris], ser. 3, vol. 8 (1843), pp. 129–150.

The author discusses the quantity of carbonic acid exhaled by 36 males and 26 females between the ages of 8 and 75. Twelve were boys and six girls below the age of 20. One table on the male sex and one on the female sex show age, masculature, and carbon consumed in one hour. Other things being equal, the male exhales more carbonic acid than the female. In girls and women menstruation decreases the output. The quantity of carbonic acid varies directly with vigor of constitution.

440 **Armbruster:** "Vom Kehlkopf der Neugeborenen" [Larynx of newborn babies]. *Der Kinder-Arzt* [Leipzig], vol. 26–30 (1915–1919), pp. 3–5.

A discussion of the relative positions of the larynx in the infant and adult with relation to the vertebræ, and the advantages to the infant and adult in such position.

441 **Bahrdt, H., and F. Edelstein:** "Die Methodik der Untersuchung des respiratorischen Stoffwechsels am Säugling" [The method of investigating the respiratory exchange in the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 72 (1910), supplement, pp. 43–70.

The authors describe their methods of testing the respiratory metabolism of infants in the Empress Augusta Victoria House by means of the Pettenkofervoit apparatus and Pettenkofer's methods of analysis.

442 **Bernstein, J.:** "Zur Entstehung der Aspiration des Thorax bei der Geburt" [Origin of the expansion of the thorax at birth]. *Archiv für die Gesammte Physiologie des Menschen und der Thiere* [Bonn], vol. 28 (1882), pp. 229–242.

After refuting Hermann's theory on elastic tension of the fetal thorax the author argues that the thorax of the newborn infant, in consequence of respiratory movements, is subject to new equilibrium, and discusses mechanics of this change, and develops his own theory of excess expansion. This rests on the hypothesis that the thorax of the fetus and all parts connected with it grow in a condition of elastic equilibrium. If a powerful inspiration occurs organs, muscles, etc., are stretched and draw in opposite directions, but not being entirely elastic they retain a certain degree of extension. The author refers to tests without precisely tabulating them.

443 ——— "Weiteres über die Entstehung der Aspiration des Thorax nach der Geburt" [Further on the origin of expansion of the thorax after birth]. *Archiv für die Gesammte Physiologie des Menschen und der Thiere* [Bonn], vol. 34 (1884), pp. 21–37.

The author continues discussion of volume 28 of this periodical on the origin of expansion of the thorax after birth. He again calls Hermann's theory on elastic tension of fetal thorax a physical impossibility.

Tests on six kids, two lambs, and one infant convinced him that expansion of the thorax arises in consequence of the first powerful movements of breathing directly after birth. In the human newborn, at least after the first week, there is a negative pressure in the thorax. That it is not so great as in adults is due to the fact that young tissue has a lesser elasticity coefficient than older and that bronchi and alveoli become thicker and perhaps also more numerous.

444 **Billard, G., and P. Gourdon:** "Sur l'indice de la puissance de ventilation pulmonaire chez les enfants de l'école primaire" [The index of chest expansion in school children]. *Comptes rendus des séances de la Société de biologie* [Paris], vol. 94 (1926), pp. 12–13.

By this index the authors designate the relation of chest volume to vital capacity. In a series of 150 children they found no correlation between stature or weight and vital capacity, but a fairly constant value, ranging from 4.5 to 5.5, for the above index.

445 **Boynton, Ruth E.:** "A comparison of normal standards for the vital capacity of the lungs of women." *Archives of Internal Medicine* [Chicago], vol. 33 (1924), pp. 292–300.

The author includes a number of observations on girls from 16 to 20 years of age.

446 **Brilli, L.:** "Ricerche sulla ventilazione polmonare nell' età infantile" [Studies of respiration in childhood]. *Lo Sperimentale* [Siena], vol. 47 (1893), pp. 218–229.

The author carried out 40 experiments with 25 children from 3 to 11 years old for the purpose of finding the quantity of air expired by them. Eighteen were well; the others were convalescent from diseases of the lungs or pleura. For each experiment the author gives the age, weight, height, chest circumference, temperature, pulse, time of day, duration of study, and quantity of air expired every five minutes. He found that the amount of air expired every five minutes by children from 3 to 11 years old varied between 30 and 47 liters; respiration is more active in children than in adults; in proportion to the sizes of their bodies the children breathe more air than adults; in children of the same age the weight, height, and chest circumference bear no relation to the amount of expired air.

447 **Dohrn:** "Über den Mechanismus der Respiration des Neugeborenen" [The mechanism of respiration in the newborn]. *Archiv für Gynaekologie* [Berlin], vol. 35 (1889), pp. 503–504.

The author tested with mask and spirometer the respiratory exchange of a very young infant when quietly breathing and when crying; it was 35 cubic centimeters in the first case and 120 to 140 cubic centimeters in the second. There is atelectasis, the author maintains, on the first day of life and often on the second. The air exchange of infants is much greater than that of adults.

448 ——— "Über die Mechanik der Respiration des Neugeborenen" [Mechanics of respiration of the newborn]. *Deutsche Gesellschaft für Gynäkologie, Verhandlungen* [Leipzig], 1890, pp. 102–108.

The author demonstrated mechanics of infant respiration with dead bodies into which glycerine had been injected. For the normal newborn child there is an exchange with every breath of 35 cubic centimeters of air, which amount may rise to 120 cubic centimeters in crying. The respiratory curve shows no pause between inspiration and expiration. Air exchange with each breath amounts to one-fourth of whole capacity of lungs—considerably more than in adults. Complete development of alveoli of lungs can not be assumed after shallow breathing.

449 **Eckerlein:** "Zur Kenntnis des Atmungsmechanismus der Neugeborenen" [Mechanism of breathing in newborn infants]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 19 (1890), pp. 120–173.

The author discusses the work done on the respiration of infants by Maye, Monti, Steffen, Kehrer, Vierordt, Kennebaum, Preyer, Kronecker, Weber, et al. To determine the form of the thorax of newborn infants he made observations for 10 days on 5 healthy children with an apparatus for outlining the longitudinal profile, and for 6 to 9 days on 28 infants, with a tape measure, to obtain the chest girth. The latter results are shown in tables. The mean for 468 measurements is 32.4 centimeters. Means from 468 measurements of anteroposterior and transverse diameters of the chest are 8.7 centimeters and 9.8 centimeters, respectively. The infant's thorax is therefore much less flat than that of the adult. To ascertain the changes in the thorax the author made curves of the chest girth of the above 28 newborn infants, which curves show a sinking on second and third days after birth. The lung volume of 4 stillborn infants he found to average 51 cubic centimeters. Further experiments on the living infants showed how the thorax rises and falls in quiet and in deep breathing. The same experiments are conducted by artificial inflation of cadavers. With Marey's drum the author measured the rhythm of respiration of which he gives many graphs. With a specially made spirometer he tested the respiratory exchange of 5 children during their first 8 or 10 days of life, and made over 100 curves. He found it 2,500 cubic centimeters a minute for crying and 1,700 for normal breathing. The infant has a greater respiratory exchange than the adult. The article concludes with many spirometric curves of respiratory rhythm in newborn infants.

450 Eckstein, A., and H. Rominger: "Die Atmung des Säuglings" [Respiration of the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 28 (1921), pp. 1–37.

The authors studied respiration in 72 infants up to 1 year of age, using a mask constructed of glass and Gad's pneumatograph. The method of testing is described, also frequency and volume of respiration and respiratory type. The article contains 14 pictures of apparatus and curves of breathing. Results are expressed also in a detailed table.

The average frequency of the normal infant is 37 to 49 breaths a minute; physiological variations are between 30 and 70. Volume of air inspired by young infants is 10 to 13 cubic centimeters; at about six months it rises to 18 cubic centimeters and in the second half of the first year to 30 cubic centimeters. Respiratory type of older infant is not very different from that of adult. Bibliography.

451 Emerson, W. R. P., and H. Green: "Vital capacity of the lungs of children." *Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 202–211.

From various institutions in Boston vital capacity was estimated on 350 approximately normal children—84 girls and 266 boys. Surface area was calculated by the tables of Benedict and Talbot, except for heavier children, for whom the chart of DuBois and DuBois was used. The height, weight, age, vital capacity, and surface area of each child are given, the data analyzed in groups based on sex and height, and the ratio of the vital capacity to the surface area estimated for the groups. The authors' conclusions are: (1) A very close relationship was found between vital capacity and surface area in children; (2) there is practically no difference between children considered in the tables for normal weight, for height, and those falling 7.5 per cent below normal; (3) the determinations of vital capacity for girls were on a whole much lower than those for boys, but the same relation held between vital capacity and surface area; (4) determinations of vital capacity below 7 years of age are unreliable.

452 Engel, S.: "Form, Lage, und Lageveränderungen des Bronchialbaumes im Kindesalter" [Form, position, and change of position of the bronchial tree in childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 60–61 (1913), pp. 267–288.

In studying the bronchial tree in childhood the author made 23 metal molds, mostly from cadavers of young children, and took many X-ray pictures of the thoraxes of living children. In this article he shows 18 figures, 3 tables according to ages from birth to 13 years, of the frontal and sagittal diameters of trachea and bronchial tubes, their length, and the position of their bifurcation; and tables for the 4 quarters of the first year and for each of the 12 following years, containing the position of the bifurcation and of the diaphragm relatively to the sternal vertebræ. He finds the proportion of right to left lung to be 16 to 12. After about the fifth year the trachea moves from the right to the median line in the normal thorax, and the bifurcation falls from above to below the fourth vertebra.

453 Feitelberg, Joseph: Der Stand der normalen untern Lungenränder in den verschiedenen Lebensaltern nach den Ergebnissen der Percussion [Position of Normal Lower-Lung Margins at Various Ages, According to Results of Percussion]. Dorpat, 1884. 93 pp.

Inaugural dissertation (University of Dorpat). All ages up to 102 years are studied. Cases up to 10 years of age are 61 in number; between 10 and 20 years 125. Tables filling many pages give age, sex, nationality, height, girth of chest, right and left half of thorax, and levels of right and of left lung margins at five points. Up to 20 years of age the margin of the left lung is usually a little deeper than that of the right; the boundary lines of the lungs in the left axillary line are definable in one-half of the cases up to 10 and in two-thirds of the cases up to 20.

454 Fitz, George W.: "A study of types of respiratory movements." *Journal of Experimental Medicine* [New York], vol. 1 (1896), pp. 677–692.

By means of belt pneumographs connected with piston recorders the author secured respiratory tracings of 407 subjects and derived tables of the respiratory movements of thorax and abdomen, recorded in millimeters, of the following groups: 35 boys aged 6 to 15—average, 9 years 8 months; 34 females with unconstricting dress, aged 3 to 60, of Eskimo, Egyptian, Syrian, American Indian, Samoan, Hawaiian, Javanese races; 44 females with constricting dress, aged 13 to 48, of Egyptian, Eskimo, Syrian, Javanese, American Indian races; 52 American women, aged 17 to 34—average 22 years, 5 months—classified as to wearing of corsets. The author concludes that in both sexes normal abdominal respiratory movement is somewhat in excess of chest movement; that the chest contributes the same bulk of air as the abdomen; that constriction of dress causes preponderance of thoracic movements in ratio to restriction of abdominal movements and sensitiveness of nervous coordination. References.

455 Forster, J.: Über die Kohlensäureausscheidung bei K'ndern" [Carbonic-acid elimination in children]. *Amtlicher Bericht der 50. Versammlung Deutscher Naturforscher und Aerzte, in Muenchen vom 17. bis 22.* September, 1877, p. 355.

With Pettenkofer's respiratory apparatus the lecturer tested 14 boys and girls ranging from 14 days to 9 years of age in a state of rest and hunger and

determined that for 10 kilograms of weight 10–12 grams of carbonic acid were eliminated in one hour, as opposed to 4–5 grams in the adult.

456 **Gilbert, J. Allen:** "Lung development in the child." *J. A. M. A.* [Chicago], vol. 38 (1902), pp. 1436–1437.

A plea for gymnasia in public schools based on a comparison of the vital capacity of pupils 6 to 17 years of age in public and private schools. About 1,600 children were examined. One table and one chart are given.

457 **Gittings, J., George Fetterolf, and A. G. Mitchell:** "A study of the topography of the pulmonary fissures and lobes in infants (with special reference to thoracentesis)." *Am. J. Dis. Child.* [Chicago], vol. 12 (1916), pp. 579–589.

Previous literature is reviewed with emphasis on its discrepancies. The relation of the pulmonary fissures to the ribs and scapulæ was determined in 14 formalin-hardened specimens 6 weeks to 15 months old. The fissures of the lungs in infancy were found to show practically the same relation to the bony framework as in adults. The lower level of the lungs in infancy is probably higher than in adults.

458 **Godin, Paul:** "Respiration thoracique et respiration abdominale volontaires au cours de la croissance" [Voluntary thoracic and abdominal respiration in the course of growth]. *Comptes rendus hebdomadaires des séances de l'Académie des sciences* [Paris], vol. 157 (1913), pp. 388–389.

On the basis of observations upon 230 children from 13 to 18 years of age the author states that thoracic expansion in breathing is to abdominal expansion as 10 is to 5 in the prepubescent period and as 6 is to 4 after puberty; or, in other words, the pulmonary expansion is horizontal before puberty and horizontal and vertical after puberty.

459 **Gregor, Konrad:** "Untersuchungen über die Atembewegungen des Kindes" [Investigations in respiratory movements of the child]. *Arch. f. Kinderh.* [Stuttgart], vol. 35 (1902–3), pp. 272–304.

After discussing Hasse's four types of breathing among mammals and his own fourfold division of the development of breathing in children from birth to 14 years the author describes a new series of studies on ordinary children, both strong and weak, between 7 and 14. He photographed 15 girls and 9 boys so as to obtain the side view of torso, naked, in two positions after inspiration and expiration. He discusses in detail the movements of the girls' bodies in breathing and of the boys', the differences due to age and sex, and the influences caused by physical development. A table gives details on the respiration of his 24 subjects, and a plate reproduces the photographs. The author discovers a great variety in the combinations of abdominal and thoracic breathing. Girls hold longer to abdominal breathing. They are much inferior to boys in the way they breathe and stand.

460 **Haedke, Maximilian:** Über den Nachweis epidermoidaler Elemente in den Lungen Neugeborener [Proof of Epidermoid Elements in the Lungs of Newborn Infants]. Kiel, 1894. 15 pp.

Inaugural dissertation (University of Kiel). In the pathological institute at Kiel the author examined the lungs of 11 newborn infants that had been dissected and in 7 ascertained the presence of epidermoid cells. A description of each infant is given.

461 **Hasselbaech, K. A.:** "Respirationsforsøg paa nyfødte Børn" [Respiratory studies on the newborn]. *Bibliotek for Laeger* [Copenhagen], ser. 8, vol. 5 (1904), pp. 219–247.

The work of other investigators is discussed. In five tables observations on 25 infants (11 girls and 14 boys) 15 minutes to 6 days of age are given.

462 **Khàrina-Marinucci, R.:** "Capacità respiratoria e statura seduta" [Vital capacity and sitting height]. *La Pediatria* [Naples], vol. 32 (1924), pp. 832–849.

The purpose of this article is to find the relation between the sitting height and vital (or respiratory) capacity in normal children as a means of judging the child's physical condition. The author gives in two tables the following data obtained by Professor Fabozzi: Age, height, sitting height, weight, chest circumference, and vital capacity for over 1,300 school children 3 to 11 years old, by sex. In two other tables he gives data obtained by himself in a study of 960 children ranging in age from 6 to 11 years old, boys and girls in nearly equal numbers. He gives for them the relation between the sitting height and vital capacity, and in a fifth table he presents an index showing the vital capacity for each centimeter of sitting height. He concludes that the vital capacity, considered by itself, increases with age; it is greater in males than in females and in the rich than in the poor. The proportion between vital capacity and sitting height is constant in children. The number which expresses the relation between the cube of the height and the vital capacity in normal condition fluctuates around 21; that expressing the relation between the cube root of the vital capacity and the sitting height is in normal condition equal to 0.16 or 0.17. Both these indexes constitute an objective method for judging whether the maximum quantity of air inhaled or exhaled by an individual is sufficient for the development of the body. References.

463 **Krogh, August, and J. Lindhard:** "Measurements of the blood flow through the lungs of man." *Skandinavisches Archiv für Physiologie* [Leipzig], vol. 27 (1912), pp. 100–125.

In their measurements of blood flow through the lungs the authors use as subjects three adults and one child of 14 years weighing 53.5 kilograms. The article contains sections on the method of determining blood flow, a long table of volume of air in lungs, mean percentage of nitrous oxide, final percentage of oxygen blood flow, pulse, etc., and a summary.

464 **Marfan, A. B., and H. Dorlencourt:** "Recherches sur l'exhalation de vapeur d'eau par le poumon chez le nourrisson sain et chez le nourrisson atteint de choléra infantile ou de diarrhée commune" [Researches in the elimination of water vapor through the lungs in normal infants and those with common diarrhea]. *Bulletins de la Société de pédiatrie de Paris*, vol. 20 (1922), pp. 22–27.

This article contains a report of a study of nine normal infants, whose exhalation of water vapor was determined by means of an apparatus invented by the author, not here described. A table shows age, weight, and water exhaled per kilogram of weight in 10 minutes. The average was found to be 0.0318 gram, the quantity increasing from the age of 1 to 3 months, then gradually decreasing to 6½ months, the age of the oldest subject examined.

465 **Mehnert, E.:** Über topographische Altersveränderungen des Atmungsapparates und ihre mechanischen Verknüpfungen [Topographical Changes at Different Ages, of the Respiratory Apparatus and their Mechanical Connections]. Verlag von Gustav Fischer, Jena, 1901. 151 pp.

This book contains 40 tables, 30 figures, and 3 elaborate plates. The text is divided into sections on larynx, trachea, diaphragm, etc., at different ages. Both cadavers and living individuals were examined. The whole respiratory apparatus sinks as age progresses. In the fetus the head is bent forward with chin on the breast; in extrauterine life the head is raised. In the fetus ribs are horizontal; in childhood they take on a slant. Exact location of cricoid cartilage, tracheal bifurcation, etc., is noted at different ages as they sink. This "age descensus" is more rapid in male than in female.

466 **Noback, G. J.:** "The developmental topography of the larynx, trachea, and lungs in the fetus, newborn, infant, and child." *Am. J. Dis. Child.* [Chicago], vol. 26 (1923), pp. 515–533.

The relation of the respiratory system to the vertebral column and the shifting of this system in a cranio-caudal direction were studied by locating the levels of the following points: The tip of the epiglottis, the inferior margin of the cricoid cartilage, the tracheal bifurcation, the upper and lower limits of the lungs, and the relation of the apex of each lung to the suprasternal notch. These levels were determined from 102 fetuses and full-term, newborn children; midsagittal sections of a 5-year and an 8-year-old child; a model of the topography of thoracic and abdominal viscera of a 65-millimeter human embryo; and a series of tracings of medially sectioned human fetuses. Seven charts show the findings of the author plotted with those of many other investigators. References.

467 **Recklinghausen, Heinrich:** "Über die Athmungsgrösse des Neugeborenen" [Respiratory capacity of the newborn infant]. *Pflüger's Archiv für die Gesammte Physiologie des Menschen und der Thiere* [Bonn], vol. 72 (1895–96), pp. 451–493.

This article is in three parts: A general section including a description of Dohrn's tests, the main part describing the author's own experiments on four infants with an apparatus to which he devotes many pages, and a third part containing full data in four tables and a plate of five figures on the apparatus, and seven curves on the subjects. In these four children, when quiet and asleep, the frequency of breathing averaged 62 per minute. The volume of air was 1,370 cubic centimeters per minute to 3 kilograms of weight, whereas in the adult it is 300 cubic centimeters.

468 **Rennebaum, Franz:** Die Athmungscurve des neugeborenen Menschen [Respiratory Curve of the Newborn Infant]. Jena, 1884. 30 pp.

Inaugural dissertation (University of Jena). After a description of his recording apparatus (Marey's polygraph from Roth in Prague), of which he gives a picture, the author shows 6 curves of adults' respiration and 12 of infants' respiration and notes the differences. Breathing of the newborn agrees with that of adults in that the inspiration passes into expiration without pause and surpasses the latter in duration. On the other hand the infant differs essentially from adult in absence of respiration pause and in greater frequency and slighter depth of respirations. These differences are to be explained by greater flexibility of children's thoraces which follow alteration in the volume of the lungs more easily than in adults, by less energetic contractions of the diaphragm, by shorter duration of circulation of blood, and by very slight thoracic aspiration in the beginning.

469 **Rock, F. E.:** "Chest girth of Edmonton school children." *School Hygiene* [London], vol. 1 (1910), p. 345.

This article presents a table for boys and one for girls 4 to 15 years of age, giving the measurements of the chest at rest and the amount of expansion of the chest, in centimeters. The probable error is noted. Measurements were taken at the level of the nipple.

470 **Scherer, F.:** "Die Respiration des Neugeborenen und Säuglings; experimentelle Studie" [Respiration of the newborn and of the older infant; experimental study]. *Jahrb. f. Kinderh.* [Leipzig], vol. 43 (1896), pp. 471–497.

Observations made by the author at the clinic for infants at Prague. He deals with the movements of the thorax and trunk in breathing, extent of respiratory exchange of gases, and effect of outside temperature on the exchange of gases. He quotes several writers on each of the points he investigated, presents in several tables the results of his 85 experiments, and draws the following conclusions: (1) The intensity of the exchange of gases in respiration of the newborn is much greater than in the case of adults; (2) low temperature of the environment causes an increase in the exchange of gases; (3) the exchange becomes somewhat smaller in the first hours after birth, increases rapidly between the ninth hour and the middle of the second day, and after that rises slowly but steadily.

471 **Schnepf, B.:** "Influence de l'âge sur la capacité vitale du poumon" [The influence of age on the vital capacity of the lungs]. *Gazette médicale de Paris*, ser. 3, vol. 12 (1857), pp. 331–335, 386–392, 602–606.

The author reports the results of a varying number of observations made at different age periods from 3 or 4 years to 80 years. Number of observations at each age was 9 to 342. Discussion of this material includes consideration of the relation between the phases of increase and decrease of lung capacity; relation between the influences of age and of stature; comparison between averages of stature and lung capacity; coefficients of lung capacity at different ages for each centimeter of height; weight of body; and lung capacity.

472 **Schwartz, Hermann:** Die vorzeitigen Athembewegungen. Ein Beitrag zur Lehre von den Einwirkungen des Geburtsaktes auf die Frucht. [Premature Movements of Respiration; a contribution to the theory of the effects of the act of birth on the fetus]. Breitkopf und Härtel. Leipzig, 1858. 308 pp.

This book discusses respiratory process of the fetus and influence of the act of birth on fetal circulation and its consequences for the child. There is a table of frequency of elimination of urine or meconium before or after birth of infants born dead or almost dead. Sixty-one births are described in detail from the author's experience at Lying-in Institute of Kiel between 1852 and 1857, and from records by Professor Litzmann of 1,300 births. The author is particularly interested in the time when the newborn infant first breathes.

473 **Signorelli, A.:** "Il diametro vertebrale o altezza dei polmoni" [Vertebral diameter or height of the lungs]. *Atti di societa romana di antropologia* [Rome], vol. 14 (1908), pp. 219–238.

The author measured 200 boys and men varying in age from 5 to 64 years to determine the maximum vertical diameter of the lungs of a living being. In several tables he gives separately for each case the age, height, height of spinal column, height of sternum, perimeter and diameter of middle thoracic segment, height of abdomen, bi-iliac diameter, and vertebral diameter. He discusses the tables and concludes that the vertical diameter (he also calls it "vertebral" diameter) varies according to age, height of the person, height of spinal column, and all the other factors given by him in the tables. The vertical diameter of the lungs of the adult was on the average 30 centimeters which is 5 centimeters greater than that generally found in corpses.

474 **Ssokolow, D.:** "Der differentielle Pneumograph und seine Anwendung bei Kindern" [Differential pneumograph and its use in children]. *Jahrb. f. Kinderh.* [Berlin], vol. 75 (1912), pp. 265–279.

The author describes his pneumograph, of which he gives a photograph, for registering the motions of the thorax in respiration and inspiration on the right and left sides, and explains 7 X-ray photographs and 19 curves made by his pneumograph of 15 boys and girls from 1 to 13 years old. These double curves of right and left sides with their ascending and descending lines in inspiration and expiration show typical breathing in cases of health, of heart disease, etc.

475 **Stewart, C. A.:** "The vital capacity of the lungs of children in health and disease." *Am. J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 451–496

A continuation of the study reported on page 83 of the same volume (No. 437 of this list). Examinations were made of 2,509 normal and 253 sick children. The previous literature on vital capacity is extensively reviewed. Full statistical tables are given. In addition to a verification of his earlier conclusions the author reports that girls may be considered relatively more mature for their age than boys, since their vital capacity forms a greater proportion of the estimated adult maximum. The maximum capacity is reached in the twentieth year for boys and slightly earlier for girls. Formulas are given for computing the vital capacity on the basis of external body measurements.

476 ——— **and O. B. Sheetz:** "The vital capacity of the lungs of children." *Am. J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 83–88.

The vital capacity recorded by a wet spirometer is given for 430 healthy children. The observations are tabulated by age, height (sitting and standing), weight, and sex. Age varied from 4 to 15 years. The vital capacity was constantly greater for boys than girls.

Stiles, C. W., and Floyd Graves: Lung Capacity of Children. *See* U. S. Public Health Service.

477 **Teuffel, E.:** "Zur Entwickelung der elastischen Fasern in der Lunge des Fötus und des Neugeborenen" [Development of the elastic fibers in the lung of the fetus and newborn]. *Archiv für Anatomie und Physiologie* [Leipzig], 1902, pp. 377–391.

After outlining previous investigation by Gardner and others on elastic fibers in the lungs the author describes the same in 11 fetuses and 10 infants from 5 days to 1 year old. He states that the elastic fiber originates in protoplasm of the embryonic cell. The fibers grow through apposition. The extrauterine development is stronger and quicker than the intrauterine; factors therein are respiration and blood circulation.

478 **Tourneux, F.:** "Sur le développement de l'épithelium et des glandes du larynx et de la trachée chez l'homme" [On the development of the epithelium and the glands of the larynx and trachea in man]. *Comptes rendus des séances et mémoires de la Société de biologie* [Paris], ser. 8, vol. 2 (1885), pp. 250–252.

The author traces the development of the epithelium of the respiratory tract from the time the embryo is 2 months old until six months after birth. Details of observations from which his conclusions are derived are not given.

479 **U. S. Public Health Service, U. S. Treasury Department:** Lung Capacity of Children. Spirometer Tests of 1,618 White School Children (751 boys, 867 girls) in the City of X, by C. W. Stiles and Floyd Graves. Reprint No. 306, Public Health Reports. Washington, 1915. 8 pp.

In this investigation each child was given three trials, and the highest record was taken for final summary. Tabulations were made by sex, quarter years, total years, and sanitary conditions of the home. Children were 6 to 17 years old. From 6 to 13 years, inclusive, the boys had an average of 100 to 200 cubic centimeters' greater lung capacity than the girls; from 14 to 17, from about 300 to about 1,100 cubic centimeters. At the age of 11 a slight irregularity was found in the increase curve for both boys and girls. Children from homes with better sanitation showed greater lung capacity than those from homes with poorer sanitation.

480 **Wilson, May G., and D. J. Edwards:** "The vital capacity of the lungs and its relation to exercise tolerance in children with heart disease. Standards for normal vital capacity for children." *Am. J. Dis. Child.* [Chicago], vol. 22 (1921), pp. 443–454.

The aim of this study was to determine to what extent measurements of the vital capacity, as an expression of one aspect of the respiratory function, can be correlated with the exercise-tolerance test as a form of measurement of cardiac functional capacity. To establish a standard for normal vital capacity the authors studied 44 boys and 41 girls from 6 to 16 years of age, expressing the vital capacity on the basis of a square meter of body surface as determined from the height-weight chart of DuBois and DuBois. The average vital capacity of the boys studied was 1,902 cubic centimeters for each square meter of body surface; of the girls, 1,837 cubic centimeters. Vital-capacity measurements were found to show a close relation to heart functional capacity as gauged by exercise tolerance.

D. NERVOUS SYSTEM

481 **Allaria, G. B.:** "Essai sur les propriétés physico-chimiques et sur la physiogenèse du liquide cerébro-spinal" [The physicochemical properties and the physiogenesis of the cerebrospinal fluid]. *Archives de médecine des enfants* [Paris], vol. 8 (1905), pp. 214–231, 257–280.

Data for this extended study were obtained by lumbar puncture of 26 subjects, 24 children and 2 men. Although none were in normal health, several of the specimens, owing to the nature of the malady affecting them, were considered normal, the numbers of these specimens being indicated (p. 257). Tables show freezing point, electric conductivity, and sodium chlorid content, the quantity of electrolytes (sodium chloride, sodium carbonate) establishing true molecular concentration. A study of the relationship between the molecular concentration of the cerebrospinal fluid and that of the blood is based on specimens from subjects not in normal health.

482 **Berry, R. J. A.:** "The annual rate of growth of the brain as determined from living males between the ages of 6 and 21 and the relations of the same to education." *Medical Journal of Australia* [Melbourne], vol. 1 (1917), pp. 536–544.

Results of an investigation in which the author estimated, by methods described, the cubic brain capacity of 1,126 normal living males between the ages of 6 and 21. He found that the increase is rapid at adolescence and also that the rate of growth in the three diametral measurements was not regular and coincident but that increase in cubic capacity at any period was due to accel-

erated growth in one diameter more than another. As a final conclusion he stated that it was impossible to predict intelligence from head measurements alone, but that abnormal types could be detected by use of the norms derived from his work. Discussion.

483 **Berry, R. J. A., and S. D. Porteus:** Intelligence and Social Valuation. Publications of the Training School at Vineland, New Jersey, no. 20, 1920. 100 pp.

As a preliminary to the use of the measure of brain capacity as an aid in diagnosis of mental subnormality, it became necessary for the authors to determine what cubic capacity of brain is normal for the boy or girl at each year of educational life. Measurements were made by one worker, specially trained, of 6,700 males (6,281 normal and below 16 years of age), and of 2,717 public-school girls and university women. Methods of measurement and of computing brain capacity are described, and results of the study are given in 14 tables with descriptive text.

484 **von Bischoff, Theodor L. W.:** Das Hirngewicht des Menschen [Weight of the Human Brain]. P. Neusser, Bonn, 1880. 69 pp.

Numerous tables contain most of the material collected by the author during many years. They give body and brain weight of 12 male and 4 female fetuses; 12 normal newborn boys and 12 normal newborn girls; 49 boys, newborns to 20 years of age; and 63 girls of the same ages. They give data on 559 men and 347 women arranged according to brain weight and approximately the same number arranged according to body weight, according to age, and according to height. Other tables give data obtained by other investigators. The various chapters discuss brain weight in relation to sex, body size, age, race, convolutions of cerebrum, intelligence, etc.

485 **Böke, Julius:** "Über die Untersuchung und Semiotik des Gehörorgans beim Kinde" [Examination and symptomatology of organ of hearing in the child]. *Jahrb. f. Kinderh.* [Leipzig], vol. 12 (1878), pp. 355–365.

The author states the structural differences between ear of newborn or of child and that of adult. Mucous membrane around the drum is filled with secretion during the first three to four months of life, and sometimes till the second year. The infant's hearing is very undeveloped. The petrous bone and external auditory canal are very different from later form. Much of the article describes pathological conditions.

486 **Braune, Wilk:** "Das Gewichtsverhältniss der rechten zur linken Hirnhälfte beim Menschen" [Weight relations of the right and left hemispheres of the human brain]. *Archiv für Anatomie und Physiologie* [Leipzig], 1891, pp. 253–270.

The article contains a table of the weights of different parts of the brains of 100 subjects, mostly adults and mostly normal, including no insane or criminals. The brains were dissected when fresh, cut from the spinal cord at the decussation of the pyramids, and separated into the two sets of hemispheres by sections through the corpus callosum and along the corpora quadrigemina. Of the whole brain, the left was heavier in 52 per cent of the cases. In the cerebrum the right half was oftener heavier, and in the cerebellum the left. Where the right was heavier no lefthandedness was ascertained.

487 **Clapp, C. A.:** "A communication upon the weight of infants' lenses and their solids." *Archives of Ophthalmology* [New York], vol. 42 (1913), pp. 618-624.

The lenses of 16 infants were weighed within 24 hours after death and after desiccation, and the percentage of solids was estimated. The infants were 7 to 150 days old, the average being 45 days. The author's conclusion was that while the weight of the infant lens varies widely the actual weight and percentage of solids is less than in adults.

488 **Cohn, Michael:** "Kalk, Phosphor, und Stickstoff im Kindergehirn" [Calcium, phosphorus, and nitrogen in children's brains]. *Deutsche Med. Wchnschr.* [Leipzig], vol. 33, pt. 2 (1907), pp. 1987–1991.

By means of Dr. Albert Neumann's acid mixture the author determined calcium, phosphorus, and nitrogen in the brains of 13 children ranging in age from the fetal stage to 20 years. A table gives age, sex, diagnosis, weight of brain, water, nitrogen, phosphorus, and calcium. The brain at birth contains 89 per cent water; at 20 years, 77.5 per cent water. During the first year it takes on more substance not containing nitrogen than containing it. During this time the total phosphorus slightly decreases, but extractive phosphorus increases. Calcium decreases as the medulla, which contains little calcium, develops. From a study of the brains of two children that died of tetany the author doubts that this disease results from an anomaly of calcium metabolism.

489 **Danielbekoff, A.:** Materiali k voprosu o viesie i obyemie golovnovo i spinnovo mozga dietei oboyevo pola v vozraste nizhe goda [Weight and Volume of Brain and Spinal Cord of Children of Both Sexes Under One Year of Age]. St. Petersburg, 1885. 26 pp.

Thesis (University of St. Petersburg). The author quotes a number of writers on the size of the brain of human beings of all ages. His own study, made in St. Petersburg, included the examination of bodies of 100 boys and 100 girls under 1 year old. In two tables, one for each sex, the author gives for

every one of his cases the age, weight and length of the body, size of head, weight of the spinal cord and the various parts of the brain, volume in cubic centimeters of the spinal cord and various parts of the brain, the cause of death, and also the average of above measurements for all cases combined. In two other tables he gives the averages of the above measurements for every 10 days of age and the number of cases in each group.

490 **Dieckmann, Adolf:** Beiträge zur Anatomie und Physiologie des Neugeborenen-Auges [Anatomy and Physiology of the Eye of the Newborn]. Marburg, 1896. 43 pp.

Inaugural dissertation (University of Marburg). The writer studied the eyes of infants dying at birth. Schmidt-Kimpler's ophthalmometer was used. In the section on formation of folds in the retina of newborn infants nine cases are minutely described and in another section on refractive value, five. Two pages of tables give 17 dimensions of the eye in 16 cases.

491 **Galton, F.:** "Head growth in students at the University of Cambridge." *Nature* [London], vol. 38 (1888), pp. 14–15.

A summary of a part of a memoir by Doctor Venn in which relative brain volumes of several hundred Cambridge students were estimated by multiplying the maximum length and breadth and height above a certain plane and conclusions drawn as to the relation between brain volume and mental capacity. Honor men were found superior in brain capacity at 19, and still superior, though to a less degree, at 25.

492 **Gladstone, R. J.:** "A preliminary communication on some cephalometric data bearing upon the relation of the size and shape of the head to mental ability." *Journal of Anatomy and Physiology* [London], vol. 37 (1902–3), pp. 333–346.

The age, sex, weight, height, head length, breadth, height, and circumference were taken. The scholastic standing, and the cephalic and auriculobregmatic indexes were noted. The number of cases is not given, nor are the data completely tabulated. No conclusions are reached.

493 ——— "A study of the relations of the brain to the size of the head." *Biometrika* [Cambridge], vol. 4 (1905), pp. 105–123.

An investigation to obtain a series of formulas by which to predict from the chief measurements of the head the approximate weight of the brain. Data collected in the postmortem room of the Middlesex Hospital include measurement of about 40 children, for whom causes of death were such as to be unlikely to affect the size of brain and head. Plates show the difference in thickness of skull between a child and an adult.

494 **Godin, Paul:** "Cerveau, germen et soma au cours de la croissance" [Brain, germ cell, and body in the course of growth]. *Province médicale* [Paris], vol. 24 (1913), pp. 377–378.

The author contrasts the periods of growth of the brain which achieves one-third of total volume in intrauterine life, another one-third in first 5 years, and the last one-third in the next 10 years. The germ cells are completely inactive between birth and puberty, at which time they develop rapidly. The body develops much more gradually and steadily.

495 **Heptner W.:** "Das Massenwachstum der peripheren Nerven und anderer Gewebebestandtheile der Extremitäten nach der Geburt" [Growth of peripheral nerves and other tissues of the extremities after birth]. *Archiv für Anatomie und Physiologie, Anatomische Abteilung* [Leipzig], (1915), pp. 277–295.

After giving four tables derived from data of others on weight of brain and of body the author describes his studies of the arms of a newborn boy, the right arm of 3-year-old boy, and the arms of two men. Tables show findings on bones, muscles, nerves, vascular system, fat, and skin of these subjects, and various relations among them. Difference in constitution of newborn appears especially in the bony system. The lower arm always has less musculature, fewer nerves, and more bone than the upper. The author discusses growth in detail, giving the following index figures: Brain, 1, 2.9, and 3.76 for the newborn, the 3-year-old, and the adult, respectively; spinal cord, 1 and 7.1 for the newborn and the adult; peripheral nerves of the arm, 1, 4, and 15.3 for the newborn, the 3-year-old, and the adult.

496 **Herzog, Maximilian:** "The brain weight of the Filipino." *American Anthropologist* [Lancaster, Pa.], new ser. vol. 10 (1908), pp. 41–47.

The author weighed by methods fully described the brains of 113 Filipino males who died at the prison in Bilibid. The weights are individually recorded. The average of 10 individuals from 17 to 20 years of age was found to be 1,325.5 grams, or very little below the generally accepted average.

497 **Heubner, O.:** "Die Entwickelung des kindlichen Gehirns in den letzten Foetal- und ersten Lebensmonaten" [The development of the child's brain in the last months of fetal life and first months of extrauterine life]. *Zeitschrift für Pädagogische Psychologie und Pathologie* [Berlin], vol. 2 (1900), pp. 73–83.

The author displays and explains cross sections of brains of infants that were born prematurely or died a few days or months after normal birth. He

describes the development of neurones, etc., at different ages. He points out how the development of mental processes goes hand in hand with comprehensive changes in the physical structure. The brains of an idiot and a genius, though similar in broad lines, are very different in detail.

498 **Horstmann, C.:** "Beiträge zur Entwickelung der Refractionsverhältnisse des menschlichen Auges während der ersten fünf Lebensjahre" [The development of refraction in the human eye during the first five years]. *Archiv für Augenheilkunde* [Wiesbaden], vol. 14 (1884–85), pp. 328–336. See also *Bericht der Ophthalmologischen Gesellschaft* [Stuttgart], 1883–84, pp. 79–83.

The author tested refraction in the eyes of 50 infants between 8 and 30 days, 50 children between 1 and 2 years, and 50 between 4 and 5 years, from the middle or upper classes. He put a solution of 1 to 2 per cent atropin in the eyes some time before the examination, for which he employed a Hirschberg eye mirror and lamp light. Among the infants myopia was found in one instance, emmetropia in five, and in all the others hypermetropia from 1 to 6 D. In the older children farsightedness decreased, but even at 5 years of age it was still characteristic of the great majority of children. In many cases the author compared the vision of the children with that of their parents and did not find that heredity played an important rôle.

499 **Keith, Arthur:** "The growth of brain in men and monkeys with a short criticism of the usual method of stating brain ratios." *Journal of Anatomy and Physiology* [London], vol. 29 (1894–95), pp. 282–303.

From data on 250 boys under 20 and 135 Catarrhine apes the author studies the relative brain weight, cranial capacity, and relation of brain weight to body weight. The article contains 12 tables and 14 diagrams.

500 **Königstein, V.:** "Untersuchungen an den Augen neugeborener Kinder" [Investigations on the eyes of newborn children]. *Medizinische Jahrbücher* [Vienna], 1881, pp. 47–70.

Königstein examined both eyes of 300 newborn infants in an obstetrical clinic. The infants' eyes were treated with an atropin solution of 1 : 1,000. Similar investigations conducted previously by von Jaeger, Ely, and Horstmann are criticized. The author found no case of myopia and only a few cases of emmetropia. Most of the infants showed hypermetria between one-sixteenth and one-twentieth. He concludes that the child's eye is probably exclusively hypermetropic; that it is not always blue but often brown; that the distinction in breadth and appearance of arteries and veins is not so pronounced in children as in adults; and that in many eyes of the newborn can be found remains of pupillary membrane and blood extravasation. The detailed tables give sex, age, color of hair and iris, nationality of parents, and refraction of infant, of parents, and of relatives.

501 **Lange, O.:** "Zur Anatomie des Ciliarmuskels des Neugeborenen" [Anatomy of the ciliary muscle in the newborn]. *Klinische Monatsblätter für Augenheilkunde* [Stuttgart], vol. 39 (1901), pp. 1–6.

This discussion, illustrated by two figures, of the anatomy of the ciliary muscle is based on arguments concerning preceding theories and on examination of the 36 eyes of 18 newborn infants. The ciliary muscle in the newborn is different from that of the adult and is also very varied in different infants. In most of the 18 the separate parts were well developed; in 4 the ring portion was not. In 3 infants the circular fibers were numerous, but in no case did the ciliary muscle consist exclusively of longitudinal fibers. The author speaks of the important rôle played by innate individualities of the structure of the ciliary muscle in myopia and in the general development of the eyeball. Thus he explains myopia where there has never been eye strain and also anisometropia.

502 **Leopold, J. S., and A. Birnhard:** "Studies in the chemistry of the spinal fluid of children." *Am. J. Dis. Child.* [Chicago], vol. 13 (1917), pp. 34–43.

In this study, made at the German Hospital, New York, spinal fluid was examined for nonprotein nitrogen, urea, uric acid, creatinin and sugar, reaction to litmus, cell count, globulin, and Wassermann. Of the 59 children examined 10 were normal. The spinal-fluid findings are compared in percentage with the blood analysis of the patient. Full data are given in tables.

503 **Levinson, A., Greengard, and H. Lifvendahl:** "Cerebrospinal fluid in the new-born." *Am. J. Dis. Child.* [Chicago], vol. 31 (1926), pp. 312–313.

A brief report of a study of the cerebrospinal fluid of 100 newborn infants. With few exceptions the fluid was withdrawn from 1 to 24 hours after birth. Lumbar puncture was first used; cistern puncture later. Twelve of the fluids were colorless, 4 were blood stained, 24 were blood tinged; in the rest the color ranged from pale to deep yellow. Pressure in the fluid obtained by lumbar puncture averaged 4.5 millimeters of mercury; in that obtained by cistern puncture, 25 millimeters of mercury. The authors give details of the methods which they found most satisfactory in making the punctures and testing the fluids.

504 **Merkel, Friedrich, and Andrew W. Orr:** "Das Auge des Neugeborenen" [The eye of the newborn infant]. *Anatomische Hefte*, I. Abteilung [Wiesbaden], vol. 1 (1892), pp. 271–299.

The authors made a detailed study of 26 eyes of newborn infants. A table gives data on 19 parts of inner, middle, and outer eye in each case, and a plate shows cross section of the eye of a newborn—two radial sections near the ciliary body. Each portion of the eye is described, and the differences between the eye of adult and infant are discussed. The whole form of eye remains unaltered only a short time after birth. In the newborn the lateral half of the ball in its posterior part shows a much greater bulging than in the adult, the cornea has a greater relative thickness, the suprachoroideal space is not yet fully developed, the optic nerve contains as many fibers as that of the adult, and the greater thickness later is due to formation of medulla.

505 **Michaelis, Paul:** "Das Hirngewicht des Kindes" [Brain weight of the child]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 6 (1907–8), pp. 9–26.

The author weighed the brains of 276 boys and girls of all ages up to 14 years, abnormal brains being excluded. Two long tables for boys and girls separately give age, weight, and height of body, weight of brain, and causes of death. Other tables give maximum, minimum, and mean weights of these brains. Still others give separately the weights of cerebrum, right and left hemispheres, cerebellum, and rest of the brain. The cerebral hemispheres the author separated from the brain by a section through the pedunculi cerebri. The female brain is always lighter than the male. The brain grows very rapidly during the first year, reaching in the boy 945 to 1,055 grams. It is usually three times this weight in the fifth year and thus not much less than the adult weight. The individual variations in brain weight are very great even for the same age, weight, and height.

506 **Mies:** "Über das Gehirngewicht des heranwachsenden Menschen" [Brain weight in the growing human being]. *Mittheilungen der Anthropologischen Gesellschaft in Wien*, new ser. vols. 14–15, no. 1 (1894, January and February), pp. 147–151.

This article contains two graphs and one table on brain weight at different ages and height in millimeters to 1 gram of brain weight. In 627 cases the author collected the data personally from other investigators. He assembled 2,000 cases. The brain of the newborn girl weighs 330 grams, that of the newborn boy 340; in nine months these weights become 900 and 1,050, respectively. Later growth is not nearly so rapid. Till the second or third year the body increases in weight with less rapidity, relatively, than the brain, and from the third to the twentieth year with greater rapidity. During these first 20 years the absolute weight of the brain is always greater in the male than in the female.

507 ——— "Über das Gehirngewicht neugeborener Kinder" [Brain weight of newborn children]. *Wiener Klinische Wochenschrift*, vol. 2 (1889), p. 39.

The author deplores the lack of precision in statistics on brain weight of children. He compiles a table of 15 sets of data, giving, where possible, sex and number of cases involved, besides mean brain weight. The average weight for 203 full-term, newborn infants was 339.35 grams. He also derives 7.5 to 8.5 grams weight and 1¼ to 1⅓ millimeters length to 1 gram of brain weight.

508 **Panau, Georges Antoine:** La refraction et le fond d'oeil de l'enfant nouveau-né [The Refraction and the Fundus of the Eye of the Newborn]. Nancy, no. 31, 1899. 139 pp.

Thesis for medical degree (University of Nancy). The original work includes observations of the eyes of 121 infants, from one-half hour to 11 days of age. Examinations were made after dilatation of the pupil with atropin. Each record included age, sex, weight, degree of maturity, mode of presentation, refraction, and description of the appearance of the fundus. Two chapters discuss the data obtained. Bibliography.

509 **Parrot, J.:** "Sur le développement du cerveau chez les enfants du premier âge" [Development of the brain in young infants]. *Archives de physiologie normale et pathologique* [Paris], ser. 2, vol. 2 (1879), pp. 505–521.

The development of the brain of young infants, particularly the modification of color in the medullary substance, is discussed. Violet, in various shades from the deepest to the lightest, and milk white are the commonest colors. Though colors change the relative intensity in different parts remains the same; and every chromatic peculiarity is strongest in the core, weakening toward the periphery. The author is particularly interested in the system or organ of Rolando. He dissected 96 brains, which he arranged not according to legal but real age, determined in the youngest by the bony point of the lower epiphysis of the femur (his first two groups cover 15 days each, the others the succeeding months). He gives a detailed description on the groups, showing how the violet gradually whitens and the cerebral substance becomes denser. The parts covering highest functions develop most slowly.

510 **Pfister, Hermann:** "Das Hirngewicht im Kindesalter" [The brain weight in childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 23 (1897), pp. 164–192.

The author investigated brain weight in 156 children—88 boys and 68 girls between 1 week and 14 years of age—that had died at the Children's Hospital of the Emperor and Empress Frederick in Berlin. Excluding all pronounced cases of hyperemia, anemia, and meningitis he severed the spinal cord at the decussation of the pyramids and weighed the brain with the soft membranes directly after taking it from the cranium. The article contains very full tables of results and a bibliography. The right hemisphere was found to be heavier than the left in 53.2 per cent and the left heavier in 41.6 per cent of the cases regardless of sex or age. The absolute weight of the cerebellum was greater in the male than in the female.

511 ——— "Neue Beiträge zur Kenntniss des kindlichen Hirngewichts" [New contributions to the knowledge of the weight of children's brains]. *Arch. f. Kinderh.* [Stuttgart], vol. 37 (1903), pp. 239–242.

The author presents a table giving the age, length, and total brain weight of 72 boy infants and 73 girl infants, dissected in Berlin, since 1898. The brain was separated where the pyramid crosses from the spinal cord, and weighed. The infants came from the lower classes of society. So far as possible foreign and pathological brains were discarded. Cases of hyperemia and anemia were noted.

512 ——— "Theilwägungen kindlicher Gehirne" [Weights of parts of children's brains]. *Arch. f. Kinderh.* [Stuttgart], vol. 37 (1903), pp. 243–251.

The author presents a table of measurements of the brains of 33 boys and 39 girls, mostly in the first year. The dissection was done in 1899 and 1900, the material coming from the Emperor and Empress Frederick Children's Hospital in Berlin. Pathological conditions were discarded; the brain was severed from the spinal marrow at the lower end of the pyramid. The tables show age, total brain weight, total weight of cerebrum, and of cerebellum and of the rest of the brain and of each half of the cerebrum. There was usually a slight difference in the weight of the halves of the cerebrum and great variation in the weight of the cerebellum. The cerebellum also grows much more than the rest of the brain; i. e., to seven times its birth weight, as compared with four times for the rest of the brain. The male brain was regularly larger than the female.

513 ——— "Über das Gewicht des Gehirns und einzelner Hirntheile beim Säugling und älteren Kinde" [Weight of brain and separate parts thereof in infant and older child]. *Neurologisches Centralblatt* [Leipzig], vol. 22 (1903), pp. 562–572.

The author describes the technique of weighing brains of 161 boys and 141 girls between the ages of 1 week and 14 years that had died in a children's hospital at Berlin. These brains were from children of the lower classes. So far as possible foreign race and pathological conditions were excluded. Five tables give sex, age, and average weight in grams of the whole and parts of the brains. Fourteen conclusions have to do with the greater weight of the male brain, with more rapid growth of the cerebellum than of the rest of the brain, and difference in weight between halves of brain.

514 **Quest, Robert:** "Über den Kalkgehalt des Säuglingsgehirns und seine Bedeutung" [The calcium content of the infant brain and its significance]. *Jahrb. f. Kinderh.* [Berlin], vol. 61 (1905), pp. 114–121.

Incited by Sabbatani's theory that a decrease of calcium in the cortex cerebri means increased excitability the author dissected the brains of 12 children, of whom 2 had had hypertonia and 3 tetanus, and the other 7 were normal (2 of these had died in the fetal stage, 1 had died at birth, and 4 had died later). He treated the brains according to the Hoppe-Seyler method. In the seven normal infants the author found that the calcium content of the brain was very high in the fetus and the newborn but diminished with time, very rapidly in the first months and then more gradually. Thus Sabbatani's theory is substantiated, since all experimentation shows that excitability is least in early infancy. The brains of the children that had had tetanus showed a conspicuously low calcium content.

515 **Roberts, M. Hines:** "The spinal fluid in the new-born." *J. A. M. A.* [Chicago], vol. 85 (1925), pp. 500–502.

In Grady Hospital, Atlanta, Ga., lumbar puncture was done on 423 newborn negro infants. The first 100 fluids were examined for cellular content and Wassermann reaction. In the last 327 cases the blood drawn from the longitudinal sinus was studied for pigment content and Wassermann reaction. The investigation showed that xanthocromia of the spinal fluid in newborn infants is a physiological condition, the intensity of pigmentation being closely related to the physical development of the child. The pigment persists at least until the ninth day, and is cleared by the fourth week.

516 **Sabin, Florence:** "Description of a model showing the tracts of fibers medullated in a newborn baby's brain." *American Journal of Anatomy* [Baltimore], vol. 11 (1910–11), pp. 113–136.

The study is made from six specimens in the Johns Hopkins University anatomical laboratory, of which three were infants' brains. Sagittal and transverse serial sections were made. Eleven figures and all measurements are from the author's work. A list is given of all the medullated tracts found in the newborn brain.

517 **Scammon, Richard E., and Halbert Dunn:** "On the growth of the human cerebellum in early life." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 21 (1923–24), pp. 217–221.

To determine whether the rapid growth of the cerebellum in infancy is correlated with the marked development of muscular coordination and activity in this period, the authors devised empirical formulas for the relation between the cerebellum volume and body length in the fetal period, the relation between body length and age in the fetal period, and the relation between cerebellum weight and age in postnatal life. The source material for study is not described in this article. Tables and 1 chart indicate that the rapid growth in the cerebellum in the first postnatal year is to be regarded as a diminishing residuum of intrauterine growth energy, rather than as a result of the stimulation of extrauterine environment.

518 **Schiff, E., and E. Stransky:** "Besonderheiten in der chemischen Zusammensetzung des Säuglingsgehirnes" [Peculiarities in the chemical composition of the infant brain]. *Jahrb. f. Kinderh.* [Berlin], vol. 44–46 (1921), pp. 245–258.

The authors examined the chemical composition of the cerebrum of 12 infants, most of whom had died of pneumonia. Results are put in two tables and a graph. Weights are given in percentage of dry substance and the total lipoid content is reckoned. Water content of the brain decreases with increasing age. Lipoid content increases. The brain lipoids in the infant consist for the most part of cholesterin, whereas unsaturated phosphatids prevail in the adult. The infant brain is richer in albumin. It has, then, many peculiarities not only in morphological structure but also in chemical composition.

519 **Schloss, O. M., and L. C. Schroeder:** "Nature and quantitative determination of the reducing substance in normal and pathological cerebrospinal fluid." *Am. J. Dis. Child.* [Chicago], vol. 11 (1916), pp. 1–10.

The cerebrospinal fluid was studied in 49 cases of children free from meningeal disease in the wards of Bellevue Hospital, New York City. The reducing substance is fermentable, dextrorotary, and probably dextrose. In these cases the cerebrospinal sugar ranged from 0.05 to 0.134 per cent. These figures are approximately the same as for dextrose.

520 **Sokoloff, D. A.:** "O razvitii perifericheskih nervov u novorozhdennikh dietiei" [On the development of peripheral nerves in newborn children]. *Vrach* [St. Petersburg], vol. 11 (1890), pp. 384–388, 456–460.

An original study of the development of the peripheral nerves in 55 cadavers of children who were from 1 day to 4 years old at the time of death. The author found that the nerve trunks of the children were less developed than those of adults, particularly as regards myelin, which was entirely absent in many nerve fibers and present to a very small degree in others. He quotes several writers who found in infants insufficient development of the central nervous system and concludes that this underdevelopment of the entire nervous system, a peculiarity of infancy and early childhood, is much greater than that of other organs. Several tables are included giving in detail the condition of the nerves studied.

521 **Spitzka, E. A:** "The brain weight of the Japanese." *Science* [New York], new ser. vol. 18 (1903), pp. 371–373.

After a review of the literature on this subject the author regroups the figures of Taguchi for 597 adult Japanese subjects and 156 children from 2 months to 14 years of age and compares them with figures for Europeans. He finds that the brain of the Japanese grows more slowly during infancy and early youth than does that of the European.

522 **Taft, A. E.:** "An estimation of the proportions of gray and white matter in the human brain, made through the plane of the optic chiasm by means of the planimeter." *Journal of Nervous and Mental Disease* [New York], vol. 47 (1918), pp. 161–175.

This study, while largely of adult brains under pathological conditions, has a report of measurements of six specimens, two infants, aged 7 weeks and 4 months, respectively, one child 5 years old, and 3 adult microcephalics. The author finds that sex, age, and brain weight do not appear to have any constant relation to the proportions between white substance and cortical gray. References.

523 **Taguchi, K.:** "On the weight of the encephalon of the Japanese." *The Sei-i-Kwai Medical Journal* [Tokyo], vol. 22, no. 1 (1903), pp. 6–8, 11–21, 27–34.

Résumé of a speech made by a professor of anatomy in Tokyo University before the National Medical Association. During the 10 years preceding publication the author weighed the brains of 597 bodies among which were 73 cadavers of males and females from 2 months to 20 years of age. Methods of weighing are described in detail. Among the 73 he found a range of weight in males from 427 grams to 1,566 grams, in females from 499 grams to 1,366 grams. By tabulating the weights by age he found indications that the male brain develops more rapidly than the female. The article largely concerns measurements of adults and has many references to the work of investigators in other countries.

524 **Tietze, Alexander:** "Beiträge zur Lehre von den Gehirnpulsationen" [Contributions to the theory of brain pulsations]. *Archiv für Experimentelle Pathologie und Pharmakologie* [Leipzig], vol. 29 (1891–92), pp. 320–326.

The author measured brain pulsation in a 7-year-old boy whose frontal bone had been fractured. He describes in detail the technique by which he obtained five curves of brain pressure during mental activity, brain pulse, carotid pulse, etc.

525 **Ulrich, Gustav:** Refraction und Papilla optica der Augen der Neugeborenen [Refraction and Optic Papilla of Eyes of Newborn]. Konigsberg, 1884. 25 pp.

Inaugural dissertation (University of Konigsberg). In the gynecological clinic of the University of Konigsberg in 1882-83 the author examined the eyes of 43 female and 59 male infants from 1 day to 2 weeks old. A 1 : 1,000 solution of atropin was dropped into the conjunctival sac, and the child was held upright by the nurse. Table gives resulting data on refraction, form of papilla, scleral and choroidal ring, central canal, color, etc. The author concludes the eye of the newborn is always of hyperopic formation; cones are inborn; optical papilla is characterized by gray coloring and scantiness of smaller vessels. No essential difference in refraction of the two eyes was found.

526 **Vulpius, Oscar:** "Über die Entwicklung und Ausbreitung der Tangentialfasern in der menschlichen Grosshirnrinde während verschiedener Altersperioden" [The development and distribution of tangential fibers in the cortex of the human cerebrum at various ages]. *Archiv für Psychiatrie und Nervenkrankheiten* [Berlin], vol. 23 (1891–92), pp. 775–798.

After a historical review of the theories concerning medullary association fibers in the normal cortex the author describes his own methods in dissecting and studying brains, 14 of which were from individuals under 18 years of age, and gives in certain cases a detailed discussion and a curve. He concludes that the newborn has no medullary fibers except in the anterior central winding, which shows bundles of fibers; the tangential fibers in number and development take a middle position between the inner and outer ones; nutritional disturbances appear to check the development of the tangential fibers; this development is not ended in all cortical layers by the seventeeth year; the number of the tangential fibers is not the same in different parts of the brain; the Baillarger and the Vicqu 'Azyr striæ are due to accumulation of tangential fibers.

527 **Wateff, S.:** "Contribution à l'étude anthropologique sur le poids du cerveau chez les Bulgares" [A contribution to anthropological study of the weight of the brain of the Bulgarians]. *Congrès international de médecine*, comptes rendues 1900, vol. 13 (section de l'anatomie descriptive et comparative) [Paris], 1901, pp. 128–138.

Measurements are recorded of the weight of the whole brain and of different parts of the brain, of 72 Bulgarian men and 40 Bulgarian women—all cases at the hospital Alexandre at Sofia. Only 11 men and 6 women were under 21 years of age. The age, occupation, and the clinical and anatomical diagnosis are given for each case, and findings are presented in a table.

SECTION III. METABOLISM

A. DIGESTION

1 Allaria, G. B.: "Des caractères physico-chimiques de la salive du nourrisson" [Physico-chemical characteristics of the infant's saliva]. *Archives de médecine des enfants* [Paris], vol. 14 (1911), pp. 250–263.

The author studied the physico-chemical characteristics of 43 samples of saliva of 12 infants from 1 to 18 months old in the Medical Clinic of Turin. Saliva was obtained 8 times by mechanical stimulation, 30 times by taste of saccharin, and 5 times by sodium chloride. He designates his methods of obtaining osmotic tension, electrical conductivity, concentration of chlorides, specific gravity, degree of viscosity and of surface tension. Findings are shown in three tables, and results noted separately on each point. The conclusion is that the principal physico-chemical characteristics of the infant's saliva are very different from those of milk and of blood.

2 ——— "Die chemische Reaktion des Säuglingspeichels" [Chemical reaction of infant saliva]. *Monatschr. f. Kinderh.* Originalien [Leipzig and Vienna], vol. 10 (1911), pp. 179–194.

The author reports results of tests of acidity of the saliva of about 400 infants, including newborn and infants up to 22 months of age. Litmus, phenolphthalein, and methylorange tests were used. The saliva was found to be almost neutral immediately after secretion.

3 ——— "Esiste la maltasi nella saliva dei lattante?" [Does maltase exist in the saliva of infants?]. *La Pediatria* [Naples], vol. 17 (1909), pp. 896–904.

The author studied the saliva of 16 infants, 4 of whom were perfectly well. All results were negative. The author concludes that there is no maltase in the saliva of the infant, that for this reason it does not transform the starch into maltose and that such a transformation does not take place in the stomach, the contents of which, even when alkalinized, reveal no maltase.

4 ——— "Recherches sur le pouvoir plastéinogène du suc gastrique des nourrissons sains et atrophiques" [Researches into the plasteinogen power of the gastric secretion in healthy and atrophic infants]. *Archives de médecine des enfants* [Paris], vol. 10 (1907), pp. 321–335.

After discussing the nature, reactions, importance, etc., of plasteinogens the author describes how he experimented on eight infants from 15 days to 18 months old in the clinic at the Royal University of Turin, making 74 test meals of which 39 were of boiled cow's milk, sometimes diluted, 17 contained sugar, and 18 salt. He observed especially the plasteinogen function and reaction, the rennin, and the pepsin. Results are shown in tables. He concludes that the plasteinogen ferment always makes it appearance with the presence of albuminoids in the gastric juice. The quantity varied directly with the duration of the test meal in the stomach. Its function seemed independent of rennin, nor was there any direct relation between plastein and pepsin. Degree of health did not influence the plasteinogen function.

5 ——— "Ricerche ed appunti sulla funzione dello stomacho del lattante" [Investigations and data on the functioning of the infant stomach]. *Rivista di clinica pediatrica* [Florence], vol. 6 (1908), pp. 481–502.

The author's own study of the functions of the infant's stomach, supplemented by numerous quotations from various writers. The author found that the functioning of the infant stomach is imperfectly developed, owing to the following factors: The very slight hydrogen-ion concentration of the gastric contents and the consequent insufficiency of peptic digestion; insufficient antiseptic action of the gastric juice and insufficient acid reflex of the pylorus; absence of osmoregulatory power of the stomach with a consequent lack of gastric isotonia; scarcity of some of the principal enzymes. Also the position of the infant's stomach was found to be more vertical than in older children and the width of the pyloric ring relatively greater in the first year of life. All these circumstances make the gastric digestion or protein substances quite imperfect in comparison with that of the adult.

6 ——— "Richerche sulla lattasi nella saliva del lattante" [Researches on lactase in the saliva of the infant]. *Riforma medica* [Naples], vol. 26 (1910), pp. 561–562.

To determine whether the saliva of infants contains lactase the author studied the saliva of 17 infants 3 to 17 months old, in a clinic of the University of Turin. Some were fed at the breast, others at the bottle; 12 were sick at the time of the study. In most cases the saliva was extracted directly from the children's mouths. In no case was lactase found.

7 **Allaria, G. B.:** "Über die Wirkung des Speichels im Anfangsstadium der Verdauung beim Säugling" [The effect of saliva in the initial stage of digestion in the infant]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 74 (1911), pp. 252–273.

The author studied initial digestion through saliva in eight infants from 1 to 10 months old in the clinic of the Royal University of Turin. With his apparatus for the purpose he extracted saliva from the mouth and also milk saliva after the children had begun to suck at the bottle. After being swallowed the milk was at once raised from the stomach. These three fluids and the sterilized cow's milk used as food were all tested for cryoscopic degree by Beckmann's thermometer, specific electrical conductivity at 18° C., concentration of chlorides reckoned as sodium chloride by Wohlard-Koranyi's process, extent of inner rubbing with vertical viscosimeter at 18° C., degree of surface tension by stalagmometric process at 18° C., and in many cases the active reaction or concentration of hydrogen ions. For the test meals the author used isosmotic solutions of full milk with 10 per cent lactose solution, hyposmotic solutions of diluted milk with 3 per cent lactose solution, and hyperosmotic solutions of sweetened milk with 15 per cent lactose solution. Results are shown in three tables, each containing data on 24 experiments, and are also discussed. Infant's saliva possesses an important physico-chemical property in diminishing the molecular concentration of fluids and thus the degree of osmotic tension. It also moderates the reaction and makes liquids less irritating to the stomach.

8 ——— "Untersuchungen über Lösungen im Säuglingsmagen" [Investigations on solutions in the infant stomach]. *Jahrb. f. Kinderh.* [Berlin], vol. 66 (1907), pp. 259–285.

The author conducted experiments on the solutions in the stomach of five healthy and two atrophic infants in the pediatric clinic of the Royal University of Turin. The quantity in his test meals he regulated according to age. The meals were of four kinds: Pure cow's milk, modified milk, sugar solutions, and salt solutions. The cryoscopic grade was determined with the Beckmann thermometer, the electric conductivity with a Wheatstone bridge, inner friction with a viscosimeter, the surface tension with the stalagmometric method of Traube, the specific gravity of 18° C. with a pycnometer, the total acidity of the filtrate fluid with sodium hydroxid N/50 and with litmus paper, chloride by the Wohlard-Koranyi method, and sugar by the use of Fehling's solution. A final conclusion is that the solutions in the infant stomach tend slowly to approximate by molecular exchange the degree of osmotic concentration of the blood, and that the frequent sign of hyposmosis is due to the disturbing element saliva, which being strongly hyposmotic, disturbs the physical processes striving after an equilibrium. One can not ascribe an osmoregulating function to the infant stomach; there is no gastroisotonia in infants.

9 ——— "Untersuchungen über Wasserstoff-Ionen-Konzentration im Säuglingsmagen" [Investigations on hydrogen-ion concentration in the infant stomach]. *Jahrb. f. Kinderh.* [Berlin], vol. 67 (1908), pp. 123–142.

The author studied acidity in the case of nine infants, between 6 and 18 months old, healthy so far as the alimentary canal was concerned. Forty-eight studies were made. The greatest acidity found corresponded to about 1/1500 of a normal solution of hydrochloric acid. It was 50 to 100 times less than that of adult. Free hydrochloric acid was lacking in all 48 tests. Unlike those of adults, infants' stomachs showed a great difference in degree between active and potential acidity. Since the active acidity is far below the percentage for the optimum of pepsin digestion, the latter finds unfavorable conditions in the infant stomach. The low active acidity limits its function to preparing the digestion of albumins, which takes place almost entirely in the intestine. The infant stomach has only a very weak antiseptic power. The tables of data arranged according to diet cover six pages.

10 **Alliot, Leon:** La capacité stomacale du nouveau-né. [The Capacity of the Stomach of the Newborn]. Paris, no. 9, 1905. 35 pp.

Thesis (University of Paris). The author measured, by methods described in detail, the stomachs of 50 infants stillborn from the sixth month of gestation to term. Results are tabulated and compared with the findings of other investigators. Bibliography.

11 **Alwens, W., and J. Husler:** "Röntgenuntersuchungen des kindlichen Magens" [Röntgen investigations of the child's stomach]. *Fortschritte auf dem Gebiete der Röntgenstrahlen* [Hamburg] vol. 19 (1912), pp. 183–200.

The article contains 27 figures of the stomachs of infants and young children on different diets. The great difference between infant and child was found to be that the infant's stomach has a horizontal position and the child's stomach a vertical position. Unlike Flesch and Peteri, the authors found peristalsis in the infant stomach. The latter also has a large air bubble. When the diet is changed from milk to gruel, mush, etc., the form and position of the stomach also change. Position of standing and walking also affects it. Pathological conditions are briefly discussed. The article concludes with short case histories of 13 infants, whose stomachs appear in one or more of the figures, and with a bibliography.

12 **Aron, Hans:** "Das Salzsäurebindungsvermögen von Frauen- und Kuhmilch" [The capacity of human and cow's milk to combine with hydrochloric acid]. *Jahrb. f. Kinderh.* [Berlin], vol. 79 (1914), pp. 288–304.

The stomach of the infant is much poorer in acid than that of adults, especially in so-called free hydrochloric acid. The latter Hess found in the newborn before the first meal, not afterwards. This denotes an $[H^+]=1\times10^{-4}$. In fact, it is a question whether there is any peptic digestion in the infant. Muller ascertained that a positive Congo paper reaction is obtained in water with 0.001 per cent hydrochloric acid, in human milk with 0.1 to 0.16 per cent, and in cow's milk with 0.3 to 0.35 per cent. Therefore the milk may be the cause for the low acidity in infantile digestion. The author gives four tables of results from his experiments concerning the acidity in mixtures of hydrochloric acid with human milk, with cow's milk, with water, with cow's and whey. A graph also shows the contrasts. His methods and apparatus are described for the $[H^+]$ and calorimetric tests with indicators. To obtain a certain degree of acidity cow's milk requires three to four times as much hydrochloric acid as human milk.

13 **Aschoff:** "Zur Histologie der Darmschleimhaut des Neugeborenen" [Histology of intestinal mucous membrane of newborn]. *Münchener Medicinische Wochenschrift*, vol. 52, pt. 1 (1905), pp. 483–484.

Aschoff refers to his examinations of the histology of the intestinal mucous membrane of the newborn, without describing his material. His discussion constantly cites other investigators. He ascertains histological differences between newborn and adults. As seen through the microscope the goblet cells are much more numerous, and production of mucous is much greater, than with adults.

14 **Aurnhammer, Albert:** "Über die Unterschiede der Magenverdauung bei natürlicher und unnatürlicher Ernährung" [Differences in the gastric digestion of natural and artificial diet]. *Arch. f. Kinderh.* [Stuttgart], vol. 51 (1909), pp. 150–160.

The author studied 13 infants between 1½ and 6½ months old, on diets of human and cow's milk. One table gives for each subject extensive data, including coagulation and pepsin digestion. These last are treated in a second table, giving time of action for both human and cow's milk. Breast-fed infants secrete less pepsin and have less coagulation in the stomach than artificially-fed infants.

15 ——— "Unterschiede der Magenverdauung bei natürlicher und unnatürlicher Ernährung" [Differences in the gastric digestion of the breast-fed and the artificially-fed infant]. *Verhandlungen der Versammlungen der Gesellschaft für Kinderheilkunde auf den Versammlungen Deutscher Naturforscher und Aerzte* [Wiesbaden], vol. 25 (1908), pp. 47–51.

An investigation carried out with healthy infants 1½ to 6½ months old. Acidity and the presence of pepsin and rennin are studied. The acidity did not differ in breast-fed and artificially-fed infants; pepsin was less in evidence with the former than with the latter; rennin was not found with the former but was always found with the latter.

16 **Baginsky, Adolf:** "Untersuchungen über den Darmkanal des menschlichen Kindes" [Investigations concerning the intestinal canal of the child]. *Virchow's Archiv* [Berlin], vol. 89 (1882), pp. 64–94.

After discussing former investigations on the child's intestinal canal the author describes his own dissection and study of a 4-month fetus, a 7-month fetus, a newborn infant, a child of 1 year, and a child of 3 years. He himself drew the 15 figures that he presents in 2 plates. He discusses in turn the stomach, cardia, fundus ventricoli, pylorus, duodenum, jejunum, ileum, and colon. He believes that without regard to the muscles the intestinal wall is characterized by two things: The surface of the intestine is constantly increasing through augmentation of the villi, and the number of glands is considerably increased from the fetal period to later periods.

17 **Bauer, Ludwig, and Ernst Deutsch:** "Das Verhalten der Magensäure, Motilität, und Resorption bei Säuglingen und Kindern unter physiologischen und pathologischen Verhältnissen" [The behavior of gastric acidity, motility, and absorption in infants and children under physiological and pathological circumstances]. *Jahrb. f. Kindrh.* [Berlin], vol. 48 (1898), pp. 22–71.

The authors describe their investigations concerning the gastric acidity, motility, and absorption of eight healthy infants a few months old and nine healthy children from 2½ to 12 years old, also of many sick children. One or two hours after a breakfast following a night of fasting the stomach contents were removed and examined. Resorption was tested by the Penzoldt and Faber method; i. e., potassium iodide was given in gelatine pills, and the urine and saliva were analysed. For motility, doses of 1.5 gram of salol were administered and the urine controlled after 10 minutes (Ewald) or 10 hours (Huber) with liquor ferri sesquichlorati. The tables of results fill 17 pages. The author finds in healthy infants a few months old lactic acid in the fore-

ground and in infants over 6 months old about the same percentage of free hydrochloric acid as in adults. They find potassium iodide in the saliva after 4 to 7 minutes, and in the urine after 7 to 15 minutes. In healthy children they find first lactic acid and then hydrochloric acid prominent as digestion progresses. In motility and absorption these children differ but slightly from adults.

18 **Beneke:** "Über die Länge des Darmkanals bei Kindern, sowie über die Capacität des Magens Neugeborener" [Length of intestine in children and also capacity of stomach in newborn infants]. *Deutsche Med. Wchnschr.* [Berlin], vol. 6 (1880), pp. 433–436, 448–449.

For 12 years the author studied the relation between anatomical conditions and constitutional troubles. In the vascular system the arterial vessels are relatively wide at birth and narrow at puberty, after which they grow large again. The carotids, however, do not change, wherefore the blood pressure in the brain remains the same. The author has measured also the heart, lungs, etc., of children but here devotes most space to his work on the intestines and the stomach. The length of the small intestine stands to the height in the relation of 570 to 100 in newborn infants, 660 to 100 in second year, 550–600 to 100 in the third year, and 450 to 100 after growth stops; that is, the intestine is longer in children than in adults, in which fact, the author thinks, lies the secret of growth. He found a greater area for intestines of children than of adults, by examining the organs in water. He determined also a greater cubic capacity for intestines and greater metabolism in children than in adults. The capacity of the stomach he discovered to be 35 to 43 cubic centimeters in newborn infants, 153 to 160 cubic centimeters after the fourteenth day, and 740 cubic centimeters at the age of 2 years. On dividing his subjects into normal, atrophic, and hypertrophic he ascertained that for 100 centimeters of body length the length of the small intestine was 313 centimeters in the atrophic, 407 centimeters in the normal, and 447 centimeters in the hypertrophic.

19 **Biedert, Ph.:** "Über normale Milchverdauung" [Normal milk digestion]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 28 (1888), pp. 344–384.

The author's theories are constantly compared with those of Escherich. Four chemical analyses are described: Cow's milk feces, cow's milk casein, coagulated casein, and milk curds in consumptive stool; also four cases of nutrition from the long series observed carefully during 10 years in the hospital at Hagenau, showing the partial success of the Soxhlet process; also five cases of nutrition with meal.

20 **Blagodatny, Hélène:** "La traversée digestive chez le nourrisson" [The passage of food through the digestive tract of the infant]. *Nourrisson* [Paris], vol. 11 (1923), pp. 331–341.

The author studied by means of the X rays the passage of food through the digestive tract of normal infants ranging in age from 6 days to 11 months. The number of subjects is not given. For these experiments the infants were fed at first on milk alone and then on milk mixed with a 5 per cent solution of carbonate of bismuth. The author describes the gastric stage of digestion, discussing in detail the vertical and transverse forms of the infant stomach, then the jejuno-ileal, and finally the intestinal stage, stating for each group the average time during which the food remained in the investigated part of the digestive tract.

21 **Bleyer, A. S.:** "The variation in the production of free hydrochloric acid in the infant stomach from various foods." *St. Louis Courier of Medicine*, vol. 26 (1902), pp. 248–253.

A report of 90 examinations of the stomach contents of infants fed on nine different foods, made at different periods of digestion varying from 15 minutes to 2¾ hours. Table and discussion.

22 **Bloch, C. E.:** "Anatomische Untersuchungen über den Magendarmkanal des Säuglings" [Anatomical investigations into the alimentary canal of the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 58 (1903), pp. 121–174.

The author dissected and studied the alimentary canal of 5 normal infants and of 10 that had died of gastroenteritis, first injecting 100 to 150 cubic centimeters of a 1/10 formalin solution. He describes both stomach and intestine in detail and presents a table showing Paneth's cells in various parts of the intestine. The distinction between the stomach of the infant and that of the adult does not rest upon the development of the single-gland cells, which are as much developed in the child as in the adult, but upon the number of the glands and the gland cells, and also upon the arrangement of the glands. The mucous membrane is little developed in the stomach but much so in the intestine, which is longer than that of the adult. Bibliography.

23 **Borie, P. René:** L'estomac du nourrisson. Anatomie et physiologie. [The Stomach of the Infant. Anatomy and Physiology]. Toulouse, no. 321, 1899. 50 pp.

The original work in this thesis (University of Toulouse) consists for the most part of analysis of the stomach contents of infants of different ages, tested one-half hour, one hour, and one and three-fourths hours after eating. Thirty-six testings are recorded, in which the author found the stomach empty at the one and three-fourth hour test, and free hydrochloric acid present. Further researches and comparison of the work of others led him to conclude

that digestion is complete with the appearance of free hydrochloric acid and not sooner, that this takes place at about one and three-fourths hours after feeding, and that feeding oftener than once in three hours is harmful to digestion. Bibliography.

24 **Bovaird, D., and M. Nicoll:** "The weights of the viscera in infancy and childhood, with special reference to the weight of the thymus gland." *Arch. Pediat.* [New York], vol. 23 (1906), pp. 641–668.

Data were collected from 571 postmortems at the New York Foundling Hospital during three years. Cases range in age from newborn to 5 years. The cause of death, sex, nutrition, length, and weight of thymus, lungs, heart, liver, spleen, and kidneys are recorded and tabulated by age groups. Vieraordt's tables for the same ages are given. A discussion of the material accompanies the tables.

25 **Buchheim, Irene:** "Zur Röntgenologie des Magendarmkanals beim Kind jenseits des ersten Lebensjahres" [Röntgenology of alimentary canal in the child after the first year]. *Arch. f. Kinderh.* [Stuttgart], vol. 72 (1922–23), pp. 100–110.

This article discusses Röntgen investigation of the alimentary canal after the first year, as conducted by other students, and author's own observations on the time required by the stomach and small intestine for emptying. Twenty-three children between 1¼ and 14 years, healthy so far as digestion was concerned, were studied during the period 1919 to 1921 after a meal of barium sulphate and apple sauce. Contrasts with corresponding phenomena in adults are constantly drawn. Two tables give full data on the 23 children. Food began to enter the small intestine after one to two hours and to leave in two to four hours; it began to leave stomach after one to three hours, usually after two hours. Bibliography.

26 **Carlson, A. J., and H. Ginsburg:** "The tonus and hunger contractions of the stomach of the newborn." *Am. J. Physiol.* [Baltimore], vol. 38 (1915), pp. 29–32.

The authors studied the gastric tonus and hunger contractions of many vigorous newborn infants while the infants were asleep, and found the contractions in evidence shortly after birth before any food had entered the stomach. The phenomenon is like that in the adult except that the periods of motor quiescence are only 10 to 15 minutes. Two tracings show the contractions in a 9-hour-old infant and in a 9-day-old infant.

27 **Clarke, T. W.:** "Gastric digestion in infants. A review of the literature." *American Journal of the Medical Sciences* [Philadelphia and New York], new ser. vol. 87 (1909), pp. 674–685.

As the title indicates, a review only. No original work reported.

28 ——— "The diagnostic value of gastric analysis in the digestive disturbances of infancy." *Arch. Pediat.* [New York], vol. 28 (1911), pp. 648–656.

In 1907 the author was appointed to the staff of the Rockefeller Institute for Medical Research and undertook a long series of investigations on infant digestion. His report, published in 1909, was followed by a number of articles by American and foreign observers, which this article summarizes and compares with the author's own work in an effort to learn the truth as to the value of gastric analysis in infancy. The conclusion reached is that much more investigation and practical application of the results on ill children will be necessary before any facts are established. The article contains a description of the author's apparatus for removal of stomach contents. Bibliography.

29 ——— "The effect of certain so-called milk modifiers on the gastric digestion of infants." *American Journal of the Medical Sciences* [Philadelphia and New York], new ser. vol. 87 (1909), pp. 827–888.

In order to determine the effect of certain foods on gastric digestion 122 observations were made on 22 infants (age not given) at the New York Nursery and Child's Hospital. The children were given test feedings of lactose, lime water, and barley water in various combinations with cow's milk and human milk. Sodium citrate was also added to the cow's milk formula. Gastric analyses were made from these various kinds of feedings, and the results tabulated, summarized, and applied.

30 **Cowie, D. M., and Wm. Long:** "Further observations on the acid control of the pylorus in infants." *Am. J. Dis. Chtld.* [Chicago], vol. 2 (1911), pp. 252–261.

A study to discover, if possible, a basis for treatment in pyloric stenosis. Observations were made on the emptying time of infants' stomachs, and the acid content in relation to emptying time was determined. No conclusion was reached.

31 ——— and W. D. Lyon: "An experimental study on the food reactions in the infant's stomach compared with those in vitro." *Arch. Pediat.* [New York], vol. 28 (1911), pp. 100–119.

A report of experimental studies on a large number of infants, by examination of stomach contents. Technique is not fully described. Tables show 107 tests on about 40 infants, aged 1 day to 23 months, giving food (breast or formula) time in stomach, amount taken, amount recovered, condition of

lavage, percentage and character of curds, presence and condition of mucus, and acid content. The progress of the secretion of mucus in the case of two infants is shown by charts. The effects of basic calcium casein and of sodium-citrate feeding are illustrated by tabulated results of a small number of experiments. The author concludes that the infant's stomach secretes all the digestive juices from the first day of life; that free hydrochloric acid rarely occurs in the infant's stomach during the active part of the day; that a total acidity value from 8 to 30 offers the normal stimulus for pyloric relaxation; that basic calcium casein delays the evacuation of the stomach contents; that sodium citrate inhibits the action of rennet; that the curds normally present in the infant's stomach are paracasein hydrochloride.

32 Crisafi, D.: "La funzionalita del fegato nei bambini provate col levulosio" [Liver function in the child as indicated by the use of levulose]. *Rivista di clinica pediatrica* [Florence], vol. 1 (1903), pp. 108–109.

A brief account of the author's study of several children (number and ages not given) for the purpose of studying the functioning of the liver by means of levulose. In the well children the author found no relation between the quantity of levulose utilized and the weight of the body. Most illnesses did not seem to affect the functioning of the liver.

33 Cunningham, D. J.: "On the form of the spleen and the kidneys." *Journal of Anatomy and Physiology* [London], vol. 29 (1895), pp. 501–517.

The article deals largely with adults, but an illustration and description of a model, produced by the reconstruction method, of the liver, right kidney, stomach, and spleen of a child are included.

34 Czerny, Adlabert: "Die Ernährung des Säuglings auf Grundlage der physiologischen Functionen seines Magens" [The nutrition of the infant on the basis of the physiological functions of its stomach]. *Medicinische Wochenschrift* [Prague], vol. 18 (1893), pp. 495–496, 510.

Making no mention of personal experiments the author discusses the physiological function of the stomach of the breast-fed and the artificially-fed infant. Whereas, he states, the breast-fed infant has digested his meal in 1½ to 2 hours and may safely receive another after 3 hours, the artificially-fed infant requires 3 hours to digest a meal and should not begin a second until 4 hours have elapsed. According to the author, the antiseptic function of free hydrochloric acid is impaired if food is ingested before a former meal is thoroughly digested.

35 Dargein, Pierre: "Surface et volume comparés de l'estomac et du duodénum" [Surface and volume of stomach and duodenum compared]. *Bibliographie anatomique* [Paris and Nancy], vol. 7–8 (1899–1900), pp. 207–216.

After presenting a discussion and tables on the dimensions of the stomach and duodenum and the relations between them in the case of 22 adults, the author gives a table of the length of the greater curvature, of the capacity, and of the surface of the stomach of 8 infants of ages from birth to 11 months. The surface of the mucous membrane of the stomach varied with age. At birth it was 12 square centimeters, at 6 months 67, at 1 year probably 140.

36 Davidsohn, Heinrich: "Beitrag zum Chemismus des Säuglingsmagens" [The chemistry of the infant stomach]. *Ztschr. f. Kinderh.* [Berlin], vol. 2 (1911), pp. 420–428.

The author believes that not titration but the concentration of hydrogen ions is the only measure for the acidity of a fluid. He made five gastric studies on two healthy infants, two on one retarded child and one on a very young infant, all artificially fed and without digestive disturbances. In every study he ascertained the presence of pepsin in the stomach, which, however, took no part in digestion. Different kinds of feeding produced almost no variation. He accepts the identity of pepsin and rennet.

37 ——— "Beitrag zum Studium der Magenlipase" [Contribution to the study of gastric lipase]. *Berliner Klinische Wochenschrift* [Berlin], vol. 49, pt. 2 (1912), pp. 2080–2081.

From his experimentation on adults and children (number not specified) the author believes that the lipase of pancreatin solution has optimum effectiveness with a slightly alkaline reaction corresponding to normality in hydrogen ions of 1×10^{-8}. The optimum of lipase action in gastric secretion is found with a slightly acid reaction. After a fatty diet the stomach content shows a weaker acid reaction than usual, and this is especially important for the infant. The author is convinced of the existence of a gastric lipase which can be measured quantitatively and evaluated clinically. To obtain the pancreatic secretion of infants he used the duodenal tube of Gross as modified by Hess.

38 ——— "Beitrag zur Magenverdauung des Säuglings" [The gastric digestion of the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 9 (1913), pp. 470–493.

After appraising his own work and that of other students on infant's gastric digestion, the author concludes that reaction of milk digestion at its height is always acid, corresponding to [H] of 1×10^{-5}, by which coagulation, lipolysis,

and casein digestion (through rennin) are optimal; digestion is governed first by coagulation and secondly by lipolysis; duration of digestion, best seen through Röntgen photographs, is about 1½ to 2½ hours in the breast-fed and 3 to 3½ hours in the artificially-fed infant. The author describes methods and results of investigation on the amount of acidity and testing of ferments. One table gives results of eight tests of [H^+] on undiluted and diluted gastric solution. There are five tables and two graphs. The author ascertains the occasional presence of pancreatic secretion and raises the question whether or not lab and pepsin are the same.

39 **Davidsohn, Heinrich:** "Beitrag zur Physiologie und Pathologie der Magenverdauung beim Säugling" [Physiology and pathology of gastric digestion in the infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 69–70 (1921–22), pp. 239–255.

From 53 double experiments on 30 infants the author concludes in opposition to Schackwitz that removal of stomach contents in two unequal portions gives varying acidity determinations. He conducts other experiments testing age and diet as affecting digestion, in both artificially-fed and breast-fed infants. In artificially-fed infants the pH of the stomach contents does not appreciably increase during the nursing period. In breast-fed children the pH is low during the first six months; thereafter it increases rapidly till it permits peptic digestion. Twenty of these tests were carried out with seven infants. Factors affecting the pH are the hydrochloric-acid content, the power in the milk to bind it, the reaction of the milk and motility of the stomach, the age and constitution of the child, etc. The article contains 17 tables.

40 ——— "Die Pepsinverdauung im Säuglingsmagen unter Berücksichtigung der Acidität" [Pepsin digestion in the infant stomach with reference to acidity]. *Ztschr. f. Kinderh.* [Berlin], vol. 4 (1912), pp. 208–230.

The author considers many sets of experiments conducted by other students, describes a series of experiments by Michaelis and himself on the dependence of pepsin digestion upon acidity, whereby they determined that the optimum of pepsin activity attends an [H^+] of $1{,}610\times^{-2}$ and mentions tests by Salge and himself on about 10 breast-fed and artificially-fed infants wherein the stomach content removed one to two hours after a normal meal gave a [H^+] of about 5.6×10^{-5}. The difference between free and bound hydrochloric acid is only quantitative. A tolerably high acidity is necessary for pepsin digestion. The acid in infants' stomachs is lactic acid, but it is too limited in amount for activating pepsin digestion, and the author concludes that the latter is sacrificed for the sake of the fat splitting of the lipase in the stomach for which the optimum is not an acid but a natural reaction. He agrees with Pawlow, who through tests with various kinds of foods has shown that the difference in the gastric secretions of adults and infants is only apparent.

41 ——— "Molke und Magendarmfermente" [Whey and ferments in the alimentary canal]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 8 (1913), pp. 178–186.

The important fermentative processes in the infant stomach are coagulation and fat splitting. The author's investigations on whey and alimentary ferments were conducted by the gas chain method. The reaction of human milk is approximately neutral, more acid than blood, and not very different from that of cow's milk. The reaction of human milk was $(H^+)=1.1\times10^{-6}$ and of cow's milk $[H^+]=3\times10^{-7}$. Human milk showed no coagulation in 20 hours, whereas cow's milk showed coagulation in 36 to 107 minutes. The reason is the difference in salt content. The more diluted the cow's milk the longer it requires for coagulation. In an appendix the author gives tables on gastric lipase, pancreatic lipase, and lactase.

42 ——— "Neuere Arbeiten zur Physiologie und Pathologie der Magenverdauung beim Säugling" [New work on the physiology and pathology of gastric digestion in the infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 69–70 (1921–22), pp. 142–155.

A critical review of current theories on the gastric digestion of the infant. The presence of pepsin in the stomach juices and in the mucous membrane of the stomach is proved; but is this pepsin effective? Three methods of investigation have been tried: Testing stomach content for products of protein decomposition, artificial digestion tests with stomach content, and determination of stomach acidity. All the work of note along these lines is discussed by the author. He concludes that peptic digestion has not been proved by the first two methods. Acidity of the infant stomach with both breast and bottle feeding amounts to $[H]=1\times10^{-5}$. But peptic digestion of infant begins with $[H]=1\times10^{-4}$ and is optimal at 2×10^{-2}. In the breast-fed infant till the ninth month and in the artificially-fed infant throughout suckling period, practically no peptic digestion of milk takes place.

43 ——— "Untersuchungen über das fettspaltende Ferment des Magensaftes nebst Angaben zur quantitativen Bestimmung derselben" [Quantitative investigations on the fat-splitting ferment of the gastric secretion]. *Berliner Klinische Wochenschrift* [Berlin], vol. 49, pt. 1 (1912), pp. 1132–1134.

Borrowing Rova and Michaelis's method of surface tension, the author measures 0.5 to 1 centimeter of diluted gastric secretion to 60 centimeters of

tributyrin. This method he used with a series of secretions. He gives a picture of Traube's stalagmometer, wherein the value of tributyrin solution was 144 and of pure water was 94 drops. He ascertained a greater digestion of fat in the infant stomach than in the adult and suggests that lipase of the stomach is different from that of the pancreas.

44 **De Buys, L. R., and A. Henriques:** "Effect of body posture on the position and emptying time of the stomach." *Am. J. Dis. Child.* [Chicago], vol. 15 (1918), pp. 190–195.

As a contribution to existing information about the digestive apparatus of infants the authors observed the effect of body posture on the position of the stomach (16 observations), and motility in the prone, supine, erect right-lateral and erect left-lateral positions (33 observations). The method employed was screen tracings, an opaque meal of barium sulphate having been added to the child's usual meal, and a Coolidge tube used with 2 milliamperes of current, spark gap 6 inches, distance from target to screen, 20 inches. Observations are recorded in 2 tables and 33 cuts. The authors conclude that the position of the stomach and of its solid contents is influenced by body posture; that motility is most rapid in the right-lateral and least rapid in the left-lateral position; that active peristalsis begins as early as the fourth month.

45 **Dementiev, Geff G.:** "O funczionalnoi sposobnosti pecheni u novorozhdionnihk dietie" [On the functioning of the liver in newborn children]. *Vrachebnaiia Gazeta* [St. Petersburg], vol. 12 (1905), pp. 177–217.

A study of the functioning of the liver in 10 newborn infants during the first 7 to 9 days of life. The author found that the liver of the newborn infant not only is imperfectly developed but functions differently from the adult liver. The liver is not in condition to neutralize the fermenting substances in the intestine. In artificial feeding indican is constantly found in the urine, which, the author holds, is an indication of insufficient functioning of the liver.

46 **Demuth, Fritz:** "Magenfunktionsprüfungen beim gesunden Säugling" [Studies of gastric function in the healthy infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 276–297.

The author studied the stomach functions of the healthy infant, from birth to over 9 months of age, with mother's milk and nine other diets, determining duration of time food remains in stomach, acidity, bacterial content, and to a certain extent ferment activity. He made 496 X-ray tests on 50 subjects. Short tables give the time human milk stays in the stomach and pH. Many curves show the same for different ages and with various diets. The following conclusions were reached: Every infant has a specific motility and acidity. The needed amount of food stays longest in the stomach; too little or too much leaves more quickly than the optimum. Contents of the stomach are not in layers. Time in the stomach corresponds to amount of casein; therefore, human milk, diluted cow's milk, and malt soup leave more rapidly than undiluted cow's milk, albumin-milk, or buttermilk. As infants grow older the retarding effect of fat becomes noticeable. Total acidity is parallel to albumin content. With a pH over 4.5 coli bacilli are to be found in the stomach in 69 per cent of cases. Bibliography.

47 ——— **and E. F. Edelstein:** "Magenfunktionsprüfungen am gesunden Säugling" [Studies of gastric function in the healthy infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 34 (1922–23), pp. 66–74.

The author conducted 28 studies on four children between 4½ and 7 months with different diets: One-half milk and 5 per cent cane sugar, to which was added either 50 per cent full milk, or its caloric equivalent in cane sugar or casein or butter. Liquid was supplied by whey with its protein removed. Time in the stomach expressed in relative numbers was 0.87 for carbohydrates, 0.89 for milk, 0.91 for fat, and 1.06 for casein. Hydrogen-ion concentrations were for casein 1.36, for milk 1.08, for sugar 1.04, and for fat 0.99. Sixty-three other tests were made on infants between 2 and 7¾ months with a one-fourth casein and a full-casein milk. One-fourth-casein milk was found to leave the stomach as quickly as human milk and to produce the same [H]. In older infants casein called forth lowest [H] and fat the highest; in infants under 6 months the single factors of milk seemed to make no difference. No relation was seen between total acidity and duration in stomach; the total acidity was approximately proportional to albumin content. The presence of the colon bacillus in stomach was increased by albumin.

48 **Dudin, V. A.:** O pishchevaritelnikh fermentakh v zheludkie plodov i nedonoschennikh dietie [Gastric Ferments in the Stomachs of Embryos and Infants Born before Term]. St. Petersburg, 1904. 91 pp.

This dissertation (University of St. Petersburg) is an account of an original study of (1) 10 embryos, to determine at what age of the embryo gastric ferments appear in the stomach; (2) gastric digestion of 16 infants born before term. The author found no free hydrochloric acid in the stomachs of embryos between the third and ninth month; in the sixth month there appeared traces of pepsin and rennin; ability to digest milk began only in the seventh month; the gastric glands reached their complete development in the sixth month; transfer of children born before term from breast milk to cow's milk resulted in increased acidity.

49 **Dwight, Thos., and T. M. Rotch:** "The abdomen in infancy." *Arch. Pediat.* [Philadelphia], vol. 8 (1891), pp. 481–492.

The conspicuous differences between the infant's abdomen and that of the adult are that the liver is larger, the pelvis smaller, the bladder an abdominal organ, and the intestines less fixed. The stomach is smaller, more vertical, and more tubular. The author explains the rationale of clinically estimating gastric capacity by weight rather than by age. About 36 abdomens were studied, and the length and location of the parts of the bowel observed, as well as their peritoneal covering and the length of the mesentery.

50 **Eiloart, Arnold:** "A food for infants, with experiments, chemical and physiological." *Transactions of the First Pan-American Medical Congress*, 1893 [Washington], pt. 2 (1895), pp. 1324–1331.

To test the fineness of clot and acidity of stomach contents after feeding with milk and various dilutents, 22 experiments were made with infants from 1½ to 8 months old, stomach contents having been removed by pumping, from 1 to 20 minutes after the meal. Results are shown in tabular form. By experimenting with various foodstuffs two formulas were arrived at, for infants' foods containing the albuminoid constituents of grain, carbohydrates in soluble form, but little insoluble starch and no excess of sugar. Digestion tests were made with three infants and with adults. Actual results of the use of these foods in hospital practice are briefly reported.

51 **Einhorn, Max:** "The time required in the stomach digestion of different foods in infancy." *New York M. J.*, vol. 50 (1889), pp. 67–73.

The author examined the stomach contents, within two hours of feeding, of several groups of healthy infants 3 to 9 months old. The different foods used were: Breast milk; cow's milk (a) undiluted, (b) diluted with water, (c) diluted with barley water; four artificially prepared infants' foods. Analyses of the stomach contents are given in detail. He concludes that infants deprived of breast milk should be fed with diluted cow's milk, but not so often as every two hours.

52 **Engel:** "Zur Kenntnis der Magensaftsecretion beim Säugling" [Concerning the gastric secretion of an infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 49 (1908–9), pp. 16–28.

A study made upon a healthy-looking infant brought to the author's clinic because of chronic vomiting. The gastric juice was found to be similar to that of an adult's stomach in quality and quantity. The article contains four tables.

53 **Epstein, Alois:** "Über Magenausspülungen bei Säuglingen" [Washing out the stomach of infants]. *Arch f. Kinderh.* [Stuttgart], vol. 4 (1882–83), pp. 325–356.

During a period of three years in the Foundlings' Institute at Prague 400 stomach washings were carried out on 286 infants from 2 days to 9 months old, most of them being between 2 and 8 weeks old. The author carefully describes the instrument used and the whole process and findings. The stomach of a healthy infant several weeks old, which drinks from 30 to 70 grams at a meal, empties itself in one to one and one-half hours. Coagulation of the milk in the stomach takes place to a very slight extent or not at all.

54 **Escherich, Th.:** "Die normale Milchverdauung des Säuglings" [Normal digestion of milk in the infant]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 27 (1887–88), pp. 100–112.

The author compares the digestion of milk and the feces for breast-fed and artificially-fed infants.

55 **Finizio, Gaëtan:** "Recherches sur les variations du pouvoir amylolytique de la salive mixte des nourrissons sains et des nourrissons malades" [Researches into the variations of the amylolytic power of the saliva of healthy and of sick infants]. *Revue d'hygiène et de médecine infantiles* [Paris], vol. 8 (1909), pp. 224–249.

To determine the diastatic power of saliva in infants the author conducted experiments by putting in a sterilized test tube one-half cubic centimeter of saliva with 10 cubic centimeters of rice starch in a one-half of 1 per cent solution and 2 drops of toluin, and measuring the quantity of sugar formed. The saliva was obtained by placing absorbent cotton in the infant's mouth. From four observations on a child of 2 years and a child of 3 years he learned that saliva obtained with suction possesses a slightly greater amylolytic power than spontaneous saliva. From observations made upon four healthy breast-fed infants about 4 months of age at the hours of 10 a. m., 1 p. m., and 4 p. m., and upon a nursling 2 months old for two days at 9 a. m., noon, and 3, 6, and 9 p. m., he concluded that the amylolytic power may be represented by a curve from 9 a. m. to 9 p. m., with greatest elevation about noon. Other experiments on infants of different ages fed on milk and porridge of rice, semolina, or bread, prove that the amylolytic power of saliva shows no differences before or after meals below the age of 6 months, but that it does after this age. Table 6 of individualizing tests upon four nurslings throughout a year demonstrates that this property increases with the months, at first slowly and then more rapidly until at end of twelfth month it almost equals that of child 2 or 3 years old. There are oscillations according to individuals. The author believes amylaceous foods should be given to infants only from the eighth month on.

56 **Finizio, Gaëtan:** "Valore dell'acido clorídrico libero nel contenuto gastrico del lattante" [Significance of free hydrochloric acid in the stomach content of the infant]. *La Pediatria* [Naples], vol. 23 (1915), pp. 167–177.

Account of 15 experiments made by the author to determine the significance of free hydrochloric acid in the infant's stomach. In his first series of experiments he exposed human milk to the action of pepsin, first in the absence of free hydrochloric acid and then in the presence of a minimum quantity of it. In the second series of experiments he studied the variations in the digestive power of pepsin as it acts on the proteins of cow's milk previously exposed to hydrochloric acid. In conclusion he expresses the supposition that protein digestion goes on even in the absence of free hydrochloric acid in the stomach during the first hour after feeding milk to the infant. Bibliography.

57 **Fischl, Rudolf:** "Beiträge zur normalen und pathologischen Histologie des Säuglingsmagens" [Contribution to the normal and pathological histology of the infant stomach]. *Zeitschrift für Heilkunde* [Berlin], vol. 12 (1891), pp. 395–446.

The author dissected and examined the stomachs of 16 male and 12 female infants, of whom 2 were in the fetal period and 3 in the second year, and the others ranged from first week after birth to sixth month. He describes his method of extracting and preserving the stomach. A description of the histology of the normal stomach is given. Much space is devoted to a description of pathological findings in the tissues of this organ. There are no tables. The author concludes from his experiments on the normal stomach that its resorbing surface is relatively greater than its secreting surface; that its functional development is not high. He could not confirm the peculiarities noted by others on the muscularis propria, the distribution of the glands in various parts of the stomach, and the peculiar quality of the wall layers.

58 **Flesch, Hermann, and Ignatz Péteri:** "Ergebnisse von Magenuntersuchungen mittels Röntgenstrahlen im Säuglings- und späteren Kindesalter" [Results of Röntgen ray investigation of the stomach in infancy and childhood]. *Ztschr. f. Kinderh.* [Berlin], vol 2 (1911), pp. 263–292.

After recounting the use of X rays in stomach investigation by Rieder, Holzknecht, Simmonds, Leven, and Barret, Trumpp, Tabler and Bogen, Zuccarelli, Fleischmann, and others, the authors describe their own experiments on the form and position of the normal stomach and its manner of filling and emptying and the duration thereof, in the case of nurslings and of older children up to 14 years, and the causes for the transition from the nursling to the later period. They examined 72 children of various ages, including 30 below 1 year, of whom some were fed at breast, some artificially, some on mixed diet. On account of the fatal results of bismuthum subnitricum, especially on the young, they employed zirconium and thorium.

The nursling stomach was found to be characterized by large air bubble, horizontal position, comparatively high position, absence of peristaltic movements, and bagpipe shape. The stomach was found to change radically after 12 to 15 months to a vertical position, fundal shape, and peristaltic function. As causes for the transition the authors discuss the change of body posture, the swallowing of air by infants, and the change in the kind of food. The article includes 15 diagrams of juvenile stomachs and explanations thereof.

59 **Foch, Siegfried:** "Über Peptonbildung im Säuglingsmagen" [Formation of peptone in the infant stomach]. *Arch. f. Kinderh.* [Stuttgart], vol. 16 (1893), pp. 1–21.

To investigate the formation of peptone in the infant stomach the author removed the stomach contents of healthy and sick breast-fed and bottle-fed infants, usually one hour after nursing. Sixteen experiments showed a universal presence of peptone. Seven experiments showed the same of pepsin. In eight further experiments the author sterilized the stomach contents with chloroform to exclude the possible effect of microorganisms and proved that the pepsin can digest fibrin flakes only when a 0.3 per cent solution of hydrochloric acid is added. Finally in six experiments the author confirmed his surmise that the rennin ferment produces the peptone. Therefore, he concludes, it is unsound to give dyspeptic infants pepsin.

60 **Folli, F.:** "La ferratina del fegato nel feto e nel neonato." [Ferratin in the liver of the fetus and newborn child]. *Gazzetta degli ospedali e delle cliniche* [Milan], vol. 18 (1897), pp. 1049–1053.

A study of the quantity of ferratin contained in the livers of 4 fetuses and 18 children from 2 days to 2 years old; also a study of muscular glycogen in infants from 15 to 30 days old. Tables and quotations are given.

61 **Fordyce, A. D.:** "Digestion and feeding in infants." *Scottish Medical and Surgical Journal* [Edinburgh], vol. 21 (1907), pp. 130–139, 208–218, 310–322, 408–419, 513–522.

The author discusses methods of feeding and gives results of his examinations of infant stools and of stomach contents. Detailed analyses of mother's milk, with suggestions for adapting cow's milk to infants' needs, are also presented.

62 **Frolovsky, V.:** Material k anatomii pishchevaritelnavo kanala grudnikh dietie [Data on the Anatomy of the Alimentary Canal of Infants]. P. S. Nachinov [St. Petersburg], 1876. 44 pp.

After extensive quotations from other writers on the anatomy of the infant stomach the author gives an account of his study of the stomachs and intestines obtained from the bodies of 40 infants from 1 week to 10 months old. He describes the form and size of the collapsed and distended stomach, the capacity of the stomach, its muscles and position, particularly in newborn infants, and the intestinal canal. A number of tables are given. References.

63 **Gaucher, Louis:** "Adaptation du suc gastrique à la coagulation et à la digestion du lait chez les nourrissons." [Adaptation of gastric secretion to coagulation and digestion of milk in infants]. *Comptes rendus des séances et mémoires de la Société de Biologie* [Paris], vol. 76 (1914), pp. 389–390.

To determine the difference between gastric secretion in breast-fed and in artificially-fed infants, the author removed the stomach contents 15 minutes after feeding. Separating secretion from milk by the use of lactose, he discovered that the secretion in seven cases of breast-fed infants was 30 to 35 per cent of the whole liquid and in cases of feeding on cow's milk the gastric secretion was 45 per cent of the whole. In further experimentation coagulation was found to take place in 2 or 3 minutes for cow's milk and 25 to 30 minutes for human milk. Tests with mixed feeding showed similar results to those with cow's milk. Therefore, it is concluded, the gastric juice of nurslings adapts itself to the kind of food given.

64 **Greco, C. M.:** "Ricerche sulla funzione dello stomaco del bambino lattante" [Study of functions of the infant stomach]. *La Pediatria* [Naples], vol. 18 (1910), pp. 161–179.

A study of the gastric digestion of eight infants ranging in age from 10 days to 10 months. Three tests were made in each case. For each case and each test the author gives age, weight, nature of test, duration of test, density, cryoscopy, tension, viscosity, total acidity, free hydrochloric acid, quantities of rennin and pepsin. Bibliography.

65 **Gucciardello, S.:** "Fleischernährung in Beziehung auf die Entwicklung und Beschaffenheit des gastro-intestinalen Apparates bei Kindern bis zum zweiten Lebensjahre" [Meat diet with reference to development and constitution of the gastrointestinal tract in children up to the second year]. *Wiener Medizinische Blätter*, vol. 22 (1899), pp. 619–621, 637–639.

The author studied the digestion of meat in young animals and in 20 children between 14 and 23 months old. Only 7 tolerated the meat; the others became ill, usually from constipation and diarrhea. Remains of the undigested meat were found in the feces.

66 ——— "L'alimentazione carnea in rapporto allo sviluppo e alle condizioni dell'apparato gastro-enterico fino al secondo anno di vita" [Meat diet in relation to the development and condition of the gastrointestinal tract in children under 2 years of age]. *La Pediatria* [Naples], vol. 7 (1899), pp. 97–105.

The author observed 20 children over 1 but under 2 years old. He concluded that to the age of 18 months milk, eggs, and starches are suitable food; that meat is always harmful for children under 15 months, also for those over 15 but under 18 months old of an average degree of robustness, and those 19 to 24 months old with a delicate constitution. Children 15 to 20 months old in excellent health and those over 20 months old of average health digested meat well. Two charts are presented.

67 **Gundobin, Nicolai:** "Über den Bau des Darmkanals bei Kindern" [Structure of the intestinal canal in children]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 33 (1891–92), pp. 439–473.

Most of the 1,000 bodies examined in two years the author rejected for this work because of pathological alterations. From material that he considered physiological he deduced these conclusions: The intestinal canal of newborn children is characterized by weak development of the muscle layer and strong development of the mucous membrane; the villi are well developed, more thickly placed and richer in blood than with adults; the lymphatic system is completely developed at birth; resorption is quicker in the young than in the mature; nerve fibers are thinner in the mesentery of infants. The article concludes with 19 case histories and 3 tables of data for 10 adults, 10 young infants, and 10 premature infants.

68 **Hahn, Milton:** "Gastric digestion in infants." *Am. J. Dis. Child.* [Chicago], vol. 7 (1914), pp. 305–314.

Using the determination of the hydrogen-ion concentration as the method of measuring gastric acidity the author analyzed 94 specimens of stomach contents from 37 infants, all artificially nourished and practically normal. The test meals consisted chiefly of one-third cream-milk (protein, 1.5 per cent; fat, 3.8 per cent; carbohydrate, 6.5 per cent) and two-thirds milk (protein, 2.5 per cent; fat, 2.5 per cent; carbohydrate, 7.5 per cent) according to the age of the children. Stomach contents were removed at what was considered the height of digestion. Results of analyses are given in tabular form. The

author concluded that the hydrogen-ion concentration, $[H]=1\times10^{-5}$, is the normal reaction of the stomach contents for infants fed on one-third cream-milk and two-thirds milk; that $[H]=1\times10^{-5}$ is the optimum reaction for rennin and gastric lipase; that pepsin is inert in mixtures having this reaction; that the important processes in the gastric digestion of infants are the coagulation of milk by rennin and the splitting of fat by gastric lipase; that the peptic digestion of casein is not important for the infant. References.

69 **Hamburger, Franz:** "Biologische Untersuchungen über die Milchverdauung beim Säugling" [Biological investigations on milk digestion in infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 62 (1905), pp. 479–494.

The author reviews the former work on milk digestion of the infant from a biological point of view. Various albumin bodies possess characteristics in common that mark them as belonging to the same species. Every kind of creature is sensitive to albumin of another species. Cow's milk produces a nonphysiological irritation of the human infant's digestive apparatus. To test the biological characteristics of albumin bodies in peptic and tryptic digestion of infants fed on human and on cow's milk the author examined the feces of 8 children between 3 and 10 months old and the stomach contents of 8 newborn breast-fed and 11 artificially-fed infants. He concludes that with the biological method albumin of cow's milk is not ascertainable as such in infant feces; that at the end of gastric digestion both breast milk and cow's milk are robbed of specific precipitability.

70 ——— "Über Verdauung und Assimilation" [Digestion and assimilation]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 21–22 (1904–5), pp. 41–47.

After a preliminary discussion on the reaction of a living organism to protein of the same and of a different species the author concludes that the young infant's intestine rejects heterologous milk and serum. With Doctors Dehne and Mann he experimented on infants (number not give) from 1 to 2 days old with tetanus serum from the horse. The transition from serum into tissue was measured by antitoxin, but no transition of the heterologous albumin was ascertained. Cow's milk, the author believes, is an aphysiological and injurious irritant to the digestive apparatus of the newborn.

71 ———, **and Bernhard Sperk:** "Untersuchungen über die Magenverdauung bei neugeborenen Brustkindern" [Investigations on the gastric digestion of newborn breast-fed infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 62 (1905), pp. 495–516.

The authors discuss infantile gastric digestion, having observed more than 150 healthy, breast-fed, newborn infants in the lying-in hospitals of Vienna. At certain carefully noted intervals after nursing the stomach contents were removed and analyzed. The rennin ferment was almost always found; in fact, where milk coagulation was not ascertained the authors suspect faulty experimentation. Pepsin was found in almost all cases. Free hydrochloric acid was found after 1 hour in 10 per cent of the cases, after 1¼ to 2 hours in 33 per cent, after 2½ hours in 50 per cent. The authors believe that the hydrochloric acid deficit offers a measure for the work of secretion still to be done in the stomach at any given time. Lactic acid was never found. Much discussion is also given to total acidity. There are five tables and a bibliography.

72 **Hayashi, A.:** "Über die Durchlässigkeit des Säuglingsdarmes für artfremdes Eiweiss und Doppelzucker" [Permeability of infant intestine to heterologous albumin and disaccharid]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 12 (1913–14), pp. 749–758.

Observations were made on 28 infants of various ages and stages of development, all healthy so far as intestines were concerned. Four tables show permeability of intestine for white of egg, cane sugar, and lactose. After a dose of 15 to 20 grams of white of egg per kilogram of body weight perceptible amounts of heterologous albumin appeared in the urine. The degree of tolerance did not change during the first year of life. Parallel with variations in permeability to albumin were variations with the disaccharoses. Assimilation limits for cane and milk sugar were almost, and sometimes exactly, identical.

73 **Heiman, H.:** "A study of the stomach contents and motility in breast-fed infants." *Bulletin of the Lying-in Hospital of the City of New York*, vol. 6 (1909–10), pp. 174–176. See also *Arch. Pediat.* [New York], vol. 27 (1910), pp. 570–578.

The author studied 20 normal infants, 3 to 7 days old, born at the Lying-in Hospital, New York. Thirty-six specimens of gastric content were examined by methods carefully described, and the following results obtained: The stomach was found empty after two hours in 4 out of 13 cases, after three hours in 5 out of 9 cases, after four hours in 5 out of 6 cases; free hydrochloric acid was found in 2 cases, pepsin in 6 cases, rennet in all but 2 cases, lactic acid in all but 3 cases.

74 **Heinsheimer, Friedrich:** "Experimentelle Untersuchungen über fermentative Fettspaltung im Magen" [Experimental investigations on fermentative fat splitting in the stomach]. *Deutsche Med. Wchnschr.* [Leipzig], vol. 32 (1906), pp. 1194–1197.

This article includes a few experiments with infants, which seemed to show that the steapsin is secreted in the stomach. The work of other

investigators, especially that of Sedgwick, is discussed. Wolhord's methods for analyzing the secretions were used.

75 **Henschel, Heinrich:** "Über Magenerweiterung im Säuglingsalter" [Dilatation of the stomach in infancy]. *Arch. f. Kinderh.* [Stuttgart], vol. 13 (1891), pp. 32–68.

Before considering pathological dilatation of the infant stomach the author describes the normal anatomy as ascertained from findings of other students and from his own 60 dissections. He explains his method of inflating the stomach considerably but not excessively. In 60 cases turn on axis was the same; position, shape, curve, etc., are discussed. Bibliography.

76 **Herlitzka, L.:** "Intorno ad alcune particolarità di sviluppo e di struttura del fegato fetale ed infantile" [Some characteristics of the development and structure of the liver of fetus and infants]. *Lo Sperimentale* [Florence], vol. 48 (1894), pp. 383–406.

Four plates and a bibliography are given.

77 **Hess, Alfred F.:** "Observations on the physiological anatomy of the infant's stomach noted in the course of the use of a balloon duodenal catheter." *Am. J. Dis. Child.* [Chicago], vol. 7 (1914), pp. 428–435.

Four Röntgenograms illustrate observations made by the author as to the position and length of the gastric canal of infants.

78 ——— "The gastric and pancreatic secretions of the newborn." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 9 (1911), pp. 20–21.

About 35 experiments were made on newborn infants before any food was ingested. The gastric and duodenal contents were examined. Hydrochloric acid was present in almost all the cases. It was found immediately after the passage of the tube, but the author thought sucking of the tube by the infant increased the hydrochloric-acid output. Pepsin, rennet, protease, lipase, and amylase were found to be present irregularly. No bile was found. No tests were made for bile salts.

79 ——— "The gastric secretion of infants at birth." *Am. J. Dis. Child.* [Chicago], vol. 6 (1913), pp. 264–276.

A study which includes gastric examination of 55 infants, varying in age from one-half hour to 18 hours, the gastric contents having been obtained by use of a glass aspirating bulb. The examinations preceded ingestion of any food. Among 52 infants only 1 did not have hydrochloric acid in the stomach; in all but 1 instance free acid was obtained. The hydrochloric acid varied greatly in amount. In almost all cases it was obtained throughout prolonged tests, in spite of the fact that food was not given to stimulate secretion. Rennin, pepsin, and lipase were also obtained in the unfed newborn. References.

80 ——— "The pancreatic ferments in infants." *Am. J. Dis. Child.* [Chicago], vol. 4 (1912), pp. 205–218.

By use of a duodenal catheter fluid was aspirated from infants, some of whom were normal, varying in age from a few hours to a year. A considerable number of newborn infants were studied before they had been put to the breast. Without the stimulus of food to incite secretion the three pancreatic ferments were found in the intestine. During the first week of life only a small amount of pancreatic secretion was discovered, but it contained the starch-splitting enzyme. In older infants there was an increase in quantity of pancreatic juice and an augmentation of its amylolytic power. References.

81 **Hess, Rudolf:** "Acidität und Pepsinverdauung" [Acidity and pepsin digestion]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 18 (1918), pp. 314–318.

Incited by Krönenberg's conclusion that the infant stomach can provide the slight acidity necessary for the peptic digestion of human milk the author tested the stomach content of infants from 3¾ to 14 months old. He found that acidity does not begin to suffice for peptic digestion till after four months of life.

82 ——— "Die Acidität des Säuglingsmagens" [Acidity of the infant stomach]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 12 (1915), pp. 409–439.

After explaining the sources of error in previous investigations on the acidity of the infant stomach the author describes his research on its peptic digestion. One and one-half to two hours after a meal, the amount of which was noted, he extracted as large a quantity as possible of the stomach contents and analyzed them by the indicator method of Davidson or by electric measurement of the hydrogen-ion concentration. The 13 tables give data on age, weight, food, and acidity for more than 70 convalescent infants, 120 healthy breast-fed infants, and others. The author found that in most cases the acidity was not sufficient for pepsin action. That very young breast-fed infants showed temporarily a sufficient amount; that, as the nursing period progressed, the acidity gradually increased and sufficed for pepsin action at about nine months; that to the age of 9 months milk causes greater acidity than other foods.

83 **Heubner, O.:** "Säuglingsdarm und Mehlverdauung" [The infant's intestine and the digestion of flour]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 47 (1898), pp. 134–140.

Replying to Schlossman's attack upon the articles by Carsten and himself on the use of flour for infants, the author declares the use of flour was advocated as a therapeutic measure, not as a food. He states that Schlossman's experiments differed widely from his and Carsten's in that Schlossman's experiments were carried on in laboratory vessels whereas his own and Carsten's were made in the intestine of the living child. Acetone and oxybutyric acid, he says, are always found in the urine during a hunger diet.

84 ——— "Über das Verhalten der Säuren während der Magenverdauung des Säuglings" [The behavior of acids during digestion in the infant stomach]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 32 (1891), pp. 27–46.

In his children's clinic, with the assistance of Prof. Albin Hofman, the author conducted studies on the acids in the infant stomach. Some of the 40 infants (his subjects) were breast fed, some artificially nourished, some healthy, most atrophic but convalescent. Out of 23 cases only 5 showed volatile acids in definite quantities. Out of 24 cases 14 showed lactic acid in definite quantities. In 26 cases only 6 showed free hydrochloric acid. The tables cover nine pages.

85 ——— "Zur Frage des quantitativen Eiweissgehaltes der Muttermilch" [The question of the quantitative albumin content of human milk]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 40 (1895), pp. 121–126, 241–242.

To justify his data in the *Berliner Klinische Wochenschrift*, 1894, nos. 37 and 38, on the very low albumin content of human milk, which data had been attacked by Pfeiffer, Camerer, and others, the author cites investigations supporting his by Forster, Brunner, Marchand, Johannessen, and Hirschfield; shows sources of errors in methods employed by Pfeiffer and by Mendes de Leon, cited by Camerer; and describes seven nitrogen tests made in the laboratory of his clinic by Finkelstein, of the unusually rich milk of a robust woman of 30 years, mother of an infant in the fifth month of life, whose milk gave an average albumin content of 1.36 per cent, according to the Kjeldahl method. He also cites Munk's work, in volume 134 of Virchow's Archiv, on 13 analyses of the albumin in human milk, which gives 1.33 per cent (or 1.21 per cent when extractive nitrogen is withdrawn) as the average value.

86 **Holt, L. E.:** "Observations upon the capacity of the stomach in infancy." *Arch. Pediat.* [Philadelphia], vol. 7 (1890), pp. 960–967.

The author measured the capacity of the stomach in 142 infants by methods carefully described. After discarding doubtful measurements he had a series of 91 cases of 14 months and under, which he tabulated, showing average capacity in ounces at various ages. He reached the conclusion that approximately at ages 1, 3, 6, and 14 months, the capacity is, respectively, 1, 4, 6½, and 9 ounces. He also investigated body weight but concluded that no inference as to stomach capacity can be drawn from body weight. Since there is a fairly constant relation between age and stomach capacity he suggested this relation as a guide to the amount of food required by a healthy infant.

87 **Huenekens, E. J.:** "Die Acidität des Mageninhalts im Säuglings- und Kindesalter bei milch- und fleischhaltiger Probenahrung" [The acidity of the stomach content in infancy and childhood after test meals of milk and meat]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 11 (1914), pp. 297–303.

The author tested acidity in relation to diet a number of times on the stomach contents of five children between 9½ months and 5 years of age. Meat was chopped fine and mixed with milk or soup; the vegetables were made into a purée. The author concluded that the reaction is always acid after milk, corresponding to $[H^1]=1\times10^{-5}$, for milk does not stimulate secretion and is itself acid-binding. After soup, vegetables, and meat, the acidity is insufficient for peptic digestion before the second half of the second year. Figures are shown in six tables.

88 **Hymanson, A.:** "Carmin test for the duration of the complete food passage in infants and children." *Am. J. Dis. Child.* [Chicago], vol. 11 (1916), pp. 112–116.

The author tested the time of food passage on two groups of children; 21 healthy, breast-fed infants 1 to 6 days old, at the Jewish Maternity Hospital and 25 sick children aged 6 weeks to 6 years. Carmin given in powder form in ½-grain doses, to the first group, appeared in the stools in 4 to 18 hours and disappeared in 4 to 20 hours. References.

89 ——— and Heinrich Davidsohn: "The saliva of the nursling." *Am. J. Dis. Child.* [Chicago], vol. 25 (1923), pp. 302–309.

More than 100 determinations were made on 55 nursings, the saliva having been collected by aspiration during a period of 15 minutes, and reactions taken by methods which are described in detail. Under normal and pathological

conditions the saliva was found to vary between slightly alkaline and neutral. The amount collected during 15 minutes from the normal nursling of 1½ to 3 months varied from 1.3 to 2.2 cubic centimeters; of 5 to 8½ months, 2.5 to 8 cubic centimeters. In normal nurslings of 1½ to 3 months, the saliva showed a ferment strength of 300 to 600; of 5 to 8½ months, 600 to 1,600. Active saliva was found in the youngest nurslings examined (1 month old). References.

90 **Hymanson, A., and Max Kahn:** "Study of the intestinal contents of newly born infants." *Am. J. Dis. Child.* [Chicago], vol. 17 (1919), pp. 112–117.

An analysis of the inorganic constituents of meconium was made in five cases. The results are compared with similar analyses of meconium of humans and animals and of feces during fasting, by Müller and Zweifel. Traces of amylase and ammonia were found. No uric acid, trypsin, erepsin, lactose nor lipase was found in an examination for organic contents.

91 **Ibrahim, J.:** "Neuere Forschungen über die Verdauungsphysiologie des Säuglingsalters" [New investigations on the physiology of digestion in infancy]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 25–26 (1908–9), pp. 21–42.

The author discusses results obtained by other investigators and those obtained by himself with 12 full-term and 22 premature newborn infants. Of the proteolytic ferments he detects pepsin, trypsin, secretin, and erepsin at birth and states at which time they apparently begin to appear in the embryo or fetus. Next he considers the amylolytic ferments and enzymes for digesting carbohydrates and shows that diastase, invertin, lactase, and maltase are found at birth. No fat-splitting enzyme could be discovered in the mucous membrane of the intestines, but a pancreas steapsin was found, also a lipase in the mucous membrane of the stomach.

92 ——— "Zur Verdauungsphysiologie des menschlichen Neugeborenen" [The physiology of digestion in the newborn infant]. *Zeitschrift für Physiologische Chemie* [Strassburg], vol. 64 (1910), pp. 95–99.

The author studied the composition of the gastric juice of a newborn infant having an incision in its stomach. Pepsin and lipase were found. Also, in the saliva, a diastatic ferment was found but no potassium sulphocyanide and probably no maltase.

93 ——— and T. Kopéc: "Die Magenlipase beim menschlichen Neugeborenen und Embryo" [Gastro-lipase in the human embryo and infant]. *Zeitschrift für Biologie* [Munich and Berlin], vol. 53 (1909–10), pp. 201–217.

The question of the presence of a lipase in the stomach of the newborn infant and human fetus, and of its origin is considered. Former investigations bearing on the subject are mentioned. The dissection and chemical analysis, first with glycerine and then with distilled water, of the stomach of newborn infants and human embryos are carefully described; and three tables are presented. Conclusions are that the stomach of the newborn infant and of the fetus from the sixth month on contains a lipase (or fat-splitting ferment); that experiments with trypsin and invertin indicate that it is a secretion of the stomach itself; that Rietschel's negative results are due to use of toluene which disturbs emulsion of fat. The lipase in question affects only fine emulsified fat such as is found in mother's milk.

94 **Jacobi, W., and F. Demuth:** "Die wahre Acidität der Mundflüssigkeit beim Säugling und Neugeborenen" [The true acidity of fluid in the mouth of the infant and newborn]. *Ztschr. f. Kinderh.* [Berlin], vol. 34 (1922–23), pp. 293–296.

The authors tested the acidity of fluid in infants' mouths with the gas-chain method and with litmus paper, the two series of results being almost identical. The indicator method was found unsatisfactory. Of 10 tests on 10 newborn, 3 results were acid and 7 alkaline. Of the 172 tests on 93 older infants (of whom 51 were healthy) 55 gave acid results, 106 alkaline, and 1 neutral. The acidity was found to vary considerably, but no effect of disease or of diet could be discerned. Bibliography.

95 **Jacubowitsch, W.:** "Von den quantitativen Bestandtheilen der Galle bei den Neugeborenen und Säuglingskindern" [Quantitative analysis of gall in newborn and nursing infants]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 24 (1886), pp. 373–383.

To investigate the gall of young infants the author examined cadavers in the Foundlings' Home at St. Petersburg. Suitable material, which he had difficulty in selecting, he divided into six classes, according to the ages of 1 day, 1 month, 2 months, 5 months, 9 months, and 1 year. For lack of sufficient gall he could make only two analyses for each class. Except for Carius-Kulz's method of taurocholic acid, he employed Hoppe-Seyler's method for all his analyses. Tables give the amount of gall in the bladder and its specific gravity, and the amounts of the various constituents, always according to the six age groups. A comparative table compiled by the author from other scholars gives a quantitative and qualitative analysis of the gall of adults. The author discusses the absence of glycocholic acid, varying opinions concerning cholestearin, etc.

96 **von Jaksch, R.:** "Beiträge zur Kenntnis der Salzsäuresecretion des verdauenden Magens" [Contributions to the knowledge of hydrochloric-acid secretion in the stomach during digestion]. *Zeitschrift für Klinische Medicin* [Berlin], vol. 17 (1890), pp. 383–399.

The author describes his findings concerning hydrochloric acid in children's digestion. After describing his method of obtaining and analysing the stomach contents he cites the amounts of the acid found one-fourth hour, one-half hour three-fourths hour, one hour, and one and one-half hours after 30 grams of lean ham had been eaten by a boy 3 years old, on two different occasions. Also a boy 7 years old was given 200 cubic centimeters of boiled cow's milk, and at another time 25 grams of starch, 16 grams of sugar cane, and 7.5 grams of chocolate. From these experiments on healthy children the author concludes that the secretion of hydrochloric acid rises most quickly with a meat diet; milk produces a slower increase; pure carbohydrates cause an almost immediate secretion, which then increases very slowly. The greatest amount of the free acid was obtained from the milk diet, less from the meat, and least from the carbohydrates. Sometimes the secretion of hydrochloric acid is missing, even in the healthy stomach. Sweetened tea is not suited to such stomach tests. Other things being equal the amount of the acid secreted one hour after a nitrogen food has been eaten, varies directly with weight. Short sections of the article deal with reactions obtained with Congo paper and with benogo-purpurin-paper, and the secretion of hydrochloric acid in the stomach of sick children.

97 **Juncker, Hermann:** "Beitrag zur Lehre von den Gewichten der menschlichen Organe" [Contribution of the study of weight of the human organs]. *Münchener Medicinische Wochenschrift*, vol. 41 (1894), pp. 847–850, 869–871.

The author gives the absolute and relative weight and growth of the heart, brain, left lung, right lung, liver, spleen, and kidneys, in men, women, and children, as obtained by himself in the Pathological Institute of Munich, 1883 to 1892, and by many others. He ascribes the varying results on record to insufficient material, different methods of weighing, lack of distinction between sexes, use of pathological subjects, difference in occupation of the latter, etc. Absolute and relative weights of the organs are given for men and women separately, as ascertained by Gocke and the author. The author's tables do not accompany this article but are published in the Münchener Medicinische Abhandlungen, Series I.

98 **Kalopothakes, Marie:** "Contribution à l'étude de la structure normale de l'estomac chez le foetus et le nouveau-né" [Contribution to the study of normal structure of the stomach of the fetus and the newborn]. *Bulletins de la Société anatomique de Paris*, Year 69, ser. 5, vol. 8 (1894), pp. 685–696.

After discussing the normal stomach at birth the author describes her own examination of stomachs of five infants born dead. The structure of each is carefully given. The author found that differentiation of cells commences early; the region of the cardia furnishes a whole series of cells of transition from the principal granular cell of fundus to the perfect cell on edge; there is also an almost complete segmentation of tubes. There are two figures, in one of which glands are deep and well developed and in the other, very slightly developed.

99 **Karger, Paul, and Albrecht Peiper:** "Über Fleischverdauung im Säuglingsalter" [Digestion of meat in infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 91–92 (1920), pp. 235–239.

After mentioning the literature, pro and con, or meat as food for infants the author describes his experiments on healthy infants between 2½ and 5 months of age. Ten grams of beef, cooked and minced, given daily caused no digestive disturbance. He gives tables for his tests on four infants of nitrogen metabolism, which was improved by the meat.

100 **Keating, J. M.:** "Some observations on the salivary digestion of starch by infants." *Bost. M. & S. J.*, vol. 109 (1883), pp. 31–32.

A report of results obtained by experiments with the saliva of 21 children varying in age from 6 days to 17 months. Cornstarch boiled and cooled into a paste was put in linen bags and given to the infants to suck for two minutes at a time. Pavy's test showed a sugar change in all but three specimens, a marked reaction being observed in the case of one infant 7 days old.

101 **Korowin:** "Über die fermentative Wirkung des pancreatischen Saftes und der Glandulae Parotis von Neugeborenen und Brustkindern auf Stärke" [The fermentative influence of the pancreatic secretion and the parotid gland of newborn and breast-fed children on starch]. *Centralblatt für die Medicinischen Wissenschaften* [Berlin], vol. 11 (1873), pp. 261–262.

From what he calls a "sufficiently large" number of tests on the pancreas and parotid gland of infants that had died principally from intestinal or lung troubles the author concludes that pancreas infusions do not begin to change starch into sugar until the second month but are fully operative at the end of the first year; and that the parotid gland can change the starch paste into sugar from the first days after birth.

102 **Korowin:** "Zur Frage über Assimilation der stärkhaltigen Speise bei Säuglingen" [The question of assimilation of starchy foods by infants]. *Jahrb. f. Kinderh.* [Leipzig], new. ser. vol. 8 (1874–75), pp. 381–416.

The author conducted a series of experiments to determine whether the infant organism can change starch into sugar. He found it difficult but possible to obtain saliva from birth on. The secretion was usually acid, often neutral, rarely alkaline. The saliva was obtained after the mouth was carefully washed and then was put into a test tube with a 4 per cent rice paste. A table shows the presence of sugar in almost all of 29 tests on 10 children not yet 1 month old. Eighteen experiments on 9 children up to 11 months of age indicated the steadily increasing quantity of glucose. Six experiments on the same child at different ages likewise indicated gain in fermentative power of saliva with age. Five experiments on one child showed the far greater percentage of sugar after two hours of fermentation than after one-half hour. The author minced the parotid gland in 15 experiments, mixed 10 cubic centimeters of water with 1 gram, and with 1 cubic centimeter of this placed 10 cubic centimeters of 4 per cent starch paste. There was always a positive glucose reaction. Similar experiments on the pancreas of infants from 1 day to 14 months old at the time of death indicated that the pancreatic secretion has no effect on starch during the first three weeks of life but exerts an ever increasing effect upon it from the fourth week on. The author also describes experiments on dogs. Eight tables are given.

103 **Kovalski, F. J.:** O pecheni u dietiei [The Liver of the Child]. St. Petersburg, 1900. 90 pp.

A dissertation (University of St. Petersburg) with many quotations, on the liver of 300 cadavers ranging in age from embryos to 12 years. The author obtained size, weight, height of upper and lower edges of the whole liver, and length, width, thickness, and weight of right and left lobes of the liver, all of which he gives, in a number of tables, by age and in some cases by sex. These are followed by a description of the physiology and the microscopic anatomy of the child's liver. Bibliography.

104 **Kronenberg, Robert:** "Acidität und Pepsinverdauung im Säuglingsmagen" [Acidity and pepsin digestion in the infant stomach]. *Jahrb. f. Kinderh.* [Berlin], vol. 82 (1915), pp. 401–422.

The author discusses at length the acid reaction necessary for the activation of pepsin and the rôle played by the hydrochloric acid secreted in the mucous membrane of the stomach, the optimum of acidity found by Sorensen to occur with a [H] of 0.02 and by Michaelis and Davidsohn with a [H] of 0.016, and the greater importance of hydrogen-ion concentration than of hydrochloric acid. He describes his experiments in the Children's Clinic at Breslau in removing the contents of 14 infant stomachs after an Ewald-Boas breakfast of 150 cubic centimeters of sweetened tea and 40 grams of roll and a Leube-Riegel dinner of 120 cubic centimeters of meat broth, 50 grams of beefsteak, 59 grams of potato, and 5 grams of roll. By the indicator method he ascertained a hydrogen-ion concentration of 1×10^{-4} in children of 3¾ to 14 months. Corresponding values for milk were 1×10^{-5} and 1×10^{-4}. He also made 41 acidity experiments with milk on the mucous membrane of the stomach of infants and adults that had died from other than digestive disturbances and found that so far as acidity and digestive power are concerned the proteolytic ferment of the infant is like that of the adult. He arrived at the general conclusion that for peptic digestion milk requires a lower degree of acidity than coagulated albumin.

105 **Krüger, W.:** "Die Aufenthaltsdauer der Nahrung im Säuglingsmagen unter physiologischen und pathologischen Verhältnissen [Length of time food remains in the infant stomach in physiological and pathological conditions]. *Monatschr. f. Kinderh.* [Berlin], vol. 21 (1921), pp. 257–262.

By means of X rays the author studied the time various kinds of food remained in the stomach of 100 healthy and sick infants, counting from the end of the meal. Accustomed diets were continued. The durations, roughly speaking, were 2¼ to 3½ hours for human milk, 4 hours for undiluted cow's milk, 3 to 3¼ hours for milk and gruel, 4 hours for buttermeal, 2 to 4 hours for buttermilk, and 4 hours for albumin milk. Bibliography.

106 **Labbé, Marcel, and Henri Labbé:** "Du chimisme gastrique normal chez les nourrissons; ses modifications dans le rachitisme et au cours des entérites" [Normal gastric chemistry of nurslings. Its modifications in rickets and enteritis]. *Revue mensuelle des maladies de l'enfance* [Paris], vol. 15 (1897), pp. 401–419.

Following a summary of work of French and German investigators the authors report the results of 18 analyses of the gastric juice of normal infants from birth to 2 years of age. Methods are described, and each analysis is given. Numerous comparisons are made with results of the analysis of the gastric juice of adults and of sick infants.

107 **Ladd, Maynard:** "The influence of variations of diet upon gastric motility in infants." *Arch. Pediat.* [New York], vol. 30 (1913), pp. 740–746.

In connection with a study of different diets observations made by means of 225 radiographs of infants' stomachs are discussed. The technique used and individual cases are described.

108 **Langstein, Leo:** "Die Eiweissverdauung im Magen des Säuglings" [Albumin digestion in the infant stomach]. *Jahrb. f. Kinderh.* [Berlin], vol. 64 (1906), pp. 139–153.

The author's purpose was to test nitrogenous substances through the alimentary canal of infants by exact chemical methods, which are carefully described. He had 20 subjects, young infants breast fed and artificially nourished, healthy and dyspeptic, in the Children's Clinic of the University of Berlin. The investigation was limited to albumoses, peptones, and amino-acids. After his stomach had been washed out each infant was fed and his stomach contents removed after half an hour. In both physiological and pathological cases the formation of albumoses and peptones took place in the infant stomach. It could not be decided, however, whether they originated from pepsin or from bacteria. Amino-acids were not found in the infant stomach. Tryptophan reaction in pathological cases was likewise missing. Human and cow's milk showed similar action in peptone formation.

109 ——— **and Max Soldin:** Über die Anwesenheit von Erepsin im Darmkanal des Neugeborenen, resp. Fötus" [The presence of erepsin in the intestinal canal of the newborn infant and fetus]. *Jahrb. f. Kinderh.* [Leipzig], vol. 67 (1908), pp. 9–12.

The author proved that erepsin was present in the intestinal canal of a newborn infant by experiments on the cadaver of a premature child that died eight hours after birth. In one cylinder he placed 20 cubic centimeters of peptone solution and 30 cubic centimeters of the small intestine; in the second cylinder a like amount of peptone and 60 cubic centimeters of intestine (10 cubic centimeters of peptone solution contained 11.2 milligrams of nitrogen). After 24 hours he found in cylinder one the biuret reaction weaker but distinctly present—15.4 milligrams of nitrogen to 10 cubic centimeters of the filtrate, and in cylinder two the biuret reaction barely indicated—17.2 milligrams of nitrogen to 10 cubic centimeters of filtrate. After 48 hours the biuret reaction was still further weakened in cylinder one and negative in cylinder two. Similar experiments concerning the presence of erepsin were conducted on a newborn calf and on human fetuses.

110 **Legueu, Felix:** "La situation du cæcum chez l'enfant" [The position of the cecum of the child]. *Bulletins de la Société anatomique de Paris*, Year 67, ser. 5, vol. 6 (1892), pp. 55–69.

Data for this descriptive study were obtained by examination of cadavers of 100 children 1 month to 15 years of age. References.

111 **Leo, Hans:** "Über den gasförmigen Mageninhalt bei Kindern im Säuglingsalter" [On the gaseous content of the stomach in infancy]. *Zeitschrift für Klinische Medicin* [Berlin], vol. 41 (1900), pp. 108–129.

The author studied the gas often found in the stomachs of infants up to 2 years old. He presents a table of his findings in carbon dioxide, oxygen, nitrogen, etc., in the case of five healthy infants, ranging from 4 to 14 months, of whom 1 was breast fed, 2 fed on cow's milk, and 2 on gruels. The nitrogen amounted to 75.11 per cent to 83.36 per cent, oxygen 12.74 per cent to 20.92 per cent, carbon dioxide 3.35 per cent to 4.59 per cent. The nitrogen and oxygen come from swallowing air, as does also carbonic acid in large part, the other part from fermentation. The breast-fed infant has less gas because it swallows less air. The author also gives a table with discussion of experiments on 25 infants having intestinal disturbances. He believes his experimentation has stressed the importance of the motor function of the infant stomach.

112 ——— "Über die Function des normalen und kranken Magens; und die therapeutischen Erfolge der Magenausspülung im Säuglingsalter" [The function of the normal and diseased stomach, and the therapeutic results of gastric lavage in infancy]. *Berliner Klinische Wochenschrift*, no. 49, vol. 25 (1888), pp. 981–986.

The author has made gastric analyses or has done gastric lavages on 134 infants. Thirty normal infants from 2 hours to 12 months old demonstrated the physiological functioning of the infant stomach. In these cases mother's milk remained from 1 to 1½ hours in the stomach; artificial nourishment remained 2 hours. Immediately after a meal mother's milk showed a reaction that was alkaline, amphoteric, or neutral; cow's milk showed a reaction amphoteric, neutral, or weakly acid. After 15 minutes the reaction in mother's and cow's milk was acid and became increasingly so. Propeptone, pepsin, and a coagulating ferment were found, but in smaller quantities than in the adult's stomach.

113 ——— "Untersuchungen über den Mageninhalt des Säuglings und Neugeborenen unter physiologischen und pathologischen Verhältnissen" [Investigations of stomach contents of the infant and newborn under physiological and pathological conditions]. *Tageblatt der 61 Versammlung Deutscher Naturforscher und Ärzte in Köln* [Cologne], 1889, p. 112.

Without giving the number of subjects the author states many results of his tests on milk removed from the stomachs of infants: Reaction after 10 minutes is always acid; pepsin is almost always and rennin always present; even one-half hour after a meal a large part of the milk has left the stomach, which is empty after 2 hours; peptone and propeptone are found, though not in large quantities; the principal task of digestion is carried on in the intestine.

114 **Leven, G., and G. Barret:** "L'estomac du nourrisson" [The infant's stomach]. *Presse médicale* [Paris], 1906, pp. 503–504.

After commenting on the ease with which the infant's stomach may be observed the authors show how it differs from the adult's stomach in that it has a more nearly horizontal than vertical position, sometimes extends much below the navel and sometimes is much above it, and contracts very decidedly for the evacuation. In the infant stomachs observed by the authors the quantities ingested varied from 80 to 175 cubic centimeters and required from 1 hour and 45 minutes to 2 hours for digestion. The duration seemed to be the same for maternal milk and for diluted cow's milk. Four figures are shown.

115 **von der Leyden, Else:** "Über die Schleimzone des menschlichen Magen- und Darmepithels vor und nach der Geburt" [The mucous zone in the epithelium of the human alimentary canal before and after birth]. *Virchow's Archiv* [Berlin], vol. 180 (1905), pp. 99–107.

The author dwells at length on previous investigations concerning the mucous zones of the epithelium of the alimentary canal before describing her own work upon 13 cases, 6 of which she describes in great detail. These 6 comprised a fetus, 4 newborn, and 1 infant 14 days old. She concludes in opposition to Disse and Behring that in nurslings the upper part of the epithelium of the stomach is formed of a continuous mucous zone, of varying width even in infants of the same age; with reference to development and number of goblet cells the intestinal canal of the fetus and newborn children does not differ from that of older children.

116 **Lomer:** "Über Gewichtsbestimmungen der einzelnen Organe Neugeborener" [Determinations of weight of various organs in newborn infants]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 16 (1889), pp. 106–130.

The author personally weighed the organs of 50 newborn infants of normal size, of whom 35 were born dead. He discusses kidneys, heart, lungs, thyroid apparatus, thymus, suprarenal capsules, liver, and spleen and compares his findings with those of Ruge and others. Numerous tables and two graphs show data. Among other things the author concludes that heart and kidneys appear to suffer no change in weight at birth; thyroid apparatus, thymus, and suprarenal capsules, especially the two last organs, decrease in weight after birth and to a slight extent the liver does the same; the lungs, however, increase in weight.

117 **Lorey, Carl:** "Gewichtsbestimmung der Organe des kindlichen Körpers" [Determination of weight of organs of the child's body]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 12 (1878), pp. 260–274.

The author presents weights of organs of 60 children examined by him aged 10 days to 6 years. Three tables are given.

118 **MacCarty, W. C.:** "Beiträge zur normalen und pathologischen Histologie des Wurmfortsatzes" [Contributions to the normal and pathological histology of the vermiform appendix]. *Virchow's Archiv* [Berlin], vol. 185 (1906), pp. 483–517.

A study of the vermiform appendix in physiological and pathological condition in the case of seven children and some adults. In the embryo and the newborn the relative length of the appendix and the big intestine is as 1 to 10 (in the adult 1 to 20). In children the length varies between 3.5 and 7.5 centimeters and the width between 2 and 6 milligrams. Plates, figures, and a bibliography are included.

119 **McClendon, J. F.:** "Acidity curves in the stomachs and duodenums of adults and infants, plotted with the aid of improved methods of measuring hydrogen-ion concentration." *Am. J. Physiol.* [Baltimore], vol. 38 (1915), pp. 191–199.

The author believes that superior results can be obtained from test meals, if abundant and tasteful, and if removed only in very small quantities every half hour. He used a small tube with bucket on the end, swallowed, and obtained the hydrogen-ion concentration by lowering a hydrogen electrode into the stomach. In addition to experiments on adults he describes 27 samples of the gastric contents of infants in their first month and 23 samples of the duodenal contents, the latter taken by means of the catheter. He found hat the gastric acidity rises slowly from 15 minutes to 1 hour after nursing and then rapidly till the stomach is empty. Peptic digestion in the stomach seems unimportant. On an average the duodenum is more acid than the stomach, and peptic digestion must take place there.

120 ——— "Differences in the digestion in adults and infants." *J. A. M. A.* [Chicago], vol. 65 (1915), pp. 12–14.

The author measured the acidity of the stomach and reaction of the duodenal contents in infants (number of observations not stated) and found that the acidity rises slowly after the milk begins to leave the stomach and four hours after nursing may be the same as that of some normal adult stomachs. The acidity of the gastric juice of the newborn is 0.005; that of the duodenal contents of the infant 0.0008. References.

121 **Major, Ralph:** "Röntgenologische Beobachtungen am Säuglingsmagen" [Röntgen observations on the infant stomach]. *Ztschr. f. Kinderh.* [Berlin], vol. 8 (1913), pp. 340–350.

A Röntgen-ray study of the stomachs of 31 convalescent infants between 9 days and 11 months old. Barium, the author found, gives a good impression of the form and position of stomach but not of the amount it contains. When the infant is in an upright position its stomach looks like an inverted retort with the air bubble high; when it is lying, the stomach has the irregular form of a partly filled sack with the bubble low. There is a striking movement of the infant stomach, caused chiefly by swinging of the diaphragm. The peristalsis is not so strong as in adults. Between meals the infant stomach often is not contracted but is filled with air.

122 **Mengert, Emil:** "Untersuchungen über den Fermentgehalt des Säuglingsmagens" [Investigations on the ferment content of the infant's stomach]. *Ztschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 85–95.

After giving in detail methods he used in determining rennin and pepsin the author presents a table of 38 studies on nine infants in his clinic, from which he derived as normal values, rennin units, 100–150; pepsin, 1–1.5; total acidity, 40–55; p^H=5. He believes that in both healthy and sick infants there exists a strict parallelism between rennin and pepsin. The relation quantitatively of rennin to pepsin is exactly the same in infant as in adult. "The same ferment that functions as lab in the p^H of the infant secretion functions as pepsin in the p of the normal adult stomach." These ferments are probably the same. Bibliography.

123 **Mensi, E.:** "La digestione nei bambini sani secondo il metodo Hayem e Winter" [Digestion in well children according to the method of Hayem and Winter]. *Giornale della reale Accademia di medicina di Torino* [Turin], ser. 3, vol. 11 (1892), pp. 181–190.

The author made 22 chemical tests (according to the Hayem and Winter method) of the stomach contents of 11 healthy children 3 to 5 years old. Full information is given for each day separately, and at the end of the article there is a general summary of the results, giving the acidity, percentage of organic chlorin and of fixed chlorines, also a comparison of these results with those obtained by the writer previously for rachitic children.

124 **Meyer, Adolph H.:** "Zur Kenntnis der Magensaftsecretion der Säuglinge" [The gastric secretion of infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 35 (1902–3), pp. 79–111, 177–222.

Discussion of investigations carried on by other students and 30 pages of tables and 12 pages of case histories of the author's own experimentation. He washed out the stomach after his subject had fasted several hours and gave a test meal of milk or oftener of barley water. His methods of analysis are described. Most of the infants thus studied suffered from acute gastrointestinal trouble or chronic affections, but 17 were normal and healthy. All were bottle fed. In the case of the healthy infants, the stomach was empty 1 to 1½ hours after a meal of barley water, 3 to 3½ hours after a meal of milk. Organic acids were absent with the former diet and present with the latter. At the beginning of digestion the secretion was the same for all foods. Pepsin was always found. No relation could be found between pepsin, acidity, and the coagulating ferment.

125 **Moll, Leopold:** "Zur Kenntnis des Parotisspeichels beim Säugling" [Parotid saliva of the infant]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 4 (1905–6), pp. 307–308.

The author analyzed pure parotid secretion from a fistula due to abscess in a seven-month infant. Pure secretion was clear as water and flowed in drops; with pressure it was more abundant, darker, and thicker. It clotted and gave an alkaline reaction. It contained a little albumin. On a starch paste at 38° it showed amygdalin, erythrodexterin, achroodextrin, and sugar, but no rhodan.

126 **Moro, Ernst:** "Beiträge zur Kenntnis des Labenzyms" [Contributions to knowledge of lab-enzyme]. *Centralblatt für Bakteriologie und Parasitenkunde* [Jena], pt. 1, vol. 37 (1904), pp. 485–491.

The author is interested in the presence of lab in the stomach of the newborn. He discusses current opinion and presents a table of his tests on the mucous membrane of the infant stomach which indicate that it does contain lab-enzyme and that the lab is to be found before food is given. Another table compares human and bovine lab. Antilab he obtained from rabbits. Raw but not boiled human milk influenced caseation of fresh cow's milk. The antirennin power of human milk is specific. Antiferment in human milk may be identical with antilab found in blood serum by Helge Röden, or it may be a specific reaction of casein itself.

127 **Mosenthal, H. O.:** "Gastric capacity of infants." *Arch. Pediat.* [New York], vol. 26 (1909), pp. 761–772.

The author studied 24 infants at the New York Foundling Hospital, from 4 to 35 weeks of age, noting the ounces of milk given at a nursing, the ounces ingested, and the postmortem gastric capacity of the stomach, determined by methods carefully described. Comparison of his results with the observations

of others led him to the conclusions that the quantity of milk given at a nursing should exceed the measured gastric capacity for an infant of a given age by a considerable margin and that the interval between nursings should never be less than two and one-half hours for breast-fed and three hours for bottle-fed infants. References.

128 **Müller, Wilhelm:** "Zur Kenntniss des Verhaltens von Milch und Casein zur Salzsäure" [Reaction of milk and casein with hydrochloric acid]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 34 (1892), pp. 439–458.

The author attempted to determine the relation of hydrochloric acid to digestion of casein in the infant stomach. In casein solution + 0.1 per cent hydrochloric acid with addition of small amounts of pepsin, about 93.5 per cent casein was digested; with 0.8 per cent hydrochloric acid about 90 per cent casein was digested. Increase or decrease of the quantity of pepsin made no noticeable difference. Casein of human milk containing 0.25 per cent hydrochloric acid showed digestion of 95 per cent. Tables.

129 **Muggia, A.:** "La capacità e la posizione del ventricolo nei bambini" [Size and position of stomach in children]. *Giornale della reale Accademia di medicina di Torino* [Turin], ser. 4, vol. 2 (1896), pp. 351–355.

A brief account of clinical and anatomical researches made by the author on the size and position of the stomach in children of various ages for the purpose of finding a better criterion for diagnosing gastric dilatation in children.

130 **Nicory, Clement:** "Salivary secretion in infants." *Biochemical Journal* [Cambridge], vol. 16 (1922), pp. 387–389.

To determine the age of onset of the secretion of ptyalin in the saliva of infants the author tested the saliva of 80 infants at St. Thomas's Hospital and Evelina Hospital, London. Methods of testing are described and results tabulated. He found ptyalin present in the saliva of infants, in small quantities, at least one and one-half months before term. The amount of enzyme increased gradually to the age of 1 year, when the composition of the child's saliva became identical with that of the adult. The quantity of ptyalin was larger in strong than in weak infants.

131 **Nothmann, Hugo:** "Zur Frage der "psychischen" Magensaftsecretion beim Säugling" [The question of "psychic" gastric secretion in the infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 51 (1909), pp. 123–138.

The author studied gastric secretion as a result of sham feeding in 34 tests on 22 children between 10 hours and 11½ months old, both breast fed and bottle fed. The tests were made 10 minutes after the stimulation, which followed a fast of 8 to 12 hours. In 25 cases the undiluted gastric secretion was obtained and in 9 cases only traces in rinsing water. Amounts could not be ascertained precisely, since there exists a bare possibility of the opening of the pylorus and since it is impossible to empty the stomach completely. The 2 to 4 cubic centimeters of pepsin obtained in most of the tests is large considering that the secretion of juice is preceded by a preparatory period of 5 minutes. Though the pepsin varied in quantity, it never was absent. Hydrochloric acid was absent nine times in cases of exudative diathesis or other disturbance; in other cases it was so strong as to color Congo paper dark blue. In the eight tests for rennin it never failed to appear. The author decides that the gastric secretion is not called forth by mechanical stimulus and concludes from experimentation on a 9-month-old infant that the reaction attends the mere sight of food and is therefore psychic, but in the young infant it is purely reflex, like the sucking reflex.

132 **Panzer, Paul:** "Die graphische Darstellung des Appetites und der Bewegungen der Säuglinge auf den Übersichtskurven" [Graphic representation of infant's appetite and motions, in the inspection curve]. *Ztschr. f. Kinderh.* [Berlin], vol. 29 (1921), pp. 90–92.

The author has devised a method of representing liveliness of movement in infants: A given line stands for normal vivacity, one line above for decided, and another line above for exaggerated liveliness; in the same way one line below means subnormal activity and two lines below, the quietness of sickness. In a large graph the author shows curves of weight, movement, appetite, temperature, and nourishment.

133 **Pautz, W., and J. Vogel:** "Über die Einwirkung der Magen- und Darmschleimhaut auf einige Biosen und auf Raffinose" [Effect of gastric and intestinal mucous membrane on some bioses and on raffinose]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 32 (1895), pp. 304–307.

The author tested the effect of the mucous membrane of the small intestine of several dogs and of two newborn infants on maltose, raffinose, and isomaltose. After a small amount of sugar had been dissolved in water and mixed with an extract from the mucuous membrane results were noted immediately and also after intervals of 24 and 48 hours in the oven. Results are shown in tables. For the children the raffinose was + 1.40 and + 1.45 for all three periods. The maltose was + 1.60, + 0.95, and + 0.95, + 1.60, + 1.10, and + 1.00 for the three periods, respectively.

134 **Péterí, Ignaz:** "Die Röntgen-Untersuchungsergebnisse des Dickdarmes im Säuglings- und im späteren Kindesalter" [Results of Röntgen investigations on the large intestine in infancy and childhood]. *Jahrb. f. Kinderh.* [Berlin] new ser. vol. 82 (1915), pp. 87–102.

The author took X-ray photographs of the large intestine of 3 newborn infants, 6 less than 1 year of age, 3 in their second year, and 16 from 2 to 8 years old. In 16 cases the exposures were made after the colon had been filled through the rectum with barium sulfuricum purissimum and a wheat starch; in 9 cases, while it was being filled; and in 3 cases after thorium oxydatum had been given per os. The article contains much information on the value of radiograms, on the position, size, volume, haustral churning of the large intestine of both adults and children. There are four figures of the sigmoid flexure, and a long bibliography.

135 **Pewny, Rudolf:** "Zur Kenntnis der Verdauungsvorgänge im Säuglingsmagen" [Knowledge of digestive processes in the infant stomach]. *Monatschr. f. Kinderh.* [Berlin], vol. 21 (1921), pp. 548–562.

After a résumé of others' conclusions on infant digestion the author gives case histories of his own investigation, 60 tests on 30 infants, between the ages of 2 and 12 months. He used a Nelaton catheter to raise stomach contents: methods of analysis are described. The diet was milk or food prepared therefrom. Bibliography.

136 **Pfaundler, Meinhard:** "Über Magencapacität im Kindesalter" [Capacity of stomach in childhood]. *Wiener Klinische Wochenschrift*, vol. 10 (1897), pp. 961–964.

This article gives the capacity of the infant stomach for the first 12 months and a table of values for each of the first 12 months and of the first 8 years in capacity, expansion, elasticity, and circumferences of polyrus. The author experimented on living children by means of a simple apparatus and on cadavers, both with the stomach in place and with it extracted. The stomach capacity varied not according to age or weight but according to length of trunk and of body. The stomach of breast-fed infants had a smaller capacity than that of artificially-fed infants; and the stomach of healthy infants had a smaller capacity than that of sick infants. Small stomachs had greater expansion and elasticity than large. According to the author, it is often salutary to empty an infant's stomach but dangerous to overfill it or wash it out. Overdistention of the stomach, which is injurious to health, was never found in breast-fed infants under 1 year of age.

137 ——— "Über Saugen und Verdauen" [Sucking and digestion]. *Wiener Klinische Wochenschrift*, vol. 12 (1899), pp. 1012–1015.

Experiments were made with nine infants to observe the effects of the act of sucking upon digestion. The author concludes that the act of sucking has many beneficial effects, one of the most important being its stimulating effect upon the secretion of digestive juices in the stomach.

138 **Pisek, Godfrey Roger, and Leon T. Le Wald:** "Pyloric obstruction, with a comparative study of the normal stomach of infants." *Arch. Pediat.* [New York], vol. 29 (1912), pp. 911–926.

Reproductions are given of 22 Röntgenograms of infants' stomachs in normal and pathological conditions.

139 ——— "The further study of the anatomy and physiology of the infant stomach based on serial Röntgenograms." *Transactions of the American Pediatric Society* [Washington], vol. 25 (1913), pp. 150–163. See also *Am. J. Dis. Child.* [Chicago], vol. 6 (1913), pp. 232–244.

This article gives reproductions of 29 radiographs of the stomachs of 13 infants from 2 days to 20 months old, taken at stated times after food had been administered. The technique of the radiographic work and the kind and method of feeding are fully described. The authors call attention to the importance of checking up present-day anatomical knowledge with Röntgenograms; find no definite normal type of stomach in the infant; and note the rapid passage of food out of the pylorus as compared with generally accepted ideas. Discussion.

140 **van Puteren, M.:** Materiali dlia fiziologii zheludochnavo pishchevarenia u grudnikh dietie v pervie dva miesiatza zhisni [Data on the Physiology of Gastric Digestion in Infants in the First Two Months of Life]. V. Kirschbaum, St. Petersburg, 1889. 46 pp.

Thesis (University of St. Petersburg). After quoting a number of writers on digestion in infants the author describes his own study of digestion in 248 infants, boys and girls in nearly equal numbers, aged 2 to 41 days. The investigation was made in a hospital, only perfectly well children being studied. Tests of the stomach contents numbered 1,027. The author also gives the weight of children and their daily gain. He studied (1) the length of the time which the food remained in the stomach, (2) the acidity of the stomach contents, (3) kinds of acids found in the stomach, (4) extent of the antiseptic power of the stomach contents, and (5) products of digestion of albumin found in the stomach. A number of tables and charts are presented.

141 **Ramsey, W. R:** "The occurrence of pepsin in the infant stomach and the dependence of its digestive power upon the presence of hydrochloric acid." *Arch. Pediat.* [New York], vol. 26 (1909), pp. 341–351.

Gastric analyses are reported on 13 normal breast-fed infants. A table includes diagnosis, weight, amount of gastric juice, reaction to litmus, to Congo paper and Gunzberg and Uffelmann's reagent, the dilution of the gastric juice, and the pepsin value. The technique for analyses is given. A larger number of sick children were similarly studied. The author's conclusions were that the normal infant's gastric juice contains pepsin; that the gastric juice is capable of transforming protein to peptone without the introduction of any acids except those normally secreted; that pepsin is active in the presence of lactic acid when no hydrochloric acid is present; that hydrochloric and lactic acid and pepsin occur independently of one another.

142 **Rasor, H.:** Über den Einfluss des Milchzuckers auf die Dünndarmperistaltik" [Effect of lactose on peristalsis of small intestine]. *Jahrb. f. Kinderh.* [Berlin], vol. 44–46 (1921), pp. 1–4.

The author gives results of his studies carried out with eight children from 9 to 21 months old. He found that lactose stimulates intestinal peristalsis.

143 **Rąudnitz, R. W.:** "Über das Vorkommen des Labfermentes im Säuglingsmagen" [The presence of rennet ferment in the infant stomach]. *Prager Medizinische Wochenscrift*, vol. 12, no. 24 (1887), p. 198.

In 1886 the author analyzed the stomach contents of seven infants in Munich. After describing his methods he states his conclusion: In the case of infants 1 to 7 days old there is little or no possibility of coagulation due to rennet, but the coagulation is unmistakably present in infants 6 months old.

144 **Reeve-Ramsey, Walter:** "Über das Vorhandensein von Pepsin im Magen des Säuglings und die Abhängigkeit seiner verdauenden Kraft von der Anwesenheit von Salzsäure" [The presence of pepsin in the infant's stomach and the dependence of its digestive power on the presence of hydrochloric acid]. *Jahrb. f. Kinderh.* [Berlin], vol. 68 (1908), pp. 191–204.

The author conducted investigations in the Children's Clinic of the University of Berlin on pepsin in the stomach of infants. In the morning after a night without food they were given weak Russian tea without sugar. He removed the contents of their stomachs after one hour and used the Edelstein test for pepsin, which he describes. Thirteen tests on the stomachs of five normal breast-fed infants all showed the presence of pepsin; the reaction of the secretion was 10 times acid, 3 times neutral; hydrochloric acid was 7 times positive, 6 times negative; lactic acid was 6 times positive, 7 times negative. In 34 other tests on 22 children more or less ill pepsin was not found in all cases, but was often present; the reaction of the secretion was 18 times acid, 16 times neutral or alkaline; hydrochloric acid was 14 times positive, 20 times negative, lactic acid was 9 times positive, 25 times negative. Further tests were made in cases of a distinct milk or hydrochloric-acid reaction. The author concludes that the gastric secretion of normal infants can change protein into peptone even when lactic acid is present and hydrochloric acid is absent.

145 **Reiche, Adalbert:** "Zur Frage des Rückflusses von Pankreassaft in den Magen des Säuglings" [The reflux of pancreatic juice into the infant's stomach]. *Ztschr. f. Kinderh.*, vol. 6 (1913), pp. 235–239.

Since it has been established that in a healthy adult after a test meal of oil, pancreatic juice flows into the stomach, the author experimented relative thereto upon 17 healthy infants who were on various diets and were from 6 weeks to 1½ years old. Three and one-half hours after their last meal he gave them one-half teaspoonful of magnesia usta and 70 to 100 cubic centimeters of raw cream from cow's milk and 20 minutes later another one-half teaspoonful of magnesia usta. The stomach content was raised three-fourths to one and one-fourth hours afterwards and tested for trypsin and lipase. Neither was found. To 10 other children he gave a palmin mixture and found a lipase but no trypsin. He concludes that as regards the pancreatic secretion there is a difference between adults and nurslings.

146 **Reyher, Paul:** "Über die Ausdehnung der Schleimbildung in den Magenepithelien des Menschen vor und nach der Geburt" [Extent of mucous-membrane formation in the stomach epithelium of human beings before and after birth]. *Jahrb. f. Kinderh.* [Berlin], vol. 60 (1904), pp. 16–28.

After briefly repeating what other authors have ascertained concerning mucous-membrane formation in the stomach epithelium the author describes his histological findings in nine fetuses and newborn infants. He is most interested in a conclusion at which he arrived in agreement with Benda, Toldt, Eischl, Schmidt, Sacerdotti, and in contrast to Disse, that not only at the time of birth but fairly early in the fetal period a mucous layer is present completely separating tissue from lumen of stomach. Figures illustrate the article. Bibliography.

147 **Ribbert:** "Beiträge zur normalen und pathologischen Anatomie des Wurmfortsatzes" [Contributions to normal and pathological anatomy of vermiform appendix]. *Virchow's Archiv* [Berlin], vol. 132 (1893), pp. 66–90.

The first section discusses the size and histology of the appendix in relation to age, etc., and contains a table giving the average length as 3½ centimeters for newborn infants, 7⅜ centimeters for children up to 5 years, 9 centimeters for children from 5 to 10, and 9¾ centimeters for those between 10 and 20. After that age the size gradually decreases. The relation of the size of the appendix to the large intestine is given as 1 to 10 in the newborn and 1 to 20 in adults. The follicles of the mucous membrane are easily visible to the naked eye in children but are much less distinct in adults.

148 **Rittershain, G. Ritter:** "Das Mundsecret der Neugeborenen und jüngeren Säuglinge" [Secretion in the mouths of newborn and young infants]. *Jahrbuch für Physiologie und Pathologie des Ersten Kindesalters* [Prague], vol. 1 (1867), pp. 131–151.

From tests on many hundreds of infants the author ascertained that reaction is almost always acid. A table for 21 infants indicates that in the first six weeks and usually much longer no saccharific quality can be detected in human saliva. Nine tests for potassium sulphocyanate were negative.

149 **Robbin, L.:** "The length of the large and the small intestine in young children." *Am. J. Dis. Child.* [Chicago], vol. 19 (1920), pp. 370–374.

In 1894 at the New York Babies' Hospital the author in a period of two years measured the length of the bodies and the large and small intestines of 185 cases. These data are tabulated by age, and the ratio of body and intestinal lengths is given. No correlation was established between the length of the intestine and clinical indications.

150 **Robinson, B.:** "The length of the small intestines in one hundred and thirteen cases." *Mathews' Medical Quarterly* [Louisville], vol. 11 (1885), pp. 338–344.

In measuring the small intestines of 113 adult subjects the author found a variation from a minimum of 11 feet to a maximum of 33 feet. Measurements of the intestines of several newborn infants showed a variation from 6½ to 12 feet; of one child, 8 months old, a length of 14⅓ feet; one child, 18 months old, 18 feet. From his own observations and the work of others the author concludes that infancy and childhood are probably the periods of real intestinal growth and that the variations in length of the intestines of adults may be due to disturbed bowel conditions during these periods.

151 **Rolssenn, Theodor:** Ein Beitrag zur Kenntniss der Langenmaasse des deutschen Darms [Contribution to the Study of the Linear Measurements of the German Intestine]. Dorpat, 1890. 53 pp.

Inaugural dissertation (University of Dorpat). The cadavers for this study were obtained from Virchow's Institute, the hospital at Moabit, and the morgue at Berlin. The subjects were without exception of the German race. Besides the intestine the author noted the general condition of the body, weight, height, length of torso, sex, age, and social standing. The data are given for 27 men, 23 women, and 16 children up to the age of 15 years. Length of sigmoid jejunum, jejuno-ileum, and colon is given. Various relations are shown between these measurements. Similar tables are given for men, women, and children suffering from pathological conditions of the abdomen.

152 **Rosenstern, J.:** "Untersuchungen über die Pepsinsekretion des gesunden und kranken Säuglings" [Investigations on the pepsin secretion of the healthy and sick infant]. *Berliner Klinische Wochenschrift*, vol. 45, pt. 1 (1908), pp. 542–544.

For his experiments on the pepsin secretion of young infants the author employed the ricin and hydrochloric-acid method described by Jacobi. His tests were made from 7 to 8 a. m. Before giving them he did not wash out the stomach. The contents were removed 10 minutes after the meal, which usually consisted of sweetened tea. Table I giving data for 20 healthy, artificially-fed infants from 10 days to 1 year old shows that the pepsin secretion increases with age up to 3 months and then remains constant. Table II for 5 infants gives the same results with a milk diet as with tea. Table III for eight breast-fed infants shows less pepsin than for artificially-fed infants of the same age. Table IV for underweight infants shows that the pepsin secretion corresponds to age, not weight. Tables V and VI for dyspeptic infants show no diminution of pepsin. Therefore, the author concludes the pepsin secretion is not of symptomatic value.

153 **du Saar, M. C.:** Melkstremmende werking van den maaginhoud bij jonge zuigelingen [Milk-Coagulating Action of the Stomach of the Young Infant]. Scheltema & Holkema, Amsterdam, 1890. 65 pp.

The author, quoting from a number of writers, gives the history of the theory of milk curdling, of rennins and renninogens in man and animal. He describes his method of studying the stomach contents of young infants, and the coagulation of cow's milk and human milk in the stomach. He also compares the infant's and the adult's digestion of cow's milk in the stomach.

154 **Salge, B.:** "Salzsäure im Säuglingsmagen" [Hydrochloric acid in the infant stomach]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 4 (1912), pp. 171–173.

Davidsohn's assertion that too little acid as measured by the concentration of hydrogen ions in the infant stomach for a peptic digestion of albumin is confirmed by the author on the basis of 11 experiments on infants, including the healthy breast-fed infant. His conclusion does not apply to older children on adult fare. The results of the tests are presented.

155 ——— "Salzsäure im Säuglingsmagen" [Hydrochloric acid in the infant stomach]. *Ztschr. f. Kinderh.* [Berlin], vol. 5 (1912–13), pp. 111–121.

A defense of previous work and a description of results obtained from more recent studies upon three healthy infants, 7 days old, 4 months old, and 7 months old and one sick infant 7 months old. In the youngest the author found a hydrogen-ion concentration of 2.3×10^{-6} and 1.824×10^{-6}, which precludes pepsin digestion. In the 4-month-old infant he discovered enough acid for pepsin digestion but not the optimum; in the weak 7-month-old infant not enough acid; in the healthy 7-month-old infant, the optimum for digestion. He further contends that no difference should be made between the periphery and the center of the stomach in testing human milk two hours after nursing. He states explicitly that healthy, breast-fed infants between 7 days and 2½ months old have too small a concentration of hydrogen-ions in the stomach to permit peptic digestion.

156 **Scammon, R. E., and L. O. Doyle:** "Observations on the capacity of the stomach in the first ten days of post-natal life." *Am. J. Dis. Child.* [Chicago], vol. 20 (1920), pp. 516–538.

The gastric capacity of infants in the first 10 days of life was determined by weighing before and after feeding. Observations numbering 14,571 were made on 323 infants at the Elliot Memorial Hospital of the University of Minnesota. From these are derived averages, maximum and minimum gastric capacities, the gastric capacity in terms of percentage of body weight, and comparison between the capacity of first-born and later infants. Data are given in full and tabulated.

157 **Schiffer:** "Die saccharificirenden Eigenschaften des kindlichen Speichels" [The saccharific properties of children's saliva]. *Berliner Klinische Wochenschrift*, 9th year (1872), pp. 353–354.

To ascertain whether infants possess a sugar-forming ferment the author placed starch paste wrapped in tulle in the mouth of an infant 16 days old and also of newborn infants 5 to 10 minutes. By Trammer's method he obtained a positive sugar reaction every time.

158 **Schilling, F.:** "Zur Sekretion der Speicheldrüsen, insbesondere der Glandula submatillaris, im Säuglingsalter" [The secretion of the salivary glands, especially of the submaxillary gland, in infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 58 (1903), pp. 518–527.

Questioning Schlossmann's theory that the young infant has no ferment for digesting flour, the author discusses previous investigations relative thereto and then describes his own experiments with potato-starch paste on the submaxillary glands of dead calves and in the mouths of living infants from 9 days to 6 weeks old, of whom one was frail and fed on cow's milk and the others were healthy and breast fed. There was a positive sugar reaction in every case.

159 **Schutz, Julius:** "Über die Bedeutung der Salzsäure für die Verdauung des Säuglings" [Significance of hydrochloric acid for the infant's digestion]. *Wiener Medizinische Wochenschrift*, vol. 56 (1906), pp. 2002–2006, 2057–2061.

The author studied the significance of hydrochloric acid in infant digestion, using Volhard's principle that the acidity of a casein solution rises through pepsin digestion, and concludes that even with a deficit of hydrochloric acid a very active pepsin digestion can be determined. In his opinion total acidity is the important determining factor of pepsin digestion.

160 **Sedgwick, Julius Parker:** "Die Fettspaltung im Magen des Säuglings" [Fat splitting in the stomach of the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 64 (1906), pp. 194–202.

A history of research on fat splitting in the infant stomach, tables of experiments on infants and on rabbits by the Volhard-Stade method, and a long bibliography. The author concludes that a fat-splitting enzyme is to be found in the infant from the second week of life on; this fact explains at least in part the relatively high acidity of the infant stomach; the organic acids soluble in ether to be found in the stomach of the healthy infant are for the most part higher fatty acids insoluble in water, owing their origin to fat-splitting enzymes.

161 ——— "The digestion of fat in the infant stomach." *Arch. Pediat.* [New York], vol. 23 (1906), pp. 414–425.

A report on the presence of fat-splitting ferments in infancy. The technique is fully given. Four examinations of infants' stomach contents were made and additional observations on young rabbits. The author's conclusion is that there is a ferment present in the infant's stomach which partially splits milk fat.

2 **Sedgwick, Julius Parker:** "The hydrogen-ion concentration of the gastric and duodenal contents in childhood." *Transactions of the American Pediatric Society* [Lakewood, N. J.], vol. 27 (1915), pp. 303–311.

After a brief résumé of the work of other investigators the author reports the results of his own observations made by the gas-chain method, of 46 specimens of stomach and duodenal contents of infants from 4 to 120 days old. Duodenal contents were obtained by the Hess method. He found low acidity in the gastric contents during the height of digestion; a sharp rise in acidity toward the close of the digestive period; very acid gastric contents in the stomach of a newborn infant before food was taken. The duodenal contents of infants, obtained by the Hess method, were not alkaline but showed a hydrogen-ion concentration of 79.5 to 0.9 $\times$ 10^{-5}. References.

3 **Seiler, Fritz:** "Die Untersuchung der Magenfunctionen der Kinder mittels Probefrühstück" [Investigation of stomach function in children by means of the test breakfast]. *Arch. f. Kinderh.* [Stuttgart], vol. 55 (1910–11), pp. 256–268.

The author made gastric analyses on 41 children, using a test breakfast of flour gruel. Children up to 1 year received 100 cubic centimeters; 1 to 7 years, 150 cubic centimeters; 8 to 12 years, 200 cubic centimeters; above this age, 250 to 300 cubic centimeters. After 1 hour 25 to 30 per cent of the meal was recovered. The findings corresponded to those in adults.

4 **Shaw, H. K. L.:** "Starch digestion in infancy." *Albany Medical Annals*, vol. 25 (1904), pp. 148–153.

The author made a series of tests on infants to determine whether they were able to digest starch. Thirty-five infants were given barley water on various occasions instead of their regular feedings, and 100 of such barley meals were removed and tested from 15 minutes to 2 hours after the feeding. Other tests were made on the stomach contents of 8 infants under 2 months old, from 30 minutes to 2 hours after a regular or barley-water feeding, to determine the presence of diastatic ferment. Tests were also made to determine the diastatic action of the saliva. All technique is fully described. The author found that the saliva of very young infants contains a diastatic enzyme capable of converting small amounts of starch into maltose and that this action may continue in the stomach as long as two hours after feeding. References.

5 **Sherman, D. H.:** "Gastric analysis in infants." *J. A. M. A.* [Chicago], vol. 54 (1910), pp. 1514–1515.

Gastric analyses were made on 42 normal infants by Töpfer's method. After a test meal of barley water removed in half an hour the analyses of the normal infants showed free hydrochloric acid 2.1; total hydrochloric acid 5.6; total acidity 9. After stronger food there was no free hydrochloric acid, and total hydrochloric and total acidity were "twice as high."

6 **Smith, Geo. M.:** "A statistical review of the variations in the anatomic positions of the caecum and the processus vermiformis in the infant." *Anatomical Record* [Baltimore], vol. 5 (1911), pp. 549–556.

Observations are based upon autopsies of 1,050 infants, mostly under 3 months of age, at the New York Foundling Hospital. Data are original. Table 1 gives location of caecum and number of cases and sex. Table 2 gives location and direction of appendix and number of cases and sex. Table 3 gives presence of ascending and descending meso-colon, number, and sex. Table 4 gives presence of superior and inferior duodenojejunal fossa.

7 **Steffen, A.:** "Über Grösse von Leber und Milz" [Size of liver and spleen]. *Jahrb. f. Kinderh.* [Leipzig], vol. 5 (1871–72), pp. 47–62.

The author has studied size of liver and of spleen in hundreds of children. In this article the tables give length, weight, chest dimensions, and 5 dimensions of the liver and 2 of the spleen in 51 normal boys and 52 normal girls from birth to 14 years old. The text gives changing proportions of liver and spleen as related to the body.

8 **Szydlowski, Zdzislaus:** "Beitrag zur Kenntnis des Labenzyms nach Beobachtungen an Säuglingen" [Contribution to the knowledge of rennin according to observations on infants]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 34 (1892), pp. 411–438.

The author presents a table on 63 children from a few hours in age to 6 years, giving their weight, health, amount of stomach contents raised and the time after the last meal, the consistency of stomach contents and its reaction to litmus, methylorange, phloroglucinvanillin, and the test for the presence of a coagulating enzyme. This rennin he found to be constantly present, regardless of age, development of hydrochloric acid, and of an acid, alkaline, or amphoteric reaction. For these experiences he used fresh, unboiled cow's milk. In another series of tests he added fresh human milk to the cow's milk with the result that the coagulation was much delayed. Boiled human milk, however, coagulated quickly.

9 ——— "Über das Verhalten des Labenzyms im Säuglingsmagen" [Behavior of lab-enzyme in the infant stomach]. *Prager Medicinische Wochenschrift*, vol. 17 (1892), pp. 365–367.

The author studied lab-enzyme by removing the stomach contents of 50 infants. The enzyme was positive in every infant, irrespective of age, health, and amount and kind of food.

170 **Talbot, F. B.:** "Casein curds in infants' stools. Biologic proof of thei casein origin." *Arch. Pediat.* [New York], vol. 27 (1910), pp. 440–44

To combat the theory that the tough curds in infants' stools are not casei the author first prepared a specific anticow casein serum (process described) By experiment he found that the protein substance in tough curds in infant stools reacts to the specific anticow-casein serum just as does casein obtaine from cow's milk. Three normal stools from bottle-fed infants contained n cow casein, as demonstrated by the precipitin reaction.

171 ——— "Physiology and pathology of the digestion of fat in infancy their application to infants' feeding." *Am. J. Dis. Child.* [Chicago] vol. 1 (1911), pp. 173–192.

The author considers 4 per cent of fat approximately normal in the food o a healthy infant. He outlines the powers of fat digestion in stomach an intestine; gives detailed directions for microscopic and macroscopic examinatio of the stools to discover their fat content; discusses metabolism experiment by the Rosenfeld and the Kumagawa and Suto methods. Extensive bibliography

172 **Taylor, Rood:** "Hunger in the infant." *Am. J. Dis. Child.* [Chicago] vol. 14 (1917), pp. 233–257.

Hunger contractions were studied by means of a rubber balloon of about 2 cubic centimeters' capacity attached to a soft rubber catheter and a bromofor manometer with float and writing lever. The subjects included five prematur infants weighing from 1,200 to 2,500 grams, 40 full-term infants under 3 week of age, 5 infants between 1 and 2 months, 2 between 3 and 4 months, 3 be tween 4 and 6 months, and 1 boy 2 years of age with a surgically induce gastric fistula. Numerous observations are recorded, with tracings of con tractions and tabular summaries of data. The author gives his conclusion under 19 heads. References.

173 ——— "Hunger and appetite secretion of gastric juice in infants' stom achs." *Am. J. Dis. Child.* [Chicago], vol. 14 (1917), pp. 258–266.

Using a flexible tube with a slotted weight at the tip combined with a simpl syringe, the author made 19 collections of "hunger juice" and "appetite juice from infants aged 2 hours to 5 months. He found no psychic secretion o gastric juice in the young infant but found that the empty stomach of hungry infant secretes a gastric juice which often is as acid as that found i the adult stomach; this secretion is not neutralized in the stomach but flow out into the small intestine; regurgitation through the infant's pylorus doe not occur. References.

174 ——— **Mildred R. Ziegler, and A. E. Gourdeau:** "Bile pigments an bile salts in the duodenal juice of children." *Am. J. Dis. Child.* [Chi cago], vol. 27 (1924), pp. 25–27.

Twenty-seven specimens of duodenal juice from 12 subjects 1 month to years of age were analyzed. Five of the subjects were normal. The author found a varying concentration of bile salts of from 0.2 to 5 per cent.

175 **Telemann, Walter:** "Über die Konfiguration des Ösophagus in Beziehun zu physiologischen und pathologischen Zuständen desselben" [On con figuration of the esophagus in relation to its physiological and patho logical condition]. *Archiv für Verdauungskrankheiten* [Berlin], vo 12 (1906), pp. 385–425.

After nine pages of tables on the esophagus of the adult the author present many measurements of the esophagi of 6 fetuses, 10 premature infants, and full-term infants, in which he establishes the biconcave form for infants tha never breathed and the biconvex form for infants that lived and breathe Other cases are described to illustrate peculiarities. There are two plate Bibliography.

176 **Terner, Karl:** "Das Wachstum und die Länge des Darmkanals im Kin desalter, Verhältnis der Darmlänge zur Sitzhöhe" [Growth and lengt of intestinal canal in childhood, relation of intestine length to sittin height]. *Ztschr. f. Kinderh.* [Berlin], vol. 21 (1919), pp. 408–409.

The author presents a table showing sitting height, standing height, lengt of torso from seventh cervical vertebra to the coccyx, length of small intestin of large intestine, of sigmoid, of vermiform appendix, and of whole intestina tract, and relation of the last to the sitting height. Nine cadavers of childre from 13 days to 13 years old were studied.

177 **Theile, R.:** "Zur Radiologie des Säuglingsmagens, mit besondere Berücksichtigung der Gestalts- und Lageveränderungen dieses Organe bei der Füllung und Entleerung" [The radiology of the infant stomach with special reference to the form and position of this organ in fillin and emptying]. *Ztschr. f. Kinderh.* [Berlin], vol. 15 (1916–17), pp 152–212.

Data are based on material collected in the Empress Augusta Victoria House Berlin. The apparatus used was the polyphos universal inductor Type II, wit an exposure of one one-hundredth second. Six hundred and sixty plate were made of 140 children, all but 15 under 1 year of age. Case histories o

the 140 are given, many diagrams of stomachs, 10 plates of 140 stomachs of which X rays were taken, and four tables showing the time the stomach required to empty in the case of 11 healthy breast-fed children, children of 10 healthy nurses, 9 newborn infants, and 9 premature infants. The emptying of the infant stomach can be followed radioscopically to within a few cubic centimeters without means of contrast. It took two or three hours for human milk and three to four hours for all kinds of artificial foods. It occurred more quickly after a full meal than a small and more quickly at the beginning than later. The air swallowed plays an important rôle in the filling, the emptying, and the form of the stomach.

78 **Tint, L. J., and L. Breskman:** "Malnutrition in infancy and its relation to gastric digestion." *New York M. J.*, vol. 91 (1910), pp. 1294–1295.

Largely pathological but containing one table of analyses of the gastric contents of 11 normal children from 2 weeks to 3 years of age. The author found free hydrochloric acid, rennin, and pepsin constantly present.

79 **Tobler, S.:** "Zum Chemismus des Säuglingsmagens" [Chemistry of the infant stomach]. *Ztschr. f. Kinderh.* [Berlin], vol. 5 (1912–13), pp. 85–93.

In criticizing the work of Allaria and Davidsohn and Salge the author takes exception to the conclusion that there is no pepsin digestion in the stomach of the infant. He mentions certain difficulties of technique: It is very hard totally to empty the stomach; it is never empty of milk 1½ hours after nursing; in raising the contents a slight hydrogen-ion concentration is produced artificially. To prove peptic digestion in the stomach the author experimented on four healthy infants 3 to 5 months old, fed on fresh, extracted human milk, which he withdrew after two hours. The considerable increase of free nitrogen in the stomach, he contends, must be due to peptic digestion since there are no bacteria. By the indicator method of Michaelis and Davidsohn he ascertained an acidity of 1×10^{-4} to 1×10^{-5}. He believes that mechanical and chemical working of food occurs only in the pylorus and the contents stay quietly in the fundus and body of the stomach; that pepsin and hydrochloric acid act only along the wall of the stomach.

80 **Troitzky, J. W.:** "Die Verdauung im Magen bei kleinen Kindern und die therapeutische Bedeutung der Ausspülungen desselben" [Digestion in the stomach of small children and the therapeutic significance of washing out the stomach]. *Jahrb. f. Kinderh.* [Leipzig], vol. 32 (1891), pp. 339–362.

To prove the therapeutic value of washing out the stomach of small children the author discusses in turn the physiological and the pathological aspect of digestion and of bacteria. He concludes that even small children's stomachs contain ferment to coagulate milk; also acid, but in small quantity; the chief rôle in digestion is played by hydrochloric acid, which increases in quantity with digestive activity; in small children food remains in the stomach two hours; the antiseptic property of gastric juice is undoubted but is slighter than in the adult.

81 **Trumpp, J.:** "Roentgenologische Untersuchungen über den Ablauf der Verdauung beim Säugling" [Röntgen investigations on the process of digestion in the infant]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 23–24 (1906–7), pp. 490–491.

The author took many instantaneous X-ray pictures of infants from a few days old to 7 months, both naturally and artificially fed. The bismutum subnitricum that he used in some cases produced no unfavorable consequences. He found that the infant stomach, full or empty, seems to remain horizontal; the colon, as in adults, rises steeply, forms a sharp flexura dextra, and passes to the left, where its position is dependent on the position and state of the stomach; duration of gastric digestion depends on how full the intestine is.

82 **Tuley, H. E.:** "Observations upon the capacity of the stomachs of infants under 10 days of age." *Arch. Pediat.* [New York], 1893, pp. 423–425.

The author weighed eight infants at a New York hospital before and directly after nursing 20 minutes, care being taken to keep the child awake for the entire period and to eliminate the possibility of error due to excretions. Sixty-four weighings are recorded. The author believes results (given in tables) are comparatively true estimates of the capacity of a young infant's stomach.

83 **Uffenheimer, Albert:** "Physiologie des Magen-Darmkanales beim Säugling und älteren Kind" [Physiology of the alimentary canal in the infant and older child]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 2 (1908), pp. 271–366.

A thorough treatment of the physiology of the alimentary canal of the infant and child, based on investigations of 10 years. Motility of the stomach secretions, intestinal-bacteria absorption, permeability, etc., are discussed. Bibliography.

184 Vierordt, Hermann: "Das Massenwachsthum der Körperorgane de Menschen" [Growth of human organs]. *Archiv für Anatomie und Physiologie* [Leipzig], 1890, pp. 62–94.

Using the statistics collected in other works, which he discusses, and considering only organs that are healthy, the author examines 2,729 cases o males and 2,707 cases of females. His results he puts in tables on the weigh of brain, heart, lungs, liver, kidneys, and spleen, arranged according to ag and sex. There are less comprehensive tables presenting data on the supra renal capsule, the thymus, thyroid, pancreas, etc. The long concluding table give the absolute weight of organs, their weight relative to weight of body and weights of organs at different ages in terms of such weight in th newborn infant.

185 Wegscheider, Hans: "Über die normale Verdauung bei Säuglingen [Nor mal Digestion in Infants]. Strassburg, 1875. 32 pp.

Inaugural dissertation (University of Strassburg), including a study o the composition of feces of several breast-fed infants between 2 and 3 month old. The author concludes that albumin of mother's milk is completely absorbed; that so-called milk detritus is not undigested casein but essen tially fat and very probably desquamated epithelium from the intestine; fa leaves the body as free fatty acid and perhaps also in part as unaltered fat

186 Wentworth, A. H.: "The estimation of chlorides in the stomach con tents from normal and from atrophic infants." *Archives of Interna Medicine* [Chicago], vol. 6 (1910), pp. 617–625.

The object was to determine whether the gastric hydrochloric acid is con stantly diminished in atrophic infants. This was found to be the case. Th analysis of the gastric contents of nine normal infants 5 to 8 months old i reported, with their weight and milk formula. For the normal infants ther was great variation in the hydrochloric acid of the gastric contents.

187 Wernstedt, Wilhelm: "Beiträge zum Studium der motorischen Funk tionen des Pylorusteiles des Säuglingsmagens" [Contributions to th study of the motor functions of the infant's pylorus]. *Monatschr. f Kinderh.* [Leipzig and Vienna], vol. 6 (1907–8), pp. 65–74.

A description is given of experiments on children from birth to 10 years Works of many investigators are referred to, and illustrations are shown.

188 Wohlmann, Leopold: "Über die Salzsäureproduktion des Säuglings magens im gesunden und kranken Zustande" [Hydrochloric-acid pro duction in the stomach of the healthy and sick infant]. *Jahrb. f Kinderh.* [Leipzig], new ser. vol. 32 (1891), pp. 297–332.

The author tests quantitatively and qualitatively the production of hydro chloric acid in the infant stomach. His methods of chemical analysis ar described. He considers only breast-fed children and would have washed ou the stomach previously had he not ascertained by comparative experiments o seven infants that such a process induces a larger flow of the acid. Therefor he timed his tests three hours after a rigorous fast. Ten further observation indicated that on different days the same child may show now a neutral, nov an acid reaction with or without free acids. In repeated tests on four perfectl healthy children the amount of acid increased with time after the meal; th maximum quantities were 0.831 per cent to 1.8 per cent. The writer als tested 25 sick infants from 7 to 93 days old and 6 premature infants. Trace of fatty acids were very rarely found in sick infants and never in healthy one When tea or albumin water was used as the test breakfast the acid secretio was often missing and was always less than when milk had been drunk.

189 Wolf, Heinrich, and Josef Friedjung: "Zur Würdigung der Magenver dauung im Säuglingsalter" [Conclusions as to gastric digestion i infancy]. *Arch. f. Kinderh.* [Stuttgart], vol. 25 (1898), pp. 161–17

A study of gastric digestion of 97 children 10 days to 21 months old, only few of whom were entirely normal. One hundred and eight tests were mad The technique of experimentation is described. Six tables contain the data o age, concentration, total acidity, free acid, lactic acid, weight, etc. Th authors conclude that for assimilation of food gastric digestion is of limite importance in infancy, and that Taube and Escherich may be right in callin the stomach a mere container. Most of their other conclusions concern path logical phases.

190 Wright, C. B.: "Gastric secretion, gastro-intestinal motility and positio of the stomach in a group of 250 children of the Lymanhurst School. *Archives of Internal Medicine* [Chicago], vol. 33 (1924), pp. 435–448.

In studies of the gastric secretion of children from 6 to 17 years of age th author found the free hydrochloric acid and total acidity of the stomach ap parently the same as in adults. Position, size, and shape of the stomach varie widely at all ages from 6 to 15, showing greatest variation at puberty. In 4 per cent the stomach was above the crests of the ilium, in 42 per cen below the crests, and in 16 per cent, at the crests. Little relationship wa found between the intercostal angle and the position of the stomach. Se was found to have no influence on gastric chemistry or motility, or on the cost angles. Ten figures show various groupings of superimposed stomach outline and tables and charts present the author's findings as to acidity, motility, an relative position of the lower pole of the stomach and the intercostal angle.

191 **Zuccarelli, P.:** L'estomac de l'enfant [The Stomach of the Child]. Paris, no. 309, 1894. 95 pp.

Thesis (University of Paris) for the degree of doctor of medicine. Data were secured from autopsies of 124 infants, records of which are given in tabular form, showing age, length, weight, state of the digestive tract, position, direction, size, capacity and condition of the stomach. A large part of the thesis is devoted to pathological conditions. Brief bibliography.

192 **Zweifel, Paul:** Untersuchungen über den Verdauungsapparat der Neugeborenen [Investigations of the Digestive Apparatus of the Newborn]. A. Hirschwald, Berlin, 1874. 47 pp.

After discussing work on infant digestion by other students the author devotes sections to salivary glands, stomach, pancreas, and liver. Thirty-three tests are carefully described. The author finds that of the salivary glands of full-term newborn infants only the parotid contains ptyalin; it appears in the submaxillary gland and in the pancreas after two months; gastric digestive apparatus is perfected; pepsin is not much affected even by illness; the pancreas, though it has no ptyalin at birth, can digest albumin and decompose fat; bile and glycogen are present in the liver before birth.

B. ELIMINATION

193 **Adler, Hermann M.:** "Zur Kenntnis der stickstoffhaltigen Bestandteile der Säuglingsfäzes" [Nitrogenous constituents in infant feces]. *Jahrb. f. Kinderh.* [Berlin], vol. 64 (1906), pp. 175–186.

In studying nitrogenous constituents in infant feces the author used Zung's method to determine albumoses and peptones. His experiments concerned 10 normal infants upon different diets. Diet seemed not to affect elimination. The soluble nitrogen was usually much less than 30 per cent of the total nitrogen. Most of the nitrogen was in the coagulable albumins including bacteria. Normal infant feces contained only small quantities of albumoses and not much genuine peptone; also, only minute amounts of amino acids, especially tyrosin.

194 **Amberg, Samuel, and Henry F. Helmholz:** "Über das Vorkommen der Hippursäure im Säuglingsharn" [Presence of hippuric acid in infant urine]. *Ztschr. f. Kinderh.* [Berlin], vol. 9 (1913), pp. 6–10.

The article contains tables showing total hippuric acid and hippuric-acid nitrogen in 100 cubic centimeters of urine. Infants examined were 2 to 14 months old. Nine hundred and ten cubic centimeters of urine of normal, breast-fed children contained per 100 cubic centimeters 0.0083 gram of hippuric acid. Two thousand and seventy cubic centimeters of urine of normal, breast-fed children gave 0.0128 gram as a result. A table gives results in the cases of nine artificially-fed infants, not in a normal state of health. In every case hippuric-acid nitrogen formed only a fraction of 1 per cent of the total nitrogen of the urine. Bibliography.

195 ——— **and J. H. M. Knox, Jr.:** "Hippuric acid in the urine of normal breast-fed infants." *Am. J. Dis. Child.* [Chicago], vol. 2 (1911), pp. 248–251.

One thousand nine hundred and eleven cubic centimeters of urine from 4 normal infants 6 to 23 days old was examined for hippuric acid. The technique is described. No hippuric acid was found.

196 ——— **and L. G. Rowntree:** "On the excretion of creatinin in the infant with some notes regarding its occurrence in amniotic fluid." *Johns Hopkins Hospital Bulletin* [Baltimore], vol. 21 (1910), pp. 40–44.

The urine of five infants between 7 days and 3 months of age was examined and was found to contain creatinine. Each case is described in detail, and findings and opinions of many medical authorities are discussed. References.

197 **Arndt, Johannes:** Das Verhalten der Kalksalze in den Faeces und im Harm von Säuglingen bei Darreichung gekochter und ungekochter Milch [Behavior of Lime Salts in the Feces and Urine of Infants on Administration of Boiled and Unboiled Milk]. Breslau, 1901. 38 pp.

Inaugural dissertation. In the Children's Clinic of the University of Breslau the author conducted comparative tests, with diets of boiled and raw milk, of the excretion of lime salts in three infants from 2½ to 6 months old. A single test covered four to five days. Methods are carefully described. Raw milk caused a much greater elimination of calcium than did boiled milk. The difference was much less marked in the urine. The article contains four tables and a bibliography.

198 **Aron, Hans, and Marianne Franz:** "Organische Säuren im Säuglingsharn" [Organic acids in the urine of infants]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 12 (1913–14), pp. 645–658.

The authors made 15 tests on 10 infants to determine the amount of volatile fatty acids in the urine. A table shows each infant's age, weight, nourishment, and amount of urine. They ascertained that only small amounts were excreted.

Fatty diet produced no increase, nor did illness. They also made 17 tests on 9 infants to determine the amount of oxalic acid in the urine and give their results in another table. They found an endogenous oxalic-acid formation in the urine even where the diet, human or cow's milk, contained none. This oxalic acid was increased by a diet of sugar or flour but not by illness.

199 **Aschenheim, Else:** "Der Wasserversuch bei Säuglingen" [Water intake and output of the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 24–25 (1919–20), pp. 281–294.

Studies of water elimination through the kidneys showed that an intake of 700 cubic centimeters of milk resulted in 18 urinations of about 22 to 27 cubic centimeters each. Twenty-nine infants were observed. The effects of salt and sugar on water retention and the relative water retention of infants and adults are discussed. Graphs and a bibliography are included.

200 **Becker, Jos.:** "Über Haut und Schweissdrüsen bei Foeten und Neugeborenen" [The skin and sweat glands of fetuses and newborn infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 30 (1921), pp. 3–20.

The author dissected parts of the skin of 6 fetuses and 13 young children in the University of Bonn. He displays 17 cross sections, a table of thickness of skin, and two tables with data on age, thickness of corium and epidermis on various parts of the body, and sweat glands of the infants. The discussion includes much detail on the lumen and on the general formation of the tela subcutanea. The sweat glands show six stages, and in the newborn infant are like those of adults, but in number and stage there is variation even in the same part of body and for the same age. Likewise for the corium there is a great difference among infants of the same age. In a given infant the regional difference is about 16 to 20 per cent; 5.5 centimeters may be considered normal thickness. The development of the skin proceeds with increased rapidity at the time of birth. The author inclines to the belief that there is a centripetal and a centrifugal growth of the epidermoidal structures as well as of the corium. He calls attention to the fact that in some young infants the fat shows an embryonal habitus and suggests that this anatomical finding may form a bridge to the pathological physiology of exudative diathesis. Bibliography.

201 **Beckmann, Richard:** Die Harnconcremente in den Nieren Neugeborener [Urine Concrements in the Kidneys of the Newborn]. Rostock, 1852. 20 pp.

Inaugural dissertation (University of Rostock). The author considers the numerous findings of other authors and also his own observations on 19 infants that died at ages varying from 8 hours to 20 days. In 8 of the 19, on dissection, he discovered uric-acid infarcts, which he decides to be a physiological phenomenon. If they are lacking on dissection the author thinks they have not yet been formed or have been excreted. The presence of the uric-acid infarct does not prove that the infant has breathed or that the kidney tissue has changed.

202 **Benfey, Arnold:** "Über eiweissspaltende Enzyme im Säuglingsharn" [Proteolytic enzymes in infant urine]. *Biochemische Zeitschrift* [Berlin], vol. 10 (1908), pp. 458–462.

The author looked for proteolytic enzymes in the urine of 10 infants from 4½ to 12 months old, using Brodzki's method, which he discusses at some length. In his table he gives data on the children studied and the nitrogen content in 10 cubic centimeters of filtrate from boiled and unboiled urine, and arrives at the conclusion that infant urine contains a ferment corresponding to pepsin and trypsin and that uropepsin is more regularly found than urotrypsin.

203 **Binda, P.:** "Sulla reazione normale delle feci del lattante" [On normal reaction of the feces of the infant]. *Rivista di clinica pediatrica* [Florence], vol. 9 (1911), p. 761.

According to this summary the author found that the normal reaction of the feces of the infant is acid and states the variations of normal feces in acidity. Artificially-fed infants showed a more acid reaction of their feces than breast-fed infants.

204 **Birk, W.:** "Hauttalg und Ernährung bei Kindern" [Sebaceous excretion and diet of children]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 8 (1909–10), pp. 394–398.

To determine the effect of diet on sebaceous excretions of the skin the author tested five children with carbohydrates for six days and with fatty foods for six days. After a bath they were clad in clean woolen union suits, which at the end of six days were cleansed of oil from the body. Results are given in weights of children and amounts of grease thus obtained. The author does not believe that diet affects sebaceous elimination.

205 **Birmingham, A.:** "The shape and position of the bladder in the child." *Journal of Anatomy and Physiology* [London], vol. 32 (1897–98), pp. 458–468.

The bladders of 6 infants, newborn to 2 years old, were injected with gelatin and the capacity, shape, and position of the bladder carefully noted.

206 **Bonar, B. E.:** "Indicanuria in the newborn." *Am. J. Dis. Child.* [Chicago], vol. 21 (1921), pp. 406–409.

A study of the presence of indican in the urine of normal newborn infants. Of 338 specimens from 50 infants, tested with Obermayer's reagent, 28 specimens from 20 infants were found to contain indican, the reactions occurring most frequently on the fourth and fifth days. No reactions were obtained on the eighth, ninth, eleventh, twelfth, and fifteenth days. From study of his observations and comparison with the work of others the author concludes that indicanuria may be considered physiological, as it could not be associated clinically with any pathological findings.

207 **Borrino, Angiola:** "Proteolytische Fermente im Säuglingsurin" [Proteolytic ferments in the infant urine]. *Monatschr. f. Kinderh.* [Leipzig], vol. 6 (1907–8), pp. 177–179.

The author studied urine of infants and children of all ages at the Children's Clinic, Florence, employing the method recommended by Mya and Belfante for adults. Contrary to Philip's experience the author ascertained that the urine of children is able to desolve fibrin, a power which can be ascribed only to pepsin. He detected albumoses and peptones in all cases. The uropepsin may come from the stomach.

208 **Boschán, F.:** "Das Wesen der Engel-Turnauschen Harnreaktion" [Nature of the Engel-Turnau urine reaction]. *Berliner Klinische Wochenschrift*, vol. 48 (1911), pp. 302–303.

The author refutes the statement of Engel and Turnau that with 1 cubic centimeter of 2 per cent silver-nitrate solution added to 5 cubic centimeters of urine there is positive reaction for a breast-fed child and negative for an artificially fed child. The reaction, he says, depends not on the nourishment of the infant but on reduction of silver nitrate. If little chloride is present the silver nitrate remains in excess and is reduced to silver oxide.

209 **Bosler, Alfred:** "Über Nierenfunktionsprüfung bei Säuglingen und älteren Kindern" [Study of kidney function in infants and older children]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 11 (1914), pp. 346–362.

The author studied functioning of the kidneys in eight children between 6 and 12 years of age and in eight nurslings; three of the first and five of the second group were normal and healthy. To the older children he gave five grams of salt daily and tested the elimination of it according to Volhard, 2 grams of lactose in intravenous injections tested qualitatively according to Nylander, and 0.5 gram of iodide of potassium per os, examined by the modified Sandow's test. Results are explained and the time of elimination shown in a table. The infants received smaller amounts of salt and iodide of potassium. They showed a high salt retention, and the healthy ones eliminated the iodide of potassium within 20 to 30 hours. The older children reacted much like adults, and the sick differed little from the healthy.

210 **Brennenmann, Joseph:** "A contribution to our knowledge of the etiology and nature of hard curds in infants' stools." *Am. J. Dis. Child.* [Chicago], vol. 1 (1911), pp. 341–359.

Believing that hard curds have their origin in raw-milk casein the author attempted to cause hard curds at will, in infants, by using raw and boiled milk alternately. Four case reports are given in which this was accomplished. References.

211 **Bryant, John:** "Observations upon the growth and length of the human intestine." *American Journal of the Medical Sciences* [Philadelphia], vol. 167 (1924), pp. 499–520.

In a series of 242 cases, of all ages and both sexes, examined by the author, there were included 37 children, 20 males between 6 months and 17 years of age and 17 females between 2 and 16 years. After a review of the literature of the subject he gives at length, with numerous tables and charts, the results of his own observations as to intestinal growth. He finds the most striking characteristic an extreme variation in length, beginning at, or before, the fifth month of age in the fetus and thereafter in evidence throughout life. The child of 6 months or less has already acquired about one-half the minimal adult length of colon and a small intestine longer than the minimum compatible with adult life. At 10 years both small intestine and colon are of a length considered normal for the adult. After that period growth is not in length but in caliber. References.

212 **Callomon, Fritz:** "Untersuchungen über das Verhalten der Fäcesgärung bei Säuglingen" [Investigations on fermentation of feces in infants]. *Jahrb. f. Kinderh.* [Leipzig], vol. 50 (1899), pp. 369–386.

The author studied fermentation in 314 stools of 21 young infants. His method, essentially like Schmidt's, is described and a picture given of apparatus. Case records are also given. The author believes he has proved that his methods enable one in a simple manner to test utilization of carbohydrates in the child organism and give important diagnoses on anomalies.

213 **Camerer:** "Zur Bestimmung der 24 stündigen Harnstoffmenge beim Säugling" [Determination of the 24-hour output of urine from the infant]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 15 (1880), pp. 161–163.

After justifying his method of collecting infant urine the author compares his findings on the quantity of urine eliminated by a child of 5 months with the findings of Cruse and Bouchaud. He also gives data on the quantities of urine eliminated by the same child at different ages and the amount eliminated by another child.

214 **Cammidge, P. J.:** The Faeces of Children and Adults. William Wood & Co., New York, 1914. 467 pp.

A treatise based on Hecht's "Die Faeces des Säuglings und des Kindes," and Schmidt and Strasburger's "Faeces des Menschen," but containing also much material from the author's own examination of several thousand specimens of feces. Discusses conditions in both health and disease. Extensive bibliography.

215 **Carron de la Carrière, G., and L. Monfet:** "Étude sur l'urine normale de l'enfant" [A study of the normal urine of the child]. *Presse médicale* [Paris], pt. 2 (1897), pp. 33–36.

Data for this study were secured by the examination of 24-hour samples of the urine of 54 healthy children, aged 15 months to 15 years, living in good homes in Paris. Methods of analysis are described, and resulting averages of the amount of each constituent per kilogram of body weight are recorded in 3 age groups (15 months to 5 years, 5 years to 10 years, 10 years to 15 years) and tabulated, with standard figures for adults for comparison. The author found the proportional volume of urine much greater for the child than for the adult, the specific gravity a little greater, the acidity greater, weight of substances contained greater, nitrogen loss one-third less than in adult, all the phenomena of nutrition more active than in the adult. References.

216 **Chernov, V. E.:** "Dalnieishiia izsliedovaniia o soderzhanii azota v sukhom ostatkie isprazhnienii" [Further study of the nitrogen content in the dry residue of feces]. *Vrach* [St. Petersburg], vol. 6 (1885), pp. 607, 629, 645.

The author studied the nitrogen in the feces of 18 infants under 1 year old. Five of them were normal breast-fed infants, 4 were normal bottle-fed infants, and the others were ill. He found that the feces of bottle-fed infants contained more nitrogen than those of breast-fed infants; and those of infants who were ill, less than those of infants who were normal. A further study of 7 cases from 7 to 30 years old showed that the fluctuations of nitrogen in the feces of infants, older children, and adults, whether ill or well but eating similar food, depend on the fat content of the feces; the amount of nitrogen decreases with the increase in fat and vice versa. Numerous quotations are given.

217 **Churchill, F. S.:** "The urine of healthy infants and children." *Arch. Pediat.* [New York], vol. 15 (198), pp. 646–653.

Report of investigation of the urine of 48 girls and 22 boys, ranging in age from 1 day to 12 years, 146 specimens having been analyzed. The urine was collected from children in the Chicago Half-Orphan Asylum. The technique of the analysis is fully described, and results are tabulated as to amount (24 hours), specific gravity, total urea, chlorides, phosphates, sulphates, amount to 1 kilogram of body weight, urea to 1 kilogram body weight. The author concludes that the records show three factors of chief importance: The small amount of urine, the high percentage of urea, and high specific gravity. Bibliography.

218 **Closson, Oliver E.:** "The elimination of creatinin." *Am. J. Physiol.* [Boston], vol. 16 (1906), pp. 252–267.

With several observations upon adults and animals the author reports two analyses of urine of children, one 6 years 9 months of age and the other 14 years, both living on a vegetable diet. He concludes that creatinine is an unfailing constituent of the urine from an early period.

219 **Cramer, Heinrich:** "Der Mekoniumpfropf des Neugeborenen" [The meconium plug of the newborn infant]. *Deutsche Med. Wchnschr.* [Leipzig], vol. 26 (1900), pp. 194–196.

The author discusses the "meconium-plug," cone-shaped, gray-white, weighing 1 to 2 grams, in the anus before evacuation of meconium. It is mentioned by Soranus but neglected in modern literature. Cramer states that in 50 successful births with head presentation meconium had been evacuated in 31 before the infant was delivered. But where meconium was not so excreted the plug was always found, in one case as late as 17 hours after birth. The presence of this plug makes it highly probable that the infant has lived post partum.

220 **Cruse, P.:** "Über das Verhalten des Harns bei Säuglingen" [Condition of urine in infants]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 2 (1877), pp. 393–432.

To make quantitative and qualitative tests of infants' urine the author on 90 occasions collected urine during a 24-hour period from infants 2 to 60 days old in the St. Petersburg Foundlings' Home. The infants were strong and healthy boys, breast-fed, one nurse to each. The author supervised collecting the urine by means of an apparatus he carefully describes; he also describes

the urinalyses conducted by him personally. His discussion covers the amount and chemical composition of the urine. The amount excreted in 24 hours increased rapidly from the second to the tenth day and then slowly; the specific gravity decreased rapidly to the tenth day and then slowly thereafter, except that the phosphorus acid increased continually as the child grew older. Albumin did not appear after the tenth day. The quantity of the urine varied considerably up to the fifth to tenth day and thereafter very little.

221 **Denzer, B. S., and K. K. Merritt:** "Studies on anemia in infancy: the urobilin content of the stools of normal infants." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 297–302.

In examination of the stools of 16 infants under 1 year of age, for periods of from 4 to 8 days, the authors found urobilin present as early as the second week; from 2 weeks to 1 year of age the quantity varied from 15 to 150 dilution units, according to the method of Wilbur and Addis. References.

222 **Deutz, Robert:** Beiträge zur Kenntnis des Kinderharnes [Contributions to the Knowledge of Children's Urine]. Gottingen, 1887. 27 pp.

An inaugural dissertation (University of Gottingen). The author examined urine of 13 children between 5½ and 9 years from 3 to 5 days for amount, specific gravity, urea, phosphoric acid, sulphuric acid, etc. The dissertation contains 17 tables, in 1 of which data of other investigators are shown for comparison. Urea elimination up to age of 7 was twice that of the adult and then decreased till at 10 it equaled that of the adult. Phosphoric-acid elimination was 0.065 to 0.09 gram per kilogram of weight. Sulphuric-acid elimination resembled that of urea. Uric-acid elimination was very slight. Sodium-chloride elimination was 0.6 gram daily per kilogram of weight.

223 **Disse, J.:** "Untersuchungen über die Lage der menschlichen Harnblase und ihre Veränderung im Laufe des Wachstums" [Investigations on the position of the human bladder and its change in the course of growth]. *Anatomische Hefte. Referate und Beiträge zur Anatomie und Entwickelungsgeschichte* [Wiesbaden], 1892, vol. 1, pt. 1, pp. 1–76.

This article on the position of the bladder is based upon study of 19 males (2 over 21 years) and 26 females (7 over 21 years). Measurements are incorporated in tables. The article contains also three sketches, two curves, and eight plates, as well as a bibliography.

The discussion traces the change in the position of the bladder from birth to maturity. In the newborn infant the bladder is higher than in the adult; it is the same in the male as female infant. The inner urethral opening sinks rapidly from birth to the beginning of the fourth year and more slowly to the beginning of the ninth, then is stationary to the beginning of puberty, and thereafter sinks slowly to the completion of growth. This descent in the male is more irregular than in the female.

224 **Dohrn:** "Zur Kenntniss des Harns des menschlichen Fötus und Neugeborenen" [Information on the urine of the human fetus and newborn infant]. *Monatsschrift für Geburtskunde* [Berlin], vol. 29 (1867), pp. 105–134.

The author obtained urine with the catheter immediately after cutting the cord. The process never proved injurious. His 100 cases included 75 normal births, 19 abnormal births, and 6 stillbirths. A table and three graphs are included. Often during birth the infant's bladder empties partly or completely. This is more likely to happen in case of first born, of boys, of small infants, and during prolonged birth act. But most infants born normally have not yet urinated; the amount of urine in the bladder is 7.5 cubic centimeters. The newborn infant's urine is pale and of weak concentration. It has a specific gravity of 1.0018 to 1.006 and an acid reaction, and contains no albumin.

225 **Dreike, Paul:** "Ein Beitrag zur Kenntnis der Länge des menschlichen Darmkanals" [Contribution to knowledge of length of the human intestinal canal]. *Deutsche Zeitschrift für Chirurgie* [Leipzig], vol. 40 (1894–95), pp. 43–89.

The author measured the length of the intestine from the duodenojejunal flexure of 17 female and 48 male normal infants, also of embryos and fetuses, sick children, and healthy and sick men and women. The data are shown in many tables. The length in children was not affected by sex; they had a relatively longer intestine than adults; the large intestine as compared with the small was relatively longer in adults than in children. The author's material was drawn from the Russian race; he believes race does not affect length of intestine.

226 **Eitel, Hans:** "Die wahre Reaktion der Stühle gesunder Säuglinge bei verschiedener Ernährung" [The true reaction of the stools of healthy infants on different kinds of diet]. *Ztschr. f. Kinderh.* [Berlin], vol. 16 (1917), pp. 13–62.

Desiring to determine the exact quantitative value of the reaction of stools of healthy infants on different kinds of diet, the author experimented with 18 healthy infants and presents for each a long table of results with case history and curve of reaction. He employs Sorensen's notation of pH for hydrogen-ion concentration and describes apparatus and process in detail. The reaction with human milk was acid and the pH between 4 and 6; with cow's milk alkaline, pH 7.8 to 8.2; with buttermilk, alkaline, pH 8; and with malt soup, acid. Bibliography.

227 **Engel, S.:** "Die Harnabscheidung des Säuglings" [The infant's urination]. *Deutsche Med. Wchnschr.* [Leipzig and Berlin], vol. 40, pt. 2 (1914), pp. 1960–61.

For several years the author studied urination in the normal infant, rationally fed. On an average an infant drinking 800 cubic centimeters of milk eliminated 500 cubic centimeters, urinating 20 to 30 times a day. The times were fewer in sleep, but the amount at each time was much greater at night. The maximum amount for most infants during the first year is 50 to 60 grams; the ordinary amount is 10 to 20 grams.

228 ——— **and L. Turnau:** Über eine Reaktion des Urins von Brustkindern" [The reaction of urine of breast-fed children]. *Berliner Klinische Wochenschrift*, vol. 48 (1911), p. 18.

By accident the authors discovered that if 1 cubic centimeter of a 2 per cent silver-nitrate solution is added to about 5 cubic centimeters of infant's urine the sediment turns black in the case of breast-fed infants but reacts negatively in the case of artificially-fed infants.

229 **Feldmann, Pauline:** "Über die Zuckertoleranz der Neugeborenen" [Sugar tolerance of newborn infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 28 (1921), pp. 325–328.

The author tested urine of each of 100 young male infants three times after giving them sugar solutions up to 34 per cent in strength. In the urine of 68 children no sugar was detected; in 22, less than 1 per cent; in the remaining 10, 1 per cent or more. These last 10 cases are described in detail. The author concludes that tolerance of infants for cane sugar fluctuates but is always high.

230 **Fischl, Rudolf:** "Über das Elastingewebe des Säuglingsdarmes" [Elastic tissue in infant intestine]. *Jahrb. f. Kinderh.* [Berlin], vol. 57 (1903), pp. 439–443.

The author studied elastin in 10 infants of various ages up to 1 year, including 3 premature and 2 stillborn; in 1 boy of 14 years, 1 dog, and 1 rabbit, all with normal intestines, and compares the conditions in an adult. He describes his method of research. Neither in the fetus nor even in the newborn is free elastin to be found in the stomach or intestine, but elastic fibers begin to form in the first weeks. However, elastin is very weakly developed in infants as contrasted with adults. The author raises the question whether or not artificial feeding hastens its formation.

231 **Flensburg, Carl:** "Studier öfver urinsyre-infarkten, urinsedimentet och albuminurin hos nyfödda" [Study of uric-acid infarcts, urinary sediment, and albuminuria in newborn]. *Nordiskt Medicinskt Arkiv.* [Stockholm], vol. 4 (1894), new ser. no. 14, pp. 1–39.

In two tables the author sets forth findings of 187 experiments as to uric-acid deposits in the urine of infants from birth to 6 days and compares his findings with the work of other investigators. In eight tables he gives the result of 247 observations as to albuminuria of infants 1 to 14 days old. He concludes that these conditions are quite constant and normal in the newborn.

232 **Folin, Otto, and W. Denis:** "On creatine in the urine of children." *Journal of Biological Chemistry* [Baltimore], vol. 11 (1912), pp. 253–256.

Experimental studies of the urine of three normal, well-nourished children, aged 11 years, 8 years 8 months, and 3 years 8 months. Tables show amounts of creatine and creatinine in night urine and afternoon urine of the three subjects; in hourly urine of the 11-year-old subject from 9 a. m. to 3 p. m.; in 24-hour urine of the three subjects when on a mixed diet including meat at noon; in 24-hour urine of the three subjects when on mixed diets containing no creatine; in night urine (three examinations) of three other subjects on a creatine-free diet; in the morning urine of four children on a vegetable diet. In the hourly examinations a decisive rise in creatine output was observed after dinner with meat. The authors believe that creatine in children's urine is due to excessively high protein consumption.

233 **Franz, Theodor, and A. von Reuss:** "Beiträge zur Kenntnis des Harnes der ersten Lebenstage" [Urine in the first days of life]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 11 (1914), pp. 193–229.

The authors present a table concerning the fetal urine of 39 newborn boys, a table concerning the urine of 70 infants during the first few days of life, a table on the diphenylamin reaction for glycuronic acid in 61 cases, and another on the Jolles reaction for indican in 31 cases. They conclude that a mild albuminuria is physiological in the new born; it does not occur in the fetal urine but is almost universal during the first four days; thereafter it decreases till it disappears by about the eighth day. It is probably a consequence of the birth act, modified by accidental factors of both physiological and pathological nature. Glycosuria was not present in cases of spontaneous birth. Indicanuria, on the other hand, during the first days, proved almost physiological. The nitrate and nitrite reactions also are usually positive during this early period.

234 **Freudenberg, E., and O. Heller:** "Über Darmgärung I. Was leistet die Messung der Wasserstoffionen Konzentration des Säuglingsstuhles für die Beurteilung der Darmgärung [Intestinal fermentation I. Hydrogen-ion concentration as a measure of intestinal fermentation]. *Jahrb. f. Kinderh.* [Berlin], vol. 44–46 (1921), pp. 251–257.

A discussion of the possibilities in measuring hydrogen-ion concentration of infant feces as an indication of intestinal fermentation. Much more space is devoted to theory than to the author's own experimentation. For the latter he gives three curves, pH values forming ordinates and the abscissas showing percentage of one-tenth normal solution of acetic acid in the stool. In determining how much acetic acid can be combined by 20 grams of feces before pH 4 he finds 1.08 grams for albumin milk feces and 0.36 to 0.48 gram for human milk feces.

235 ——— "Über Darmgärung II. Über den Einfluss von Eiweiss und Kalk auf die Gärung" [Intestinal fermentation II. Effect of protein and calcium on fermentation]. *Jahrb. f. Kinderh.* [Berlin], vol. 44–46 (1921), pp. 314–333.

The authors tested stools of infants obtained in the morning, making 300 tests by Michaelis's method. The ideal breast-milk stool is described. The pH is 5 to 5.4. The author describes five cases with albumin added to milk, three with albulactin added, six with albumin and lime added, five with lime added. There are two graphs. The lime caused insignificant changes in the intestinal fermentation; the albumin caused dyspeptic stools of a gray-green color with mixed bacteria. Sometimes the pH is increased.

236 **Freudenstein, Georg:** Untersuchungen über die makrometrischen Grössen der Harnwerkzeuge neugeborener Kinder [Investigations on Macrometric Dimensions of Urinary Organs of Newborn Children]. Marburg, 1861. 45 pp.

This inaugural dissertation (University of Marburg) contains detailed macrometric dimensions of urinary organs of 14 newborn infants, compiled by the author from data collected by Professor Falck in a Marburg lying-in clinic.

237 **Fuhge, Gertrud:** "Untersuchungen über den Einfluss des Basensäurenverhältnisses auf den Eiweissbedarf" [Investigations of effect upon protein requirement of proportion of base to acid]. *Arch. f. Kinderh.* [Stuttgart], vol. 67 (1918–19), pp. 291–320.

The author repeatedly tested the urine of 150 children with litmus, finding that, with few exceptions, like diet caused a like reaction—alkaline on a vegetable diet. On meat days 2 to 3 grams of calcium chloride were administered. Three boys of 10, 12, and 13 years were subjects of very extensive tests. Tables of body weight, amounts of food and water, titration values of urine, etc., cover many pages. Dependence of the nitrogen requirement on an excess of acid or alkaline valences in the body secretions is not proved by the author's study.

238 **Funaro, Roberto:** "Über den Kreatiningehalt des Säuglingsharns" [Creatinine content of infant urine]. *Biochemische Zeitschrift* [Berlin], vol. 10 (1908), pp. 467–471.

The author followed Folin's methods except that he used Dubosca's instead of Plesch's colorimeter. One table gives the age, weight, state of health, diet, amount of urine in 24 hours, and creatinine for 15 infants between 1½ and 10 months. Another table gives creatinine in 24 hours from the same person on different days and different diets. The author concludes that creatinine is always to be found in infant urine, that variations are not great in normal or pathological cases or on various diets, and that the amount is much smaller than in the urine of adults.

239 ——— "Über die quantitative Bestimmung einiger reduzierender Substanzen im Säuglingsharn" [The quantitative determination of some reducing substances in infant urine]. *Biochemische Zeitschrift* [Berlin], vol. 10 (1908), pp. 463–466.

After discussing Hilding Lavesson's methods and results in investigating reducing substances in infant urine the author presents results obtained from his own studies on 15 infants between 1½ and 10 months old, whose weight, diet, and state of health are noted. One table gives the amount of urine in 24 hours, total reduction, glucose, uric acid, creatinine, residue (in glucose). The second table, of absolute values in amounts for 24 hours, gives total reduction in dextrose, glucose, uric acid, creatinine, and residue in dextrose, for each of the 15 subjects, and also the averages. Infant urine, the author decides, contains a much smaller quantity of reducing substances than the urine of adults or of older children.

240 **Gallo de Tommasi, Janvier:** "Recherches sur l'élimination des acides sulfoconjugues de la série aromatique chez les enfants" [Researches on the elimination by children of sulphoconjugate acids of the aromatic series]. *Comptes rendus, xiii^e congrès international de médecine, Paris, 1900, section de médecine de l'enfance* [Paris] (1901), pp. 251–252.

A summary only of the author's conclusions reached by investigations not described in detail.

241 **Gamble, James L.:** "The ammonia and urea content of infants' stools." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 519–532.

Thirty-seven determinations of total nitrogen and ammonia nitrogen were made from 24-hour stool specimens of infants aged 2 to 10 months. Methods are described and results tabulated and discussed in detail. The nitrogen per gram of dried stool was found to be 24 to 126 milligrams, the ammonia nitrogen 0.7 to 11.6 milligrams. Grams of protein per kilogram of food are recorded in each observation. The ammonia content was found to increase with increase of protein intake and with increased frequency of stools. Urea nitrogen was determined in fifteen 24-hour specimens from practically normal infants. The average was found to be 2 milligrams per gram of dried stool.

242 **Gerstenberger, H. J., and W. M. Champion:** "The constipating qualities of orange juice." *Am. J. Dis. Child.* [Chicago], vol. 18 (1919), pp. 88–92.

Observations were made on a normal infant, 10 months of age, to ascertain the relative value as a cathartic of orange juice and of an equal amount of a 10 per cent sugar solution composed of 6.5 per cent glucose and 3.5 per cent sucrose. It was found that orange juice, relatively speaking, was less laxative than the 10 per cent sugar solution when given in doses of 15 cubic centimeters 6 times in 24 hours.

243 **Goebel, F.:** "Über die Aminosäurefraktion im Säuglingsharn" [Amino-acid fraction in infant urine]. *Ztschr. f. Kinderh.* [Berlin], vol. 34 (1922–23), pp. 94–141.

This article of about 50 pages discusses many different phases of amino-acid fraction in infant urine; the investigations of Pfaundler, Sörensen, and others; and many studies conducted by the author. Studies of 7 children between 7 and 12 years showed an average value for the amino-acid fraction of 1.85 per cent of the total nitrogen. The same value for 23 healthy infants was 4.62 per cent. The kind of diet made no difference. The values for 16 premature infants were from 9.5 per cent to 5.46 per cent. Besides shorter experiments on polypeptid nitrogen, the author also made 12 double tests for amino acid-nitrogen and urea-nitrogen on 6 infants and 6 older children, from which he concludes that the amino-acid fraction in the blood is no higher for the infant than for the older child. Therefore the kidney of the infant, and especially of the premature infant, is more permeable for amino acids than that of older children or adults. The article contains 10 tables and a long bibliography.

244 **Greenthal, R. M.:** "A study of the urine sugar in infants." *Am. J. Dis. Child.* [Chicago], vol. 20 (1920), pp. 556–561.

From 170 observations on 37 infants under 7 months of age the author concludes that sugar is generally present in infant's urine; it is dependent on the amount of sugar ingested and independent of the quantity of urine voided. Feeding formulas and the technique of sugar analysis are given.

245 **Grulee, Clifford G.:** "Precipitins for egg albumin in stools." *Am. J. Dis. Child.* [Chicago], vol. 20 (1920), pp. 15–17.

Tests were made on 3 groups: (1) 103 stools from 24 children, aged 2 to 12 years; (2) 17 stools from 3 children, aged 13 to 22 months (all 27 had some disorder and were given 1 teaspoonful of egg albumen per day); (3) 221 stools from 33 infants 2 years old or under, 12 of whom were normal, many of them newborn infants who had received dilute albumin water to the amount of 10 cubic centimeters of egg albumin to 500 cubic centimeters of water. Anti-egg-white rabbit serum of a titer of 40,000 was used, titer equaling highest dilution of egg white in salt solution in which the serum produced precipitate by contact method after one hour at room temperature. The results indicated that egg albumin is in nearly every instance either completely broken down by the digestive processes in infants and children or absorbed unchanged.

246 ——— **and B. E. Bonar:** "Precipitins to egg white in the urine of newborn infants." *Am. J. Dis. Child.* [Chicago], vol. 21 (1921), pp. 89–95.

An investigation to determine the permeability of the intestinal tract of the newborn infant to egg albumen. Specimens of urine, 136 in all, from 23 infants who were given a 2 per cent solution of egg white instead of plain water between nursings were tested for precipitin reactions by means an anti-egg-white rabbit serum of a titer of at least 50,000. The first positive reactions were found in the urine obtained on the fourth day of life; no reactions were obtained after the eleventh day, but the small number of tests made this result inconclusive. The authors conclude that the intestinal wall of the newborn infant, from the fourth to the tenth day, inclusive, is permeable to small quantities of egg white.

247 **Hadlich, Richard, and Paul Grosser:** "Über den Aminosäuregehalt des Kinder- und Säuglingsharnes" [The amino-acid content of the urine of children and infants]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 73 (1911), pp. 421–429.

The authors conducted tests to ascertain the amino-acid content of the urine of children and infants. After discussing previous work of the kind and the new method of Sørensen of determining the amino-acid value they present a table of tests on 28 children and infants on various diets and in various conditions, with results in total nitrogen, ammonia nitrogen, amino-nitrogen, etc.

They conclude that the amino-acid content of the urine in older children corresponds to that of adults but in the nursling is higher than in the adult. The presence of amino acids in the urine speaks for an incapacity of the organism to decompose amino acids into ammonia and thus prepare them for the formation of urea.

248 **Hahn, H., and F. Lust:** "Über die Ausscheidung von eiweiss-, stärke- und fettspaltenden Fermenten beim Säugling" [The elimination of the proteolytic, diastatic, and lipolytic ferments in the infant]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 11 (1912–13), pp. 311–320.

This article is divided under the headings trypsin, erepsin, rennin, diastase, and lipase. A table of results from experimenting upon 48 infants cites age, weight, state of health, diet, and character of stools, as well as the positive or negative finding upon the ferments. The trypsin was always present in the feces except in one case, the erepsin very frequently in the majority of cases, the rennin always present in healthy cases, the diastase never entirely lacking, and the lipase positive but much reduced in cases of alimentary intoxication.

249 **Hamill, S. McC., and K. D. Blackfan:** "Frequency and significance of albumin in the urine of normal children." *Am. J. Dis. Child.* [Chicago], vol. 1 (1911), pp. 139–163.

Four hundred and forty-five urinalyses from 124 normal children 18 months to 14 years old showed no relation between specific gravity and the presence albumin. Thirty-two and one-half per cent of the cases showed occasional hyaline casts and cylindroids. No orthostatic albuminuria was observed; 88.7 per cent of the cases showed traces to slight traces of albumin. Slight albuminuria is therefore too constant in childhood to be of clinical significance. Technique and full data on the cases are given.

250 **Hartje, E.:** "Über den Einfluss des Zuckers auf die Darmflora der Kinder" [The effect of sugar on the intestinal flora of children]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 73 (1911), pp. 557–565.

In connection with a study of bacterial flora in the intestines the author gives information regarding the composition of feces of two infants, aged 1 year and 3 months and 1 year and 5 months, respectively, fed various diets.

251 **Hecht, Adolf F.:** "Das Verhalten der Fettsäurebildung im Darminhalt des Säuglings" [Fatty-acid formation in the contents of the infant intestine]. *Münchener Medizinische Wochenschrift*, vol. 57, pt. 1 (1910), pp. 62–67.

The author describes in detail his methods of examining the feces of seven breast-fed and four artificially-fed infants. He gives tables of his findings in formic acid, acetic acid, propionic, butyric, and valerianic acids, and in indican and skatol. He concludes with Czerny and Keller that a certain amount of volatile fatty acids in the stool is necessary for normal digestive processes.

252 ——— "Über die Bedeutung der Seifenstühle im Säuglingsalter" [The significance of soapy stools in young infants]. *Münchener Medizinische Wochenschrift*, vol. 55, pt. 1 (1908), pp. 1010–1012.

The author analyzes the typical "soapy stools" of an artificially-fed infant 3 months old and about 4 kilograms in weight, and discusses the characteristics of such stools. They have no mucus, are alkaline and of an evil odor; they show that the fermentation processes are subnormal. They result from a slight but chronic disturbance of fat absorption.

253 **Hecker, Rudolf:** "Über die Herkunft des Harneiweisses bei Kindern" [Origin of albumin in urine of children]. *Münchener Medizinische Wochenschrift*, vol. 56, pt. 2 (1909), pp. 1875–1878.

The author tested the urine of 6 infants, 14 older children, and 3 adults, also of rabbits, for precipitable constituents of human and bovine albumin. Two tables give negative and positive reaction with anticalf serum. Any deficiency of kidneys decreases the activity of intestinal wall and can induce entrance of homologous albumin into the body secretions. The author believes, like Ascoli, that it is better with these precipitin tests to register results and not to attempt conclusions.

254 **Heller, Fritz:** "Die Albuminurie neugeborener Kinder" [Albuminuria in newborn children]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 7 (1913), pp. 303–309.

In studying albuminuria in young infants the author was careful to select those that were healthy and born of mothers free from any kidney abnormality, to test the 24-hour urine for 14 days after birth, and to collect the urine in glass tubes attached to the penis of the boys or vulva of the girls. A table of results of examination of 31 infants shows no albuminuria after 8 days and not very much after 4 days. Further studies of 48 healthy infants indicated that at birth the urine contains no albumin. The author also ascertained that albuminuria has no connection with the number of births or kidney diseases of the mother, the length of birth, weight of child, or digestive disturbance. He thinks the albumin of the newborn may originate not from the kidneys but from the urinary passages. Though he believes albuminuria need awaken no apprehension he prefers not to call it physiological.

255 **Heller, Oskar:** "Über den normalen Frauenmilchstuhl" [Normal human-milk stool] *Münchener Medizinische Wochenschrift*, vol. 68 (1921), p. 1118.

Referring to tests conducted by Freudenberg and himself and by other scholars the author concludes that the so-called ideal human-milk stool—golden, neutral, or alkaline, of the consistency of ointment—is extremely uncommon and not more desirable than other kinds.

256 **Herz, Maximilian:** "Über die täglichen Harnquantitäten bei Kindern und ihre Abweichungen" [Daily quantities of urine eliminated by children, and their variation]. *Wiener Medizinische Wochenschrift*, vol. 38 (1888), pp. 1473–1477, 1509–1512, 1542–1545, 1575–1577, 1601–1604, 1637–1639, 1669–1672.

After presenting data and conclusions of other investigations, especially Cruse and Vierordt, on children's urine, the author gives tables of his own measurements of daily urination of 60 healthy children, 30 boys and 30 girls, between 6 and 14 years old. The quantity of urine daily eliminated by girls is less than that for boys; it varies not so much according to age as according to diet and development.

257 **Heubner, Otto:** "Bemerkungen über die Kuhmilchfäces des Säuglings" [Remarks on the feces of the infant fed on cow's milk]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 17–18 (1901–2), pp. 230–236. See also *Deutsche Aerzte-Zeitung* [Berlin], vol. 3 (1901), pp. 481–483.

On the basis of tests conducted by Rubner and Heubner on the mineral balance of one healthy breast-fed child, one healthy bottle-fed infant, and one atrophic infant, and by Blauberg on a similar series, the author arrives at the conclusion that the healthy bottle-fed infant eliminates about 10 times as much ash in the feces as the breast-fed child, and the atrophic child still more; and that the healthy bottle-fed child absorbs four times as much mineral compounds as the breast-fed child.

258 **Hodann, Julius:** Der Harnsäure Infarkt in den Nieren neugeborener Kinder in seiner physiologischen, pathologischen, und forensischen Bedeutung [Uric-Acid Infarct in the Kidneys of Newborn Children in Its Physiological, Pathological, and Forensic Significance]. Breslau, 1855. 33 pp.

Thesis (University of Breslau). A study of 76 infants. The 31 that were stillborn and the 21 that died soon after birth contained no infarct. Of 24 that died between the second and sixtieth days, 11 showed no infarct.

259 **Hofmann, Karl Berthold:** "Über Kreatinin im normalen und pathologischen Harne" [Creatinine in normal and pathological urine.] *Virchow's Archiv* [Berlin], vol. 48 (1869), pp. 358–408.

This article on creatinine in normal and pathological urine at all ages contains a long table of 243 tests, giving date, amount of urine, specific gravity, and amount and percentage of creatinine. The season of the year made no appreciable difference. The author could find no creatinine in the urine of the infant. In 4 cases of boys about 10 years old he found 0.044 per cent, 0.034 per cent, 0.44 per cent, and 0.041 per cent.

260 **Holt, L. E., Angelia M. Courtney, and Helen L. Fales:** "The chemical composition of diarrheal as compared with normal stools in infants." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 213–224.

A preliminary report of observations made on 21 patients for 35 periods, over a total of 128 days. The cases were divided into three groups: (*a*) With formed, firm, or pasty stools, practically normal; (*b*) with loose stools; (*c*) with very loose stools. The average age of the children was 9 months; the average weight was 5,500 grams. Tables give a clinical summary of the cases studied, percentage composition of the stools, total daily excretion, percentage composition of dried matter, percentage of dried matter of stools not accounted for as fat, protein, and ash, ratio of intake to excretion, and percentage of intake lost in stools.

261 **Hutchison, H. S.:** "Fat metabolism in health and disease with special reference to infancy and childhood." *Quarterly Journal of Medicine* [Oxford], vol. 13 (1919–20), pp. 277–292.

Primarily an investigation of the digestion and absorption of fats in disease but containing, for comparison, various results of 22 examinations of stools of healthy children.

262 **Jacobson, Grégoire:** "Graisses neutres et acides gras dans les selles des nourrissons" [Neutral fats and fatty acids in the stools of young infants]. *Comptes rendus des séances et mémoires de la Société de biologie* [Paris], vol. 67 (1909, vol. 2), pp. 145–146.

The author made numerous experiments with anilin on the stools of young infants. He found that neutral fats as well as fatty acids were colored though in varying degrees. He concluded that they were both found in varying proportions in all the fat droplets contained in the feces.

263 **von Jaksch, R.:** "Über das Vorkommen von Fermenten in den Fäces der Kinder nebst Bemerkungen über das Vorkommen von saccharificirenden Fermenten im Cysteninhalt" [The presence of ferments in the feces of children, with remarks on the presence of saccharific ferments in the cyst content]. *Zeitschrift für Physiologische Chemie* [Strassburg], vol. 12 (1887–88), pp. 116–129.

The author tested the feces of 30 children between infancy and 14 years first for diastase and then for invertin. He placed starch paste in the feces one-half to one hour and tested for grape sugar at a temperature of 40° C. and carried on similar experiments with cane sugar at a temperature of 40° to 50° C. He detected the saccharific ferment very frequently, and though his material was pathological, yet from a candid consideration of the nature of the illnesses involved he believes that this ferment is very common physiologically in human feces and is absent in certain illnesses. The invertin he found to be even more constant than the diastase. The origin of both he discusses without definite conclusions.

264 **Johnston, M. R., and B. S. Veeder:** "The nitrogen partition in the urine of normal children." *Am. J. Dis. Child.* [Chicago], vol. 13 (1917), pp. 404–412.

The authors concluded: "A study of the nitrogen partition in the urine of two groups of healthy children was made to establish normal figures. One group was fed on an ordinary or standard diet containing meat and vegetable with the quantity regulated by age periods; the second on a creatine-creatinine free diet in which the quantity of food (and hence of nitrogen) was regulated according to body weight. In both groups the nitrogen partition was practically the same, with the exception of the uric-acid nitrogen. Urea nitrogen made up from 80 to 85 per cent and ammonia nitrogen from 3 to 5 per cent. The combined figure for the two is less than 90 rather than above 90 per cent as in adults. Creatine is constantly present, as is creatinine. The two combined form a smaller percentage than the creatinine alone in the adult. The amount of undetermined or 'rest' nitrogen is high in children."

265 **Kahn, Walter:** "Über die Dauer der Darmpassage im Säuglingsalter" [Time required for the passage of food through the alimentary canal of the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 29 (1921), pp. 321–330.

The author made about 200 tests of the time food remained in the alimentary canal of 27 infants and 3 young children. A table gives the kind of diet and the number of hours between meal and stool. The passage of food is relatively quick in infancy, varying from 4 to 20 hours and averaging 15 hours. Other tables show the effect of time of day of meal and of diet. The passage is quicker in the morning hours and with the breast-fed infant. Vegetable stool seemed no quicker than other kinds, nor did the age of infants appear to have any effect. Using a barium-sulphate preparation the author took X-ray pictures of infants lying down. The stomach was empty in 4 to 5 hours, the small intestine in 7 to 8 hours, and the stool followed in 8 to 16 hours. Bibliography.

266 **Kaminer, Gisa, and Ernst Mayerhofer:** "Über den klinischen Wert der Bestimmung des unorganischen Phosphors im Harne unnatürlich ernährter Säuglinge" [The clinical value of the determination of inorganic phosphorus in the urine of artificially-fed infants]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 8 (1913), pp. 24–49.

For four years the authors studied the elimination of inorganic phosphates in the urine of infants in the clinic of the University of Vienna and the Emperor Franz Joseph Hospital of the same city. In this article they describe 50 cases, for the most part healthy and artificially fed. The amount of inorganic phosphates eliminated in urine is far greater with a diet of cow's milk than with a diet of human milk, the excess more than covering the difference in intake. The amount of phosphates increases with concentration of milk. It increases also with intestinal disturbances, change to new diet, and addition of sugar or flour.

267 **Kerley, C. G., and W. C. Campbell:** "Stool examination in starch-fed children under 1 year of age." *New York M. J.*, vol. 83 (1906), pp. 181–182.

A report of 166 stool examinations made on 30 children, inmates of the New York Infant Asylum. Raw barley flour, cooked 1½ hours, was used as the food; the stools were examined by the von Jaksch test. The article gives various results of the examinations.

268 **Kissel, A. A.:** "K voprosu ob udyelnom viesie mochi u dietie i o soderzhanni v niey svobodnoy mochevoy kisloti" [Specific gravity of the urine in children and the amount of free uric acid contained in it]. *Vrach* [St. Petersburg], vol. 14 (1893), pp. 995–1028.

The author investigated 186 cases and gives data on 71 cases including both well and sick children.

269 **Knöpfelmacher, Wilhelm:** "Die Ausscheidung flüssiger Fette durch die Fäces und die Resorption des Milchfettes bei Kindern" [Elimination of fluid fats through feces and resorption of milk fat in children]. *Wiener Klinische Wochenschrift*, vol. 10 (1897), pp. 695–701.

After a preliminary discussion of current theories on elimination of fluid fats through feces and resorption of milk fat in children the author presents findings of his studies on four infants, on three children between 6 and 11 years, and of two tests on fat in meconium. He also tabulates data of Uffelmann on infants. He concludes that the fat of feces of older children, as well as of adults, when on a milk diet, contains 12 to 20 per cent of olein; that of infants contains 28.8 to 37.8 per cent of olein; utilization of milk fat is less in the infant than in the child or the adult.

270 **Krause, R. A.:** "On age and metabolism and on the significance of the excretion of creatine." *Quarterly Journal of Experimental Physiology* [London], vol. 7 (1914), pp. 87–101.

To determine the creatine excretion of normal children 17 children of both sexes, aged 2 to 13, were put on a creatine-free diet for several days, and the urine collected and analyzed. Examination of the results showed that the creatinuria of boys ceases apparently at about the age of 5 or 6 whereas that of girls persists until about the age of 10. To determine the power of children to retain ingested creatine two sisters and two brothers were given creatine of measured quantity with their food. The result showed that the power to assimilate creatine is very much weaker in children than in men. Investigations are compared with the work of other scientists, and many references are given.

271 **Lade, O.:** "Studien über die Acidität des Urins mit experimentellen Beiträgen aus dem Säuglingsalter" [Studies on the acidity of the urine with data on experiments with infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 55 (1910–11), pp. 161–199.

After discussing urine acidity, methods of determining it, the cause in adult and child, and the investigations of other students the author gives in tables and curves the results of his own tests upon a few boy infants. Acidity was tested according to Folin's method, in breast-fed and bottle-fed infants. The urine acidity of the breast-fed infant fluctuated between 0.3 and 0.4 cubic centimeter one-tenth normal solution of potassium hydroxide for 10 cubic centimeters of urine, and of the artificially-fed child between 1.2 and 2.9, about the same as that of the adult on milk diet. Parallel with this acidity curve runs the phosphoric-acid curve and to a greater or less extent the nitrogen curve.

272 **Landsberger, M.:** "Über die Ausscheidung von organischen Säuren" [On the excretion of organic acids]. *Ztschr. f. Kinderh.* [Berlin], vol. 39 (1925), pp. 597–607.

The author studied 40 infants ranging in age from 1 day to 1½ years, for the purpose of finding amount of organic acids excreted through the urine. The observations, which were conducted by the van Slyke-Palmer method, lasted in most cases 1 day; in others several days. A table gives the age of each child, the quantity and nature of food, quantity of urine, titration acidity, hydrogen-ion concentration, nitrogen, ammonium, ammonium coefficient, quantity and coefficient of organic acids. The author found a moderate degree of relationship between the quantity of protein in the food and the excreted acids. The urine of breast-fed infants contained a smaller quantity of organic acids than that of artificially-fed infants or those on a mixed diet. Fat seemed a particularly important factor in producing organic acids. The author was unable to determine whether age had any effect on the quantity of organic acids excreted.

273 **Lange, Jerome:** "Über den Stoffwechsel des Säuglings bei Ernährung mit Kuhmilch" [The metabolism of the infant fed on cow's milk]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 39 (1895), pp. 216–240.

After a prolonged discussion of the work done by Camerer, Tschernoff, Uffelmann, and others the author describes his own metabolic experimentation with infants. The nitrogen in the excretions he determined according to Kjeldahl's method as modified by Argutinsky.

He tested the feces of 24 infants, of whom 1 was breast fed. Of the 23 artificially fed 9 had digestive disorders and 14 were healthy. The fecal dry residue was twice as great in the case of the 9 as in the 14, but the percentile nitrogen content was much smaller. The author also tested both feces and urine (using Epstein's recipient) of four infants during two days and of five infants for one day. Their artificial food was 2.25 per cent albumin, 2.16 per cent fat and 7 per cent lactose. The small output of urine he ascribed to perspiration and the nitrogen deficit to the formation of new cells and a reserve store of albumin in the infant organism.

274 **Langfeldt, E.:** "Zur Engel-Turnauschen Harnreaktion" [Engel-Turnau's urine reaction]. *Berliner Klinische Wochenschrift*, vol. 48 (1911), pp. 2114–2115.

Engel-Turnau's urine reaction is positive when blackness results on addition of 1 cubic centimeter of 2 per cent silver-nitrate solution to 5 cubic centimeters of urine; reaction is negative if blackness does not result in 10 minutes. The author tested the urine of 14 breast-fed infants, 6 bottle-fed infants, and 5 who were given both kinds of milk. Though the reaction was

positive in 85 per cent of the breast-fed infants and negative in 83 per cent of the artificially-fed infants the author believes with Boschan that the reaction can not be accepted as proof of the kind of infant nourishment.

275 **Langstein, Leo:** "Untersuchungen über die Acidität und den Zuckergehalt von Säuglingstühlen" [Investigations on the acidity and sugar content of infant stools]. *Jahrb. f. Kinderh.* [Berlin], vol. 56 (1902), pp. 350–358.

The author discusses experiments conducted by other investigators on the acidity of stools of breast-fed infants and on the sugar content of breast-fed and bottle-fed infants. He gives nine tables of repeated tests upon nine infants, citing date, diet, stools, sugar, acidity, and weight. On the basis of these he has arrived at the conclusion that in no case were quantitative amounts of sugar present after titration with Fehling's solution. Traces of sugar were to be detected only by a positive osazone test. He describes his methods, including the fermentation test of the Bonn school. He also confirmed Callomon's results.

276 ——— **and F. Steinitz:** "Die Kohlenstoff- und Stickstoffausscheidung durch den Harn beim Säugling und älteren Kinde" [The carbon and nitrogen elimination in the urine of the infant and older child]. *Jahrb. f. Kinderh.* [Berlin], vol. 61 (1905), pp. 94–105.

To investigate the carbon and nitrogen elimination in the urine of infants the authors collected the 24-hour urine of infants fed with different kinds of food. The nitrogen they determined by the Kjeldahl method, the ammonia by the Reich method, the urea by the Pfaundler method, the carbon by the Pregl-Steyrer method. Tables give the amount of urine, nitrogen, carbon, and relation of carbon to nitrogen in 19 experiments on nurslings and in 6 on older children and adults and the total nitrogen, ammonia nitrogen, urea, amino acids, nitrogen, and urea nitrogen in 6 experiments on nurslings. The proportion of carbon to nitrogen is subject to alimentary influences. It varies from 0.68 on cow's milk to 1.19 on human milk and to 1.36 on malt soup, etc. That of older children is like that of adults. The absolute quantity of the carbon not eliminated as urea is greatest where the quotient carbon : nitrogen is lowest.

277 **Lehmus, Emilie:** "Über den relativen Werth der Phosphorsäure im Urin beim Kinde" [Relative value of phosphoric acid in children's urine]. *Central-Zeitung für Kinderheilkunde* [Berlin], vol. 1 (1877–78), pp. 291–292.

The author investigated the urine of 13 children, ranging from 7½ months to 3 years and 9 months in age. A table shows age, nutrition, nitrogen and phosphorus pentoxide morning and forenoon, and relative value of phosphoric acid. The latter value is higher in the child up to 3 years than in the adult.

278 **Leiner, Carl:** "Über Farbenreactionen der 'Caseinflocken'" [Color reactions of casein curds]. *Jahrb. f. Kinderh.* [Berlin], vol. 50 (1899), pp. 321–330.

After sketching the work of others on casein curds the author recounts his own 12 color tests on the feces of infants, most of them fed upon cow's milk. He describes his methods of coloring and in what manner albumin, casein, pseudonuclein of casein, and mucin react on color mixture. Though there are white curds in the stools of normal children, made up mostly of masses of bacteria or crystals, the author believes they are much smaller than those in dyspeptic stools. Bibliography.

279 **Leo, H.:** "Untersuchungen über Indicanurie im ersten Kindesalter" [Investigations on indicanuria in early childhood]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 23–24 (1906–7), pp. 281–302.

The author made urine tests for indican of 68 young children, including newborn, infants fed at the breast, on mixed fare, and on the bottle, and children from 2 to 3 years old. He shows his findings in seven tables. No indican was detected in the first week of life. Healthy, breast-fed infants showed indicanuria; if cow's milk was added to their fare the indican was but slightly increased, but it was much increased by the addition of sterilized skimmed milk. This confirms the theory that carbohydrates and fat fermentation work against putrescence. All infants on regular mixed diet and all bottle-fed infants had indicanuria; also, those on a hunger diet. Older children showed more of it than young infants, especially when eating vegetables. Thus the indican test is not very reliable for the pediatrician.

280 **Leschziner, Leo, and Fritz Rieger:** "Über die Ausscheidung des an Säuren gebundenen Schwefels im Säuglingsurin bei verschiedener Ernährungsweise" [The elimination of sulphur bound in acids in the urine of infants on different diets]. *Arch. f. Kinderh.* [Stuttgart], vol. 40 (1904–5), pp. 97–102.

After stating that sulphuric acid indicates the intensity of intestinal putrefaction the author analyzes chemically the foods (milk, cream, buttermilk) used in his experiments, especially the albumin in them, since nitrogen is of great influence in sulphur trioxide. He also tabulates the effects of these foods upon two children in the amount of urine eliminated, the total sulphur trioxide, the sulphur trioxide from inorganic sulphates, etc. He concludes that fat reduces

intestinal putrefaction more than lactose and that the greater content of sulphur in albumin as compared with casein does not give rise to the elimination of larger amounts of etheric sulphuric acid.

281 **Lesné, E., and Prosper Merklen:** "Urine normale des nourrissons" [Normal urine of nurslings]. *Revue mensuelle des maladies de l'enfance* [Paris], vol. 19 (1901), pp. 61–66.

In an article on the pathology of the liver and kidney the authors present this brief study of the quantity and analysis of urine of normal infants.

282 **Levin, G. L.:** K voprosu o soderzhanii azota, zhira, zoli, plotnikh veshchestv, i vodi v normalnom kalie zdorovikh dietie grudnago vosrasta. [Contents of Nitrogen, Fats, Mineral Substances, Solid Substances, and Water in the Normal Feces of Well Infants]. St. Petersburg, 1900. 58 pp.

This pamphlet consists almost entirely of quotations on the content of nitrogen, fat, mineral salts, solid substances, acid, and water in the normal feces of well infants, supplemented by a brief account of the author's own study of these subjects. Bibliography.

283 **Liefmann, Else:** "Die Acetonausscheidung im Urin gesunder und spasmophiler junger Kinder" [The acetone elimination in the urine of healthy and spasmophilic young children]. *Jahrb. f. Kinderh.* [Berlin], vol. 77 (1913), pp. 125–145.

The author describes her investigations into the elimination of acetone in the urine of many normal and spasmophilic infants. The acetone was determined by the process of Embden and Schmitz, fat by Gerber's method, and carbohydrates by the polarimetric method. The tests included various diets. Magnus-Levy found the physiological elimination of acetone in the adult to be 10 to 30 milligrams in 24 hours. The author found it to be 3 to 10 milligrams in older children. The tables on healthy infants, 4 breast fed and 6 artificially fed, of the first year and 3 from 1⅓ to 2¼ years old, show a variation of acetone in the urine from 1 to 5 milligrams. No difference was noted between breast and artificial feeding, but the acetonuria was greater in the younger infants.

284 **McClure, W. B., and P. S. Chancellor:** "Über die diastatische Wirkung des Kinderharns" [The diastatic action of children's urine]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 11 (1914), pp. 483–496.

The authors investigated the diastatic action of urine (d. 38°/30′) by Wohlgemuth's method in the case of 106 infants and children of ages varying from 1 day to 14 years, of whom some were in good health and some not. The results are tabulated. The average d. value for 55 infants in the first year was 1.8; for 5 in the second year, 4.4; for 13 of ages 3 to 7, 6.4; for 9 of ages 7 to 15, 11.2. Two tables give results of tests on rachitic children with a starch diet. The author also discusses the factors of temperature, salt, and low specific gravity of the urine.

285 **Marfan, A. B., and H. Dorlencourt:** "Recherches sur les reductases des selles du nourrisson à l'état normal et à l'état pathologique" [Researches on the reductases of the stools of the nursling, normal and pathological]. *Le Nourrisson* [Paris], vol. 9 (1921), pp. 382–389.

By use of the two reagents of Schardinger (technique described) the authors investigated the stools of 56 nurslings, in some cases examining the stools of 1 infant several times. The total number of examinations was more than 80. They found that normal feces always decolorized the two reagents completely in 20 to 50 minutes. Boiling the fecal solution prevented decolorization; adding an antiseptic neither prevented nor delayed it; at 15° to 80° C. the decolorization was more rapid as the temperature rose; above 80° it became slower. From those facts the authors concluded that the reductases were of the nature of enzymes. Further researches showed that the reductases were contained, for the most part, in the solid particles of the feces and were more abundant in infants fed with cow's milk than in those fed at the breast.

286 **Martin, A., and C. Ruge:** "Über das Verhalten des Harns und der Nieren der Neugeborenen" [The condition of urine and kidneys in newborn infants]. *Zeitschrift für Geburtshülfe und Frauenkrankheiten* [Stuttgart], vol. 1 (1875–76), pp. 273–322.

The authors conducted comprehensive examinations of the urine of 24 male infants born in a gynecological clinic in Berlin. Fifteen were first born, 8 were premature, there was 1 set of twins; 2 died in the institute. The article describes the time and frequency of the passages of urine; the amount of urine excreted; its color, specific gravity, and reaction; its content in chlorine, albumin, urea, and uric acid; the percentage of water and residue. The manner of collecting and of analysing the urine is described. There are many tables and one plate.

287 ——— ——— and **R. Biedermann:** "Untersuchungen des Harns während der ersten 10 Lebenstage" [Urine tests during the first 10 days of life]. *Centralblatt für die Medicinischen Wissenschaften* [Berlin], 13th year (1875), pp. 387–388.

This article gives many figures on the urine of 17 boys during the first 10 days of life. One table shows average amounts excreted; another shows spe-

cific gravity. In color the urine was at first like one and two of Vogel's scale; later it became lighter. At first weakly acid, it became alkaline. All 17 boys had albumin in the urine, and all had uric acid, which increased to the third day and then decreased.

288 **Mayerhofer, Ernst:** "Chemische Teilerscheinungen im Harne gesunder und kranker Säuglinge" [Chemical phenomena of urine constituents in healthy and sick infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 1 (1910–11), pp. 487–545.

The subject is discussed under the following headings: (1) Phosphoric-acid elimination; (2) G. Goldschmiedt's alpha naphthol reaction (glycuronic acid and nitrogen nitrate); (3) reduction index as measured by permanganate in acid solution; (4) reaction with concentrated sulphuric acid; and (5) casuistics on breast-fed and artificially-fed children (16 in all), tests on which are comprehensively stated and in part illustrated by five curves. The author believes that the urine of newborn infants is altogether peculiar, on account of its albuminuria, higher specific gravity, deeper color, and increased phosphates. The urine of the healthy breast-fed child is an indication of the excellent powers of the organism to absorb and retain materials, very different from those powers in the artificially nurtured child.

289 **Meyer, Ludwig F.:** "Zur Kenntnis der Phenolausscheidung beim Säugling" [Information on phenol elimination in the infant]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 4 (1905–6), pp. 344–351.

The author studied the results of administration of phenol to infants and the quantity eliminated. He tested the elimination of phenol and sulphuric-acid ether in two breast-fed and six artificially-fed infants. The phenol content in the urine was relatively higher for the artificially fed than for the breast-fed infants. Elimination of sulphuric-acid ether showed analogy to phenol. The author also tested 7 infants to whom he administered 4 to 15 cubic centimeters dilute phenol per os. Results are shown in a table.

290 **Michel, Charles:** "Les selles du nourrisson au sein; utilisation des matériaux nutritifs du lait de femme" [The feces of the breast-fed infant; utilization of the nutritive materials in human milk]. *Union Pharmaceutique* [Paris], vol. 29 (1898), pp. 433–436.

The author made 10 analyses of the feces of male infants, from 5 to 15 days of age, breast fed and in normal health. He found the composition of the dry feces to be: Mineral salts, 10.78 per cent; free fatty acids, fat, and cholesterin, 20.65 per cent; albuminoid matter, 27.68 per cent; indeterminate organic material, 40.89 per cent. In 7 of these cases he was able to investigate the utilization of the materials in the mother's milk ingested, measuring the quantities of milk by weighing the infant before and after each nursing, and collecting the feces without loss. Utilization, except of the lime and phosphorus, was found to be almost complete. A table is given.

291 **Millikin, Frances:** "The presence of sugar in the urine of newborn infants before the intake of food." *Am. J. Dis. Child.* [Chicago], vol. 21 (1921), pp. 484–487.

The author examined the urine of a series of infants, collected before the first feeding (16 cases), and found sugar present in percentages of 0.027 to 0.140. Determination showed the fermentable sugar to be glucose; the nature of the unfermentable sugar was not known. References are given.

292 **Miloslavich, Edward L.:** "Racial studies on the large intestine." *American Journal of Physical Anthropology* [Washington], vol. 8 (1925), pp. 11–22.

With many data on adults, from the author's own observations, are included his statistics on the length of the large intestine in Serbian children and comparison with the corresponding statistics of Russian children(after Gundobin-Debeles) and of German children (Beneke). He found the average length of colon in Serbian children, between the first and sixth years, 120 centimeters, between the sixteenth and twentieth years, 175.4 centimeters. References.

293 **Moll, Leopold:** "Die klinische Bedeutung der Phosphorausscheidung im Harn beim Brustkind" [The clinical significance of phosphorus elimination in the urine of the breast-fed infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 69 (1909), pp. 129–152; 304–332; 450–478.

With the purpose of correlating the phosphoric acid in the urine with the general health of infants the author tested the urine of breast-fed children, healthy and sick, on ordinary diet and on hunger diet. The article cites former work on the same subject; describes methods used in these experiments; gives case histories of many infants, with tables; and concludes with a bibliography. Of the breast-fed infants examined the healthy ones had in the urine no phosphates, or only traces, and none when on a hunger diet; the sick ones often showed large amounts. The relation of phosphorus pentoxide to nitrogen was from 1:16 to 1:23 in the healthy infant, or 1:29 when it was hungry. This relation fell to 1:2.8 in the sick infant.

294 **Momidlowski, Stanislaus:** "Über das Verhalten des Indicans bei Kindern" [The behavior of indican in children]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 36 (1893), pp. 192–209.

The author investigated indican in the urine of 214 children including 129 nurslings up to 6 years of age, of whom some were healthy and some sick.

The indican he determined qualitatively according to Obermayer. He describes his results, giving tables and case histories of individual cases and comments on similar work done by others. The urine of the healthy, breast-fed infants was generally, but by no means always, free of indican. The indican was sometimes found a few hours after birth unattended by any disturbance in the alimentary tract. Healthy artificially-fed infants showed small amounts of indican almost constantly. In general, indicanuria increased in intensity with intestinal disturbance. There was no apparent connection between indicanuria and tuberculosis. In children over 1 year the indican content was like that of adults.

295 **Monti, Guarnieri C.:** "Su una reazione colorante delle feci dei bambini come indice della digestione dei grassi" [On the color reaction of infant feces as indication of the digestion of fats]. *Rivista di clinica pediatrica* [Florence], vol. 9 (1911), pp. 768–769.

In his study of 50 infants the author used the Jacobson method based on the affinity of fats for fuchsin; this affinity is particularly great for fatty acids, which with fuchsin take on a bright red; it is not so great for saponaceous acids, which take on a pink color; and it is absent in neutral fats, which remain colorless.

296 **Moore, Charles U.:** "The phenol excretion in the urine of infants, including the newborn." *Am. J. Dis. Child.* [Chicago], vol. 13 (1917), pp. 15–33.

Two groups of infants were studied. With 15 the urine was tested daily for three successive weeks, with week-end rest periods of three days each, a total of ninety-five 24-hour specimens having been examined. With 19 newborn infants the specimens included the urine passed during the first three days of life. Of these 114 specimens a total of 164 analyses were made. The ages of the infants varied from 1 week to 6 months; weights, 1,765 grams to 5,740 grams; food intake, 24 hours, 405 grams to 1,080 grams; number of stools 1 to 9; total phenol excretion per day, 9 milligrams to 58 milligrams; average phenol excretion, 28.9 milligrams. Tables show phenol excretion with reference to number of stools per day and with reference to breast and artificial feeding. The author found an increase in the number of stools associated with a decrease in the total phenol output. The phenol excretion per kilogram of body weight was less in the breast-fed than in the artificially-fed infant. In general, with infants and adults, trebling the protein intake doubles the phenol excretion. Since phenol is quantitatively present in the urine of newborn infants during the period of starvation it must originate in part through endogenous metabolism.

297 **Moro, Ernst:** "Untersuchungen über diastatisches Enzym in den Stühlen von Säuglingen und in der Muttermilch" [Investigations on diastatic enzyme in the stools of infants and in mother's milk]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 47 (1898), pp. 342–361.

After describing methods employed the author gives a table of results of tests on 40 stools of infants in the first month of life to determine diastatic enzyme. The ferment was lacking in only four cases; it rapidly increases with age. The author also dissected the pancreas of 10 children and found that the extract exerts a slight diastatic influence. From two studies of human milk and two of cow's milk he found that the first contains an intensively diastatic enzyme that the second lacks.

298 **Müller, Erich:** "Über Ernährung debiler Kinder mit molkenreduzierter Milch an der Hand von Stoffwechseluntersuchungen" [Feeding weak children on whey-reduced milk in the light of metabolism experiments]. *Jahrb. f. Kinderh.* [Berlin], vol. 73, Supp. vol. (1911), pp. 252–262.

The author gives data on the chemical analyses of the excretions of weak infants, with whom he conducted feeding experiments lasting four or five days.

299 **Müller, Friedrich:** "Über den normalen Koth des Fleischfressers" [Normal feces of meat eaters]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 20 (1884), pp. 327–377.

This discussion on feces of children, adults, and animals on various diets, supported by tables of chemical analyses, compares meconium, hunger feces, and feces of meat eaters. These three kinds of feces are elimination products and not the residue of food. They consist of more or less altered digestive juices and bits of mucous membrane of the intestine. After a quick passage through the canal, unaltered bile acid, alkali salts, etc., are present in feces.

300 **Niemann, Albert:** "Fett und Kohlehydrat in der Säuglingsernährung. Ihre Wirkung auf die Ammoniakausscheidung gesunder und rachitischer Kinder" [Fat and carbohydrates in the infant's diet. Their effect on ammonia elimination of healthy and rachitic children]. *Jahrb. f. Kinderh.* [Berlin], vol. 85 (1917), pp. 210–224.

The author and N. Krasnogorski conducted experiments covering 8 to 16 days on five children in the second half of their first year. Two of the children were healthy and three had rachitis. All five received the same diet of cow's milk with a decoction of flour and extract of malt soup in such quantity as to

supply sufficient calories. Ammonia in the urine was distilled in vacuum and collected in sulphuric acid, and total nitrogen was determined according to Kjeldahl. Ammonia elimination was conspicuously greater in rachitic than in nonrachitic children. The author discusses possible reasons for this. Case histories, curves, and tables are given.

301 **Niemann, Albert:** "Über den Einfluss der Nahrung, insbesondere des Kohlehydrats, auf die Harnsekretion beim Säugling" [Effect of diet, especially of carbohydrates, on the secretion of urine in the infant]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 82 (1915), pp. 21–44.

The author describes the simple contrivance he employed in conducting experiments on the effect of a carbohydrate diet on the urine secretion of infants. His subjects were 14 young infants. He classified the infants into three groups: Those whose urine secretion is lessened and the weight increased on a carbohydrate diet and who in general thrive; those whose urine increases and who seem more or less sickly; those who do not increase in weight but show no digestive disturbances. The author concludes that the pathological excess of weight may be due to lack of fat or protein. He discusses different diets of carbohydrates, rye, lactose, cane sugar, Saxleth's "Nährzucker"; also water elimination through skin and lungs.

302 **Nobécourt, P.:** "De l'élimination par les urines de quelques sucres introduits par la voie digestive ou la voie souscutanée chez les enfants" [Concerning the elimination in infant urine of certain sugars introduced by mouth or subcutaneously]. *Revue mensuelle des maladies de l'enfance* [Paris], vol. 18 (1900), pp. 161–191.

The author studied the absorption of sugars by infants. Lactose was studied with 8 infants, saccharose with 17, and glucose with 23 infants. He found that the intestine of the infant is capable of transforming greater quantities of lactose, ingested at one time, than are contained in a single nursing; that its capacity for transforming saccharose is practically the same; that the organism, at this age, has a marked effect on glucose, greater than that of the adult and not limited to the liver but exerted by the tissues collectively.

303 ——— **and P. Merklen:** "Passage du carmin à travers le tube digestif des nourrissons" [Passage of carmine through the digestive tract of the infant]. *Bulletins de la Société de pédiatrie de Paris*, vol. 12 (1910), pp. 4–7.

A report of 10 observations of normal infants, aged 4 days to 2½ months, with a table showing time of appearance and disappearance of the carmine. The author found this time very variable, not only in different infants but in the same infant. In the 10 observations its presence was determined seven times between 3 and 10 hours after ingestion. In one case a slight coloration of the stools was found after 38 hours.

304 **Nothmann, Hugo:** "Laktase und Zuckerausscheidung bei frühgeborenen Säuglingen" [Lactase and sugar elimination in premature infants]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 8 (1909–10), pp. 377–388.

The author discusses sugar in the infant organism and describes his own tests upon eight thriving premature children for lactase in the stool, analyzed according to Orban, and sugar in the urine, analyzed with the osazone test. His tables of full data show lactase to be negative in only two out of eight cases, and sugar to be positive at some time in the urine of every infant. A third table gives the satisfactory increase in the weight of the subjects. Bibliography.

305 **Oechsner de Coninck:** "Sur l'élimination de l'azote et du phosphore chez les nourrissons" [On the elimination of nitrogen and phosphorus by nurslings]. *Comptes rendus hebdomadaires des séances de l'Académie des sciences* [Paris], vol. 129 (1899), pp. 223–224.

A note on studies made by the author of 12 breast-fed infants, giving a table of 24-hour quantities of urine and total nitrogen and phosphoric acid secreted.

306 **Ohlmann, Julius:** "Weitere Untersuchungen über den Wasserversuch im Kindesalter" [Further investigation of water elimination in childhood]. *Ztschr. f. Kinderh.* [Berlin], vol. 26 (1920), pp. 291–303.

The author conducted experiments upon children from birth to 10 years of age by giving definite amounts of water and measuring the elimination within 5 hours. For the first year he employed 200 cubic centimeters of water and for later ages 400 cubic centimeters. In 56 experiments upon 34 infants there was an elimination of 69 per cent for the first quarter of the year, 79 per cent for the second, 92 per cent for the third, and 113 per cent for the fourth. In 32 experiments upon 20 older children the elimination was 91 per cent for 1 to 4 years, 133 per cent for 4 to 6 years, and 175 per cent for 6 to 10 years. Similar experiments with a 7 per cent salt solution produced similar results relatively, but all lower. The striking phenomenon of the above is the marked retention of the first 3 months of infant life. That is followed by a gradual increase of excretion up to school age.

307 **von Oordt:** "Über das Verhältnis von Stickstoff und Kohlenstoff im Säuglingsharn" [Relation between nitrogen and carbon in infant urine]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 43 (1902), pp. 46–51.

After discussing the relation of nitrogen and carbon in infant urine, as investigated by Rubner and others, for animals and human beings on different diets, the author presents his own data derived from many tests on two breast-fed infants. The reaction was always acid and the specific gravity varied between 1.001 and 1.005. His table also shows nitrogen according to Kjeldahl. Whereas nitrogen according to Kjeldahl was 240.5, according to Hufner it was 214.7. Neither albumin nor sugar was found.

308 **Orban, Rudolf:** "Über das Vorkommen der Lactase im Dünndarm und in den Säuglingsfaeces" [The presence of lactase in the small intestine and in the feces of young infants]. *Prager Medicinische Wochenschrift*, vol. 24 (1899), pp. 427–429, 441–443.

To ascertain the presence of lactase in the small intestine and feces the author, besides a number of animal experiments, examined two fresh intestines from newborn infants and the stools of 10 infants. He found that the middle portion of one intestine had the power of splitting sugar. Eight of the stools contained lactase.

309 **Orgler, Arnold:** "Über Harnsäureausscheidung im Säuglingsalter" [Uric-acid elimination in infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 67 (1908), pp. 383–412.

The article contains full case histories of the 11 infants that were the subjects of tests involving human milk, mixed diet, and wholly artificial feeding, and also chemical analyses of the nitrogen in food, excretions, the nitrogen retention, the uric acid, and the total purin. The writer discusses the form in which retained nitrogen is incorporated into the organism. Every growing organism possesses the power of forming purin bodies and nucleoproteids synthetically from matter free of purin. Since the uric-acid elimination gives a measure for the metabolism of the nucleoproteids, the author tests the metabolism of these important albumin bodies, varying the intake of albumin with the natural and artificial diets. The uric acid was analyzed according to the method of Ludwig-Salkowski, the nitrogen according to that of Kjeldahl, the fat with Gerber's butyrometer, etc. Each test lasted three days. Among other things it was ascertained that the higher the nitrogen retention the lower the uric-acid elimination. The retention was more favorable with natural than with artificial diet.

310 **Oshima, L.:** "Über den Eiweissgehalt der Säuglingsstühle" [Protein content of infant stools]. *Arch. f. Kinderh.* [Stuttgart], vol. 45 (1906–7), pp. 405–419.

The author tested infant stools for albumin, albumoses, peptone, casein, nuclein, paranuclein, pseudonuclein, nucleoprotein, and mucin. One table contains full data on feces of 50 infants 3 months old; another, data on 200 infants of various ages. The albumin test was positive in breast-fed children only when they had intestinal disorders. Infants fed on cow's milk showed albumin even when healthy and still more when overfed or sick. Alkaline buttermilk proved most like breast milk, so far as albumin in feces was concerned. The test was negative, or almost so, on a carbohydrate diet.

311 **Parrot, J., and Albert Robin:** "Études pratiques sur l'urine normale des nouveau-nés" [Practical studies in the normal urine of the newborn]. *Archives générales de médecine* [Paris], vol. 27 (1876), pp. 129–148, 309–331.

An extended study of the general physical characters, sediments, and chemical characters of the urine with application of these studies to the physiology and pathology of the newborn. Many original observations are given. References.

312 **Pechstein, Heinrich:** "Über die Ausscheidung der Magenfermente im Säuglingsharn" [The elimination of gastric ferments in infant urine]. *Ztschr. f. Kinderh.* [Berlin], vol. 1 (1910–11), pp. 356–397.

After a discussion of previous work on pepsin in the urine the author describes his own investigation on gastric ferments in the urine of infants in the Empress Augusta Victoria House. With Fuld's edestin method he tested the morning urine of 22 healthy infants from 1 to 10 months old, 10 breast fed, and 12 artificially fed. He concluded from this experimentation that all children from birth eliminate pepsin and rennet in the urine. These ferments can be established only in their early stage as proferment and are approximately alike in quantity. The ferment content was very slight in the first days after birth and then during the first year remained about one-twentieth of that in the adult. Infants nourished artificially showed higher content than breast-fed infants. The author describes many other experiments on two or three infants at a time. On putting pepsin and rennet in the milk he detected no trace thereof in either urine or stool. Most of these additional tests involved pathological cases. Bibliography.

313 **Perini, A.:** "Sulla reazione chimica delle feci nei lattanti" [On the chemical reaction of feces of infants]. *La clinica medica italiana* [Milan], vol. 50 (1911), pp. 722–739.

The purpose of the study was to find the degree of acidity of infants' feces under normal and pathological conditions of the gastrointestinal tract, relation between acidity of feces and method of feeding, and relation between acidity of feces and their physiological nature. In his experiments on 44 children the author found that the acidity of normal feces varied from 150 to 200 per cent, the average being 180 per cent. Where the gastrointestinal tract was diseased the acidity was sometimes lower, at other times higher, in the same case. Artificially-fed children showed in some cases normal acidity, in others more or less than normal. Normal acidity was found in feces which are yellow and show that the food has been completely digested or which contain at most a few grains of fat or casein. Green feces have a strong acid reaction. Tables are given. Bibliography.

314 **Pollak, O.:** "Beiträge zur Kenntnis des Harnes der Säuglinge" [The urine of infants]. *Jahrb. f. Kinderh.* [Leipzig], vol. 2 (1868–69), pp. 27–32.

The author tested urine of more than 20 healthy infants from 8 days to 2½ months old. A table gives for one infant amounts of urea, uric acid, water, solids, chlorides, phosphoric acid, etc.; another table compares these data and amounts voided daily, the specific gravity, color reaction, etc., with corresponding figures for the adult according to Kühne. The water content of infant urine was relatively great. The amount of uric acid as compared with that of the adult was also relatively great. Among inorganic salts, the quantity of which was much smaller than in the urine of adults, phosphates were least in amount. Considering the amounts of albumin and phosphoric-acid salts contained in human milk, very little is eliminated in the urine.

315 ——— "Zur Frage des Zucker- und Eiweissgehaltes im Säuglingsharne" [Question of sugar and albumin content in infant urine]. *Jahrb. f. Kinderh.* [Leipzig], vol. 12 (1878), pp. 176–178.

Since Cruse asserted that sugar and albumin are found in infant urine only during the first 10 days of life in opposition to the author's previous findings, the latter renewed experimentation on one healthy infant 1 month old and on another healthy infant 2 months old, and his tests again proved positive. He describes methods of testing and reactions. The albumin was smaller in amount in the urine of the older infant.

316 **Pottevin, Henri:** "Contribution à l'étude de la digestion chez l'enfant nouveau-né" [A contribution to the study of the digestion of the newborn child]. *La revue médicale de Normandie* [Rouen], vol. 1 (1900), pp. 205–209.

Analysis (method described) of the meconium of an infant 3 hours old showed that it contained rennin, amylase, and a diastase capable of liquefying gelatine.

317 ——— "Sur la présence des diastases digestives dans le méconium" [The presence of digestive diastases in the meconium]. *Comptes rendus hebdomadaires des séances et mémoires de la Société de biologie* [Paris], vol. 52 (1900), pp. 589–591.

The author in examining the meconium always found it sterile. He found in it rennin, amylase, and casease, and believes that the newborn infant's alimentary canal is provided with a large number of diastases.

318 **Poulsen, Vald:** "Über Rohmilchgerinnsel im Säuglingstuhl" [The coagulation in the infant stool from raw milk]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 79 (1914), pp. 77–90.

The author examined chemically the casein curds he found in stools of infants nourished on raw cow's milk at Queen Louise's Child Hospital. Five of 13 children in the first year had passages containing many large curds ranging in size from that of a pea to that of a hazel nut. These the author tested for fat by Soxhlet's ether extraction method, for nitrogen by Kjeldahl's method, and for ash. The fat was found to vary with the fat in the milk. Much effort was expended on ascertaining the origin of the nitrogen. The author finally concludes that it comes from the albumin of the milk and probably is paracasein.

319 **Reusing, H.:** "Beiträge zur Physiologie des Neugeborenen" [Contributions to the physiology of the newborn infant]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 33 (1895), pp. 36–93.

Many short diagrams and 16 tables are given on infant urine, its amount, its chemical analysis, etc. The author conducted his investigations from January to October, 1893, and February to May, 1894, in the Lying-in Station of the Royal Würzburg University, on 44 male infants, 31 breast fed and 13 artificially fed. The latter excreted more urine than the breast-fed infants. All excreted relatively less than usual for infants during the first week, but relatively more than adults from the fourth day on. The small amount of urine during the first week is due to small intake of liquids and loss through skin and lungs.

320 **von Reuss, A.:** "Indicanurie bei Neugeborenen" [Indicanuria in newborn infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 3 (1911–12), pp. 12–27.

The author made 400 urine tests of healthy breast-fed infants during the first nine days of life for indican. None was detected on the first or ninth day. The percentage of cases of indicanuria was 14 for the second day, 22 for the third, 42.1 for the fourth, 14 for the fifth, 7.1 for the sixth, 25.7 for the seventh, and 11.1 for the eighth day. To ascertain the cause of indicanuria the author considers 20 infants clinically. He decides that either indol arises from the intestinal secretion or the indicanuria is a sign of tissue decomposition.

321 ——— "Über das Vorkommen von Glykokoll im Harne des Kindes" [Presence of glycocoll in child's urine]. *Wiener Klinische Wochenschrift*, vol. 22 (1909), pp. 158–159.

The author describes investigation on glycocoll after Forssner declared it to be a normal constituent of urine. After describing his own method of testing he presents a table of data on 14 children from 2 weeks to 11 years old, showing that glycocoll is normal in children's urine, independent of age and diet. Since it appears in the urine of the infant, whose milk contains very little glycocoll, it would seem that glycocoll eliminated is a product of intermediary metabolism. Experiments of others are discussed.

322 ——— "Zur Frage der Albuminurie der Neugeborenen" [Question of albuminuria in the newborn]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 29–30 (1912–13), pp. 145–152.

Zarfl and the author in a clinic and a children's home in Vienna tested the urine of 500 healthy breast-fed children less than 5 weeks old for albumin. Almost all excreted small quantities of albumin, chiefly during the first three days of life. The primary cause of this infantile albuminuria is disturbance of circulation during the birth act.

323 **Ribbert, Hugo:** "Über Albuminurie des Neugeborenen und des Fötus" [Albuminuria of newborn infants and fetus]. *Virchow's Archiv* [Berlin], vol. 98 (1884), pp. 527–540.

The author describes methods of studying kidneys of many children who had died at birth or soon after. He never failed to find albumin in the urine, sometimes in large amounts. This was due, in part at least, to epithelial cells discharged on account of regeneration of glomeruli. The great extent of the process is noteworthy and is to be explained by rapid growth of the organs of the newborn. Another cause of albuminuria is that given by Virchow, heightened metabolism of the child, for in the newborn the kidney is not yet fully developed anatomically and functionally.

324 **Rietschel, Hans, and Leo Langstein:** "Über das Vorkommen von Aminosäuren im Harn der Kinder" [The presence of amino acids in the urine of children]. *Biochemische Zeitschrift* [Berlin], vol 1 (1906), pp. 75–80.

The authors examined amino acids in the urine of infants, first of breast-fed infants, then of those fed on malt soup. In the first case they found no deposit of crystals even when they collected as much as 560 cubic centimeters; in the second case in 725 cubic centimeters they obtained a brownish amorphous powder. They conclude that amino acids are not found in normal conditions in the urine of artificially-fed or breast-fed infants.

325 **Rogatz, Julian L.:** "Roentgen-ray studies of stomach function." *Am. J. Dis. Child.* [Chicago], vol. 28 (1924), pp. 53–68.

The author presents a review of 10 significant articles, with references and reproduction of figures, together with the results of his own investigations both fluoroscopic and roentgenographic. Number of subjects is not given. Examinations were made at regular intervals before and after meals, with observations concerning form, size, position, air bubble, peristalsis, and emptying time. Three types of feeding were used with each child: (1) A milk of average caloric value, (2) a concentrated milk, (3) a gruel or mush of thick consistency. No contrast mediums were used. With fluid feeding two main, constant types of stomach were found: (1) The shape of a pear lying on its side with large, circular, expanded fundus and a smaller, narrow, pyloric area; (2) smooth elliptical or oval. Either type with feeding of thick gruel might assume a third form, small, circular or oval, about one-third the size of the fluid forms, with practically no air bubble.

326 **Rose, W. C.:** "Excretion of creatine in infancy and childhood." *Journal of Biological Chemistry* [Baltimore], vol. 10 (1911–12), pp. 265–270.

An investigation to determine at what age creatine disappears from the urine of children. Numerous specimens of urine from children of different ages were analyzed, with the result that creatine was found in all specimens, with two exceptions, under 15 years of age. Tables and a bibliography are included.

327 **Rosenbaum, S.:** "Zucker im Harn Neugeborener" [Sugar in urine of the newborn]. *Monatschr. f. Kinderh.* [Leipzig], vol. 23 (1922), pp. 600–612.

The author studied sugar in the urine of 26 healthy newborn infants. Of 119 urine tests 83 were negative and 36 positive. From the second to the fifth

day 40 per cent of urines contained lactose. The assimilation limit for sugar is three times as great in the infant as in the adult. Twenty-six graphs, three tables, and a bibliography are included.

28 **Sabrazès and Fauquet:** "Propriétés hematolytiques de la première urine du nouveau-né" [Hematolytic properties of the first urine of the newborn]. *Comptes rendus des séances et mémoires de la Société de biologie* [Paris], ser. 11, vol. 3 (1901), p. 372.

The authors examined the first urine of three newborn infants, themselves normal, from normal mothers, finding its hematolytic qualities beyond question. Red corpuscles immersed in it immediately lost their hemoglobin.

29 **Saito, Hideo:** "Über den Fettgehalt der Fäces der Säuglinge nebst einigen anderen Bemerkungen" [The fat content of the feces of infants, and other observations]. *Jahrb. f. Kinderh.* [Berlin], vol. 73 (1911), pp. 222–262.

Believing that the amount of fat in the feces gives an approximate idea of the fat assimilation of an infant if the melting point of the fatty acids in the feces is also considered, the author tests with the Kumagawa and Suto method the fat content in the feces of 18 healthy infants (9 breast fed and 9 bottle fed) and of many atrophic and dyspeptic infants. He finds that the fat content of the feces of infants is almost constant—about 20 per cent of the solid feces. The fat absorption amounts to about 96 per cent. The fat content is higher in the newborn, as also in the dyspeptic and atrophic infants.

30 **Schiff, Ernst:** "Beiträge zur quantitativ-chemischen Zusammensetzung des im Laufe der ersten Lebenstage entleerten Harnes" [Quantitative and chemical composition of urine voided during first days of life]. *Jahrb. f. Kinderh.* [Leipzig], vol. 35 (1893), pp. 21–87.

The author analyzed 569 samples of urine from 36 newborn infants from birth to the tenth or fourteenth day. His many tables and long discussion concern the amount of urine, specific gravity, sodium-chloride content, urea content (also their elimination), as well as weight, temperature, and general health. Theories of other investigators are considered.

31 ——— **and A. Balint:** "Über Kreatin- und Kreatininausscheidung beim Säugling" [Creatine and creatinine elimination in the infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 69–70 (1921–22), pp. 439–450.

The elimination of creatine and creatinine was tested by Folin's method with Autenrieth's colorimeter. The nitrogen in the urine was also determined by Kjeldahl's method. Tables give the values for three healthy, normal infants and for many pathological cases. The elimination of creatine and creatinine is low in chronic nutritional disturbances and high in hypertonia of the muscles.

32 **Schikora, Ernst:** Zur Kenntnis der Gallenfarbstoffe in den Fäces der Säuglinge [A Study of Bile Pigments in the Feces of Infants]. Breslau, 1901. 32 pp.

Inaugural dissertation (University of Breslau). The author made 190 feces tests of 97 infants to determine bile pigments. The ages ranged from 7 days to 4 months. Twenty-one infants were breast fed, the others artificially fed; in both groups some were normal and some more or less disordered. With healthy, breast-fed infants the feces contained exclusively bilirubin. In healthy artificially-fed infants the feces contained exclusively hydrobilirubin. An appendix gives results on a few infants of tests for the transition from natural to artificial feeding, and tests on the use of antiseptic drugs.

33 **Schippers, J. C., and Cornelia de Lange:** "Über die 'spezifische Diurese' Pollitzer's als Methode zur Funktionsprüfung der Nieren im Kindesalter" [Pollitzer's "specific diuresis" as method in testing function of kidneys in childhood] *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 89 (1919), pp. 11–29.

The authors employed Pollitzer's "specific diuresis" method to test the functioning of kidneys in 10 boys and 8 girls between 5 and 11 years of age whose kidneys were normal. Other subjects were tested who suffered from albuminuria, etc. Tests were made lying and standing, and hourly amounts of urine, with its specific gravity, nitrogen, salt, and phosphates were determined. Data are shown in 13 tables.

34 **Schlutz, F. W.:** "Die Fraktion der Aminosäuren im Säuglingsharn" [The fraction of amino acids in infant urine]. *Jahrb. f. Kinderh.* [Berlin], vol. 72 (1910), pp. 94–106.

The author studied the elimination of amino acids in infancy by a new method, indicated by Sørensen, employing formol. To determine the amino-acid nitrogen he used Frey and Ligon's method, except that he removed the ammonia from the urine by distillation, according to the method of Krüger, Reich, and Schittenhelm. He gives a brief description of the infants studied, the amount of urine, total nitrogen, amino-acid nitrogen, ammonia nitrogen, etc. He concludes that part of the nitrogen in the urine of infants is eliminated as amino-acid nitrogen (amino acids or higher complexes); the percentage values of amino-acid nitrogen are in general higher than in adults, vary widely in different children, but are remarkably constant in any given child on a given diet.

335 **Schoenberner, Reinhard:** Zur Kenntnis der Mekoniumfermente [Meconium Ferments]. Munich, 1909. 33 pp.

Dissertation (University of Munich). To study meconium ferments the author dissected infants that died at birth or soon after. He tied the intestine at the pylorus and at the lower end of cecum and the rectum; in these three parts he tested the meconium separately. Experiments were made on three children for diastase and invertin, on two for maltase, on three for lactase, on three for meconium with pancreatic juice, and on two for meconium with peptone solution. The meconium contained most and perhaps all digestive ferments. The large intestine seemed to be poorer than the small intestine in the ferments. The digestive glands secreted before birth, and even earlier in fetal life. Bibliography.

336 **Schorlemmer, Rudolf:** "Über den Nachweis von Gallenfarbstoff in den Fäces, in Sonderheit mit der Ad. Schmidt'schen Probe, and über die klinische Bedeutung des Vorkommens von Bilirubin in denselben" [Demonstration of bile pigment in feces, particularly with Ad. Schmidt's test, and the clinical significance of presence of bilirubin therein]. *Archiv für Verdauungskrankheiten* [Berlin], vol 6 (1900), pp. 263–284.

The author divides his discussion on bile pigment in feces into sections on method and on physiological and pathological phases. His studies involved 120 cases, including infants (number not given), in the Women's Clinic at Bonn. Stools of the newborn contained only unaltered bile pigment. It appeared first on the 14th or 15th day in the feces of breast-fed infants, but hydrobilirubin was observed as early as the seventh day in artificially-fed children. In contrast to hydrobilirubin, bilirubin never appeared in normal stools after the first few days of life. Schmidt's sublimate test for bile was considered by the author to be the best.

337 **Sedgwick, J. P.:** "Oxalic-acid excretion in the urine of children." *Am. J. Dis. Child.* [Chicago], vol. 10 (1915), pp. 414–417.

A report of the quantitative determination of oxalic acid in the urine of infants under 10 days old. Fourteen urinalyses were made. The oxalic-acid excretion in children is relatively and at times absolutely higher than for adults. Technique is given.

338 **Shabanova, Anna:** "Beitrag zur Kenntnis der Harnstoffmengen, welche im Kindesalter unter normalen Verhältnissen und bei verschiedener Diät ausgeschieden werden" [Study on amount of urea eliminated in childhood in normal circumstances and according to variations in diet]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 14 (1879), pp. 281–307.

To fill gaps in the investigations of others the author measures the urea elimination by 16 healthy children, 2 to 13 years old, in the Hospital of Prince Peter of Oldenburg. The tests covered 146 days and determined averages of urea elimination per 24 hours per kilogram of weight and variations in amount of urea according to age and amount of food consumed. Much information was collected on quantity of feces and urine, on quality and quantity of food, amount of water drunk, on weights, etc. The urea was analyzed by Hüfner-Borodin method. Constant comparisons are made with former researches and these results as well as author's own are shown in many tables. The absolute amount of urea increased with age; the relative amount increased to age of 4 and then decreased. The amount decreased with insufficient nourishment and loss of weight. The amount of water drunk increased urine but not urea. The amount of food needed by children per kilogram of weight decreased with increasing years.

339 ——— "O kolichestvie mochevini videliaemoi v razlichnie periodi detskago vozrasta pri normalnikh usloviakh i pri razlichnoi diete" [On the quantity of urea secreted in different ages of childhood under normal conditions and with various kinds of diet]. *Voyenno-Meditsinski Zhurnal* [St. Petersburg], pt. 135 (1879), pp. 201–229.

An account of a study made by the author in a children's hospital in St. Petersburg of the quantity of urea secreted by 16 children ranging in age from 2 to 13 years. After quoting several writers the author gives for each case, in several tables, the quantity of feces, urine, and urea according to each of the four kinds of diet given to the children and also according to the change in their weights. She found that the absolute quantity of urea increased with age; the relative quantity as compared with the child's weight increased until the age of 4; then it decreased gradually. Both these quantities increased with gain in weight.

340 **Simon, S.:** "Zur Stickstoffverteilung im Urin des Neugeborenen" [Apportionment of nitrogen in the urine of the newborn infant]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 2 (1911), pp. 1–17.

This article contains very detailed descriptions and tables of the urine analyses of 21 infants fed on extracted human milk. The author used Hecker's urine apparatus and describes his methods of chemical analysis. He found in all healthy infants a very great elimination of nitrogen, which sank at the end of the first week to the normal amount for infants. The newborn during the first days excretes 12 per cent polypeptid unsplit. When, however, this can be decomposed the percentage of excreted amino acids rises to the high amount usual in infants.

341 **Southworth, T. S.:** "The stools of the newborn and their significance." *Arch. Pediat.* [New York], vol. 27 (1910), pp. 167–177.

As a basis for this study the author tabulated data of the maternity-ward charts of a children's hospital on 50 infants satisfactorily breast fed as to birth, weight, subsequent loss, and gain to the eighteenth day, and color and nature of the stools. Charts are given showing excellent gains in individual cases where the stools were not normal according to accepted standards. The author's general conclusion is that too much emphasis has been laid upon so-called normal stools.

342 **Stansky, Eugen:** "Weitere Beiträge zur Nierenfunktion im Säuglingsalter" [Further contributions on kidney function in infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 44–46 (1921), pp. 361–373.

This article contains 12 detailed case histories. In a number of cases studied after administration of urea no marked increase in the 24-hour output of urine was observed. Therefore the author concludes that urea does not affect infants diuretically. It is eliminated better by infants than by older children. To 1 kilogram of body weight the infant eliminates three to four times as much as the adult. Theobromin does not affect the healthy infant kidney diuretically, but theocin does.

343 **Steffen, Wilhelm:** "Beiträge zu Indican-Ausscheidungen bei Kindern" [Indican elimination in children]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 34 (1892), pp. 18–33.

Most of this article has to do with estimations of indican in the urine of tuberculous children or those otherwise ill. But it also shows that in three newborn infants there was no indicanuria and that the urine of five healthy, normal, breast-fed infants less than 2 weeks old always gave a negative reaction. The author discovered no connection between indican and the amount of urine, specific gravity, color, urates, and albuminuria.

344 **Takahasi, S.:** "Beiträge zur Kenntnis der Lage der foetalen und kindlichen Harnblase" [Contributions to knowledge of the position of the fetal and child bladder]. *Archiv für Anatomie und Physiologie* [Leipzig], 1888, pp. 35–50.

The author demonstrates that the bladder is placed relatively much higher in newborn infants than in adults. Examination of three grown apes shows that the bladder has the same relative position as in human infants. Descent of the bladder in childhood is due to the growing roominess of the infant pelvis and the weight of the bladder which is not rigidly attached and which descends when the body assumes upright position. Tables give many data for about 12 infants and 6 older children. A plate of eight figures illustrates the position of the bladder in the fetus, the newborn, and the child of 2⅓ years.

345 **Talbot, Fritz B.:** "Composition of large curds in infants' stools." *Bost. M. & S. J.*, vol. 158 (1908), pp. 905–908.

The author gives in full his technique in analyzing the stools in seven cases of natural curds and an analysis of artificially produced curds. Large curds weighed one-fourth to 1½ grams. Their size varied from that of a bean to a peanut. They were tough, varied in color, and sank in water. Microscopically they consisted of a fine, white, shiny network in which may be seen fat drops of various sizes which appear to be "bound by the shiny network." The amount of fat in the curd depends on the amount of fat in the ingested milk.

346 ——— "The composition of small curds in infants' stools." *Bost. M. & S. J.*, vol. 160 (1909), pp. 13–16.

The author, following German writers, classified curds as large and small. He examined 10 cases of normal stools and 8 cases of stools containing small curds. The data are tabulated by case, age, formula, description of stool, reaction, weight, total and dry, percentage of nitrogen in dry stool, percentage of fat, percentage of neutral fat, percentage of fatty acid, percentage of soap, and percentage of total fat in neutral fat, fatty acids, and soap. The small curds were friable, semisolid, and remained in suspension in water when fragmented. They were not homogeneous. They were composed mainly of fat in the form of fatty acids and soaps. Large curds were tough, sank in water, were soluble in 5 per cent sodium hydrate, and contained about 15 per cent nitrogen.

347 **Thadée, Philippe:** Contribution à l'étude de l'urologie chez l'enfant de deux à dix ans, avec notes relatives à 30 analyses d'urines de quatre enfants rachitiques [A Contribution to the Study of the Urology of the Child from 2 to 10 Years Old, with Notes Relative to 30 Analyses of the Urine of Four Children Affected with Rickets]. Toulouse, no. 252, 1898. 75 pp.

Thesis for medical degree (University of Toulouse). Data were obtained by daily analyses, for periods of 2 to 11 days, of the urine of nine healthy children, from a few months to 11 years of age. Age, weight, sex, diet, health, history, and average of analyses of 24-hour specimens are given. The author found that from 15 months to 5 years the child eliminates proportionally about one and one-half times as much urine as the adult; from 5 to 10 years the quantity decreases. From 10 years his curve tends to approach that of the adult. Density, acidity, urea content, and quantity of uric and phosphoric acid per kilogram of body weight are greater than in the adult. In general, the cellular activity of the child is greater than that of the adult. Bibliography.

348 **Tisdall, Frederick F., and Alan Brown:** "Studies on the acidity (hydrogen-ion concentration) of infants' stools." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 312–331.

The authors report the results of over 1,300 tests, made by themselves, to determine acidity, as a routine procedure over a considerable period of time. With a few exceptions the specimens were obtained from artificially-fed infants. In 12 determinations on stools from breast-fed infants the results varied from 4.7 to 5.1; in artificially-fed infants the results varied from 4.6 to 8.3, the former found only in severe diarrheal conditions. References.

349 **Tobler:** "Über die Schwefelausscheidung im Harn bei Säuglingen" [Elimination of sulphur in infant urine]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vols. 25–26 (1909–10), pp. 94–98. [Sessions in 1908 and 1909, respectively.]

This article contains a table on five healthy and five sick infants, showing, besides diet and weight, nitrogen, total sulphur, sulphuric acid, neutral sulphur, and relation between the last two in the urine. In breast-fed children absolute values of neutral sulphur were high and percentile values were low.

350 **Uffelmann, Julius:** "Über den Fettgehalt der Fäces gesunder Kinder des ersten Lebensjahres und über die Ausnutzung des Fettes seitens derselben bei verschiedener Ernährung" [Fat content of the feces of healthy children in the first year of life and their assimilation of fat on different diets]. *Arch. f. Kinderh.* [Stuttgart], vol. 2 (1880–81), pp. 1–17.

Since even perfectly healthy infants evacuate some fat the author investigated the fat content in feces of eight children in their first year. One healthy, breast-fed female infant showed a fat percentage of 16.5 to 20.3, including cholesterin. The author describes his other subjects in detail as also his method of deriving the percentage of fat. Of the infants, five were breast fed, two received cow's milk, and one a patented food.

351 ——— "Untersuchungen über das mikroscopische und chemische Verhalten der Fäces natürlich ernährter Säuglinge und über die Verdauung der einzelnen Nahrungsbestandtheile seitens derselben" [Investigations on the microscopic and chemical contents of the feces of breast-fed infants, and on the digestion of different food elements by them]. *Deutsches Archiv für Klinische Medicin* [Leipzig], vol. 28 (1880–81), pp. 437–475.

The author recounts at length the results of his microscopic and chemical analyses of the feces of a few healthy breast-fed infants from 8 days to 12 months old. He describes his analytic methods and the general qualities of normal infant feces, yellow in color, weakly acid in odor and reaction, and in amount, 3 grams to 100 grams in food. He lists contents of the normal feces of the healthy breast-fed child as found under the microscope and describes in detail his chemical analyses as to water content, albumin, fat and fatty acids, sugar and lactic acid, and salts. The article is accompanied by a plate with four figures.

352 **Uffenheimer, A., and Yoshiyiro Takeno:** "Der Nachweis des Caseins in den sogenannten 'Casein Brockeln' des Säuglingsstuhls mit Hilfe der biologischen Methodik, insbesondere der Anaphylaxie" [The demonstration of the casein in the so-called casein curds of the infant stool, by biological methods, especially anaphylaxis]. *Ztschr. f. Kinderh.* [Berlin], vol. 2 (1911), pp. 32-61.

To detect casein in the so-called casein curds in the stools of infants the authors employed the two biological methods—the anaphylactic and precipitation methods—during 1910–11 in the infants' clinic of the University of Munich. They describe their methods in giving guinea pigs intravenous and subcutaneous injections of solutions made from the aforesaid stools taken from 22 infants fed on cow's milk and 2 fed on human milk. Five tables contain the results of their experiments. They conclude that casein is often to be found in the feces of artificially-fed infants that are not entirely healthy. They raise the question as to whether said casein is unchanged casein or paracasein and as to the significance of the elimination of casein in feces. The article concludes with a bibliography.

353 **Usuki, S.:** "Das Schicksal des Fettes im Darm des Säuglings unter normalen und pathologischen Verhältnissen" [The behavior of fat in the infant's intestine under normal and pathological conditions]. *Jahrb. f. Kinderh.* [Berlin], vol. 72 (1910), pp. 18–52.

To examine the feces of infants for neutral fat, soaps, and free fatty acids the author conducts 11 series of experiments on young infants, which are carefully described and tabulated. His methods, too, are explained. He lists 13 conclusions. He found the average fat loss in the feces to be 13 to 13.5 per cent; the fat of stools consisted very largely of fatty acids and soaps; the fat of homogenized milk was no better assimilated than that of ordinary milk; malt extract produced less fat and soap elimination than meal and milk; alkali soaps did not cause increase in diarrhea; neutral fat was greater in sour than in soapy stools; there was a pronounced fat splitting in infant stools.

54 **Van Slyke, Donald D., Angelia Courtney, and Helen L. Fales:** "Forms of nitrogen in the stools of infants." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 533–541.

A study of the relative proportions of fecal nitrogen excreted in the form of protein and of amino acids and ammonia. A large proportion of the infants studied (about 40) were ill, but the authors' results failed to show any constant relation between the clinical condition of the patients and the distribution of the fecal nitrogen. Methods are described and results tabulated. From 50 to 70 per cent of the total nitrogen was found as protein and amino acids, 2.4 to 24 per cent as free amino acids and from 3 to 37 per cent as ammonia. There was no evidence of antagonism between the processes of acid and ammonia formation respectively in the intestines. Urea was absent in three-fourths of the stools examined; in the other fourth it formed only from 1 to 5.6 per cent of the total nitrogen.

55 **Veeder, B. S., and M. R. Johnston:** "On the presence of ketones and betahydroxybutyric acid in the urine of normal children." *Am. J. Dis. Child.* [Chicago], vol. 11 (1916), pp. 291–293.

Analyses of 24-hour specimens in 21 cases, 2 months to 12 years of age, were made. The results in these cases were so constant it was not thought necessary to study more cases. Twenty to 100 milligrams of ketone and betahydroxybutyric acid in terms of acetone were found in 24-hour specimens. Age, sex, and weight had no apparent effect on the amount.

56 **Vogt, Hans:** "Zur Kenntnis der Stickstoffverteilung im Säuglingsharn" [Concerning nitrogen distribution in infant urine]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 8 (1909–10), pp. 57–76.

Since the chief part of nitrogen taken in the food appears as urea in the urine the determination of nitrogen in urine appears to the author as an important task of physiological chemistry. He describes his methods and studies both normal and pathological cases in infancy and constantly considers theories of other investigators. His eight tables show urea in percentage of total nitrogen directly determined and determined after precipitation, of total nitrogen, nitrogen of urea, nitrogen of ammonia, etc., as well as age and kind of feeding. The infant organism tries hard to incorporate nitrogen. Therefore, even in physiological conditions, a tendency seems to exist to eliminate relatively little urea. Bibliography.

57 **Vozárik, Am.:** "Acidität, Ammoniak, Phosphorsäure, und Gesamtstickstoff im Kinderharn bei eiweissarmer und eiweissreicher Ernährung" [Acidity, ammonia, phosphoric acid, and total nitrogen in the urine of children on diets poor and rich in protein]. *Arch. f. Kinderh.* [Stuttgart], vol. 50 (1909), pp. 199–242.

The author tested the urine of four boys of 9 and 10 years of age placed upon three diets with varying proportions of protein. Experiments covered 35 days in the summer of 1907. The boys had seven meals a day. Full data are given on meals and chemical analyses of urine; tables and curves are included.

58 **Weidmann, O.:** "Die praktischen Ergebnisse der Mollschen Phosphatprobe" [Practical results of Moll's phosphate test]. *Monatschr. f. Kinderh.* [Berlin], vol. 18 (1920), pp. 520–529.

To test Moll's theory that the urine of perfectly healthy breast-fed children is practically free from phosphate the author studied breast-fed infants from 14 days to 3 months old in three groups: 30 healthy, 61 dyspeptic, and 92 dyspeptic and fasting. Tables give weight, amount of milk consumed, interval between meals, kinds of stools, and phosphate content. The urine of healthy infants was free from phosphate in 44.66 per cent of the cases and poor in it in 53.33 per cent. For the dyspeptic infants these percentages were 44.26 and 32.78; the urine contained much phosphate in 22.95 per cent of the cases. Urine of fasting children was free of phosphate in 50 per cent of the cases and poor in phosphate in 50 per cent.

59 **Weill, E., and A. Dufourt:** "Sur les réactions des selles des nourrissons à l'état normal et dans les dyspepsies d'origine alimentaire" [The reactions of the stools of nurslings, normal and with digestive troubles]. *Le Nourrisson* [Paris], vol. 2 (1914), pp. 65–74.

The stools of 100 nurslings at the Crèche Saint-Ferdinand, Lyon, were tested for several successive days to determine their normal stool reactions. Great variability was found, even in the same infant, the stools of a single day being sometimes acid, alkaline, and neutral by turns. Attempts were made, with varied results, to modify the reaction by feeding glucose, levulose, maltose, lactose, saccharose, Soxhlet's sugar, dextrine, and casein. Results are shown in tabular form.

60 **Wengraf, Fritz:** "Über die Ausscheidung getrunkenen Wassers beim Säugling" [Elimination of water ingested by the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 30 (1921), pp. 77–85.

In commenting on other students' observations upon elimination of water by infants the author repeats the theory that water retention in the infant is very marked especially during the first three months, and the opposing theory that such estimates may involve an error in insensible perspiration. He himself examined excretion of water in 11 breast-fed and 5 artificially-fed infants be-

tween 3 weeks and 4 months old. Weight of body and of urine were determined at short intervals. They were given 150 to 200 grams of sweetened tea in the morning. Eight were also given salt solution. Data are shown in three tables and two curves. On an average 35 per cent of water was given off in perspiration. Urination began in 15 to 20 minutes. By the second hour about 90 per cent of liquid was eliminated. In healthy breast-fed children elimination of water, whether in the first three months or later, was very regular. Artificially-fed infants, if healthy, also eliminated water completely but sometimes required four instead of three hours.

361 **Zweifel:** "Untersuchungen über das Meconium" [Investigation on meconium]. *Archiv für Gynäkologie* [Berlin], vol. 7 (1874–75), pp. 474–490.

The author dissected an infant that died during birth to examine the meconium and presents several tables of analyses. He found in the meconium intestinal epithelia, vernix caseos, cholesterin crystals, bilirubin, biliverdin, mucin, taurocholic acid, etc., but no albumin, peptone, tryosin, oleucin, free lactic acid, acetic acid, nor grape sugar.

C. GENERAL NUTRITION AND METABOLISM

362 **Adair, F. L., and Chester A. Stewart:** "Milk ingestion in relation to changes in body weight of newborn infants." *J. A. M. A.* [Chicago], vol. 78 (1922), pp. 1865–1868.

A study of the changes occurring in body weight and of the amount of breast milk obtained at each nursing during the first 10 days of life, for 149 first-born and 149 later-born infants receiving, during the first five days postpartum, 10 per cent lactose solution ad libitum up to 60 cubic centimeters after each nursing. The authors found that the average loss of body weight during the first four days amounted to approximately 8 per cent of the birth weight for the first-born and 6.4 per cent for later-born infants; that, on the tenth day, the weight was still 2.4 per cent and 2.6 per cent, respectively, below the initial weight; that the amount of breast milk obtained by the first born increased from 13 grams for feeding on the second day to 54.9 grams on the fifth day, the average meal on the tenth day amounting to 78.4 grams; that the corresponding amounts for later-born infants were 16.9, 59.4, and 84.7 grams. Tables and charts are given.

363 **Adam, Max:** "Nahrungsmengen künstlich ernährter Kinder nebst einem neuen Vorschlag zur Nahrungsmengenberechnung" [Food amounts for artificially-fed children with a new proposal for reckoning these amounts]. *Jahrb. f. Kinderh.* [Berlin], vol. 56 (1902), pp. 29–48.

In connection with a study of infant feeding the author gives case histories and weight curves for infants received at a foundlings' home, at the age of 8 or 10 days. Caloric requirements for children of various ages and weights are discussed.

364 **Allen, Thomas Grant:** "Proteid in infant feeding; the necessity of a standard." *Arch. Pediat.* [New York], vol. 24 (1907), pp. 899–907.

The weight and the quantities and proteid content of milk taken daily by a large number of breast-fed infants for several months are given. The proteid quotient (hundredths of an ounce per pound of the infant's weight) for the first three weeks is approximately the number representing the week of the baby's age. Thereafter it is approximately four.

365 **Amberg, S., and W. P. Morrill:** "Ein Stoffwechselversuch an einem Brustkinde mit besonderer Berücksichtigung des Ammoniakkoeffizienten" [A metabolism study on a breast-fed infant, with special reference to the ammonia coefficient]. *Jahrb. f. Kinderh.* [Berlin], vol. 69 (1909), pp. 280–303.

The authors experimented with various diets on a healthy, young, breast-fed infant born November 15, 1908. They found that with a diet relatively poor in protein the ammonia coefficient rose, as also the nitrogen percentage of the uric acid and creatinine; to a certain extent the increase in the ammonia coefficient was dependent on the relation between fat and protein; the amount of urine could vary and fall below 68 per cent of the fluid drunk which is the average fixed by Camerer; the nitrogen retention and nitrogen absorption decreased from the first week to the second or third month. The article contains many tables.

366 ——— ——— "On the excretion of creatinin in the newborn infant." *Journal of Biological Chemistry* [New York], vol. 3 (1907), pp. 311–320.

The authors' first studies consisted of qualitative tests for creatinine in specimens of urine from infants; later, the creatinine was determined quantitatively according to Folin's method and in five cases the total creatinine excretion in 24 hours was determined. Tables show the results of the studies which are discussed with many references to the work of other investigators. The authors found creatinine constantly present in the urine of normal, breast-fed infants. The creatinine coefficient, though only approximately one-third as great as in adults, was fully as constant. The authors favor the theory that creatinine excretion is an important index of endogenous protein metabolism. References.

7 **Aron, Hans:** "Die Bedeutung von Extraktstoffen für die Ernährung" [Significance of extractives in relation to nutrition]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 15 (1918–19), pp. 561–575.

The author studied the significance of extractives in the nutrition of rats and infants. Carrot extractive he found especially adapted for studying vegetable extractives. When added to milk diet it greatly improved the general physical development of the child. Two graphs are presented of infants' diet and weight.

8 ——— "Influence of quantity and quality of food upon the growing organism." *Transactions of the Fifteenth Congress on Hygiene and Demography*, 1912 [Washington], vol. 2 (1913), pp. 451–456.

The author found by experiments on animals that a growing organism, so limited in its intake of food that the energy required for maintenance is not covered, will continue, for a time at least, to grow but that the skeletal increase will be in abnormal proportion; that if growth is entirely checked and kept at a standstill during the period of "youth" the animal will never attain normal proportions. He found indications that the growing animal organism demands no other organic building material than proteins and carbonydrates but that the inorganic constituents of food can not be spared.

9 ——— "Kalkbedarf und Kalkaufnahme beim Säugling und die Bedeutung des Kalkes für die Aetiologie der Rachitis" [Calcium requirement and calcium intake of the infant, and significance of calcium in the etiology of rachitis]. *Biochemische Zeitschrift* [Berlin], vol. 12 (1908), pp. 28–77.

In connection with a study of lime deficiency in relation to rickets the author gives tables for the amounts of milk taken from the third to the twenty-sixth week by infants observed by Feer, Bendix, and König. The normal child body contains 1.2 per cent of calcium oxide. Bibliography.

10 **Aronstamm, O.:** "Stoffwechselversuche an Neugeborenen" [Metabolism experiments on newborn infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 37 (1903), pp. 66–91.

Before discussing the results of his metabolism experiments on young infants the author explains his methods, the numerous weighings, the apparatus, including Hecker's urine receptacle, etc. He describes his test of 10 breast-fed infants, all first born except 1. Tables show the amounts of milk consumed and the urine and meconium or feces excreted. Constant comparisons are made with the findings of Camerer, Reusing, and others. The number of calories needed and the energy quotient are found in the case of a 9-week breast-fed and a 7½-month artificially-fed infant. The utilization of food is determined from the amount consumed and the increase in weight. Figures are given for experiments on four artificially-fed infants.

11 **Aschenheim, Erich:** "Beitrag zum Fett-, Kalk- und Stickstoffwechsel beim Säugling" [The metabolism of fat, lime, and nitrogen in the infant]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 77 (1913), pp. 505–533.

The author discusses fat, lime, and nitrogen metabolism in infants. The lime was precipitated in feces and food from the ash and in the urine from the native solution as calcium oxylate. The fat was determined by the Kumagawa-Suto technique and the nitrogen by the Kjeldahl method. Not all the six infants studied were healthy. Their food contained so small an amount of fat that the fat appearing in the feces can be assumed to have come from the intestine. In one series of tests the food given consisted of skimmed milk and a water solution; in another series, of 50 to 80 grams of albulactin and 50 grams of Soxhlet's sugar. The fat metabolism showed a certain, though slight, elimination of fat. The assimilation of lime was not affected by the diet in the healthy children but was retarded in the others. The assimilation of nitrogen was low. Case histories of the children, tables, and a bibliography are given.

12 ——— "Beitrag zum Fett-, Kalk- und Stickstoffwechsel des Säuglings" [Contribution to metabolism of fat, calcium, and nitrogen in the infant]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 29–30 (1912–13), pp. 107–112.

This article sketches the metabolism of fat, calcium, and nitrogen in children (number not given). Though diet be free of fat there is always fat in small quantities in the feces. Calcium metabolism is very closely connected with metabolism of fat. Utilization of nitrogen is much improved by fat.

13 ——— "Über Zuckerausscheidung im Kindesalter" [Sugar elimination in childhood]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 25–26 (1908–9), pp. 178–233.

The author determined the limit of assimilation of grape sugar given in water or café au lait to children after a meal or fasting. Methods of testing urine are cited. He found the greatest individual variations just as in the adult and could detect no influence of age. In general, the assimilation limit for dextrose is higher in childhood than after maturity. On an empty stomach it is about 3.2 grams per kilogram of weight. Time of administering had slight effect. Data on 50 children are given, and a table covering 45 pages shows results of various diets.

374 Bahrdt: "Zeitliche Stickstoffausscheidung bei Ernährung mit verschiedenen Eiweisskörpern" [Temporary elimination of nitrogen on various protein diets]. *Münchener Medizinische Wochenschrift*, vol. 55 (1908), p. 824.

Nine tests were conducted on infants in two-hour periods following a hunger diet, a diet of human milk, and diets containing casein from human and cow's milk and lactalbumin from cow's milk. A distinct increase of nitrogen elimination was observed on the first day, but there were no variations between the curves of homogeneous and heterogeneous diets.

375 Bahrdt, Hans, and Stafford McLean: "Über die flüchtigen Fettsäuren im Darm gesunder und magendarmkranker Säuglinge und ihre Beziehungen zu den Stoffwechselstörungen" [The volatile fatty acids in the intestine of healthy infants and infants suffering from affections of the alimentary canal, and their relation to metabolic disturbances]. *Ztschr. f. Kinderh.* [Berlin], vol. 11 (1914), pp. 143–178.

The authors by the Edelstein-Welde method distilled the volatile acids in about 140 stools, of which 41 were from healthy infants. They assign considerable importance to the volatile fatty acids as the origin of the acute digestive disturbances of childhood. Many tables accompany the text.

376 Bailey, H. C., and J. R. Murlin: "The energy requirement of the newborn. *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 11 (1914), pp. 109–111. See also *Am. J. Obst.* [New York], vol. 71 (1915), pp. 526–547.

An abstract of the authors' communication to the society reporting their investigation to determine whether it would be desirable to furnish artificial food with the colostrum during the first three days of life. From 19 observations made on six newborn infants from 6 hours to 12 days of age, using the Benedict respiration apparatus connected with a Freas electric incubator and calculating the heat production by the method of Zuntz and Schumberg, the authors found the caloric needs for the first three days to be greater than the caloric value of the breast secretions. They conclude that feeding a formula of about the same composition as colostrum would appear logical.

377 Bakwin, Harry: "Dehydration in newborns." *Am. J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 497–507.

Dehydration was studied in newborn infants by correlating weight changes, skin elasticity, and serum protein concentration (plasma water). Usually, but not invariably, a marked loss of weight in a newborn infant was accompanied by loss of skin elasticity and an increase in the serum concentration. Certain infants showed evidence of dehydration at birth. The weight curve is not a criterion of dehydration. Tables, curves, and references.

378 ——— "Dehydration fever in newborns." *Am. J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 508–519.

A continuation of the author's study, "Dehydration in newborns." Daily determinations were made on a group of normal and febrile infants in an attempt to discover the relationship between dehydration and fever. In the febrile cases (not due to infections) fever was found to be associated with increase in the serum protein concentration. A fall in temperature was coincident with an increase in the plasma water. A similar increase in the serum concentration was not found in normal newborns, nor in infants in whom fever was due to other causes. References.

379 Banze, C.: "Dr. Biedert's Rahmgemenge" [Dr. Biedert's cream mixture]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 9 (1875–76), pp. 76–80.

The author describes the development of 26 infants between 3 weeks and 11 months old, of whom 15 were artificially nourished from the beginning.

380 Baron, Leo: "Über die Erfolge bei Eiweissmilchbehandlung" [Success in protein-milk treatment]. *Jahrb. f. Kinderh.* [Berlin], vol. 81 (1915), pp. 252–268.

Finkelstein-Meyer's protein milk, in which the whey is replaced by one-half buttermilk and one-half water, was used from 1909 to 1914 on 85 children in the Charlottenburg Children's Clinic. Success was positive in 55 per cent of cases and negative in 45 per cent. The article contains 18 graphs on diet, weight, excreta, etc.

381 Bartsch, Johann Adolph: Beobachtungen über den Stoffwechsel Neugeborener [Observations on Metabolism of Newborn Infants]. Marburg, 1859. 26 pp.

Inaugural dissertation (University of Marburg). After commenting on the difficulty of measuring the metabolism of infants and on the composition of human milk, on colostrum, meconium, initial loss, etc., the author describes his investigation on infants in the hospital at Marburg, most of them normal cases leaving after eight days, others pathological staying longer. He ascertained the amount of milk intake and the excretions through lungs and skin, in urine and feces. The weight of the umbilical cord he found to be of slight importance. Spittle, however, he thought should be considered. Results are shown in tables, usually on six or seven children each.

382 **Bauer, Virginia, and Katharine Blunt:** "Effect of a small breakfast on the energy metabolism of children." *Journal of Biological Chemistry* [Baltimore], vol. 59 (1924), pp. 77–82.

To find whether basal metabolism determinations made on children at noon instead of before breakfast give satisfactory results, seven children—five girls and two boys between the ages of 10 and 13 years—were repeatedly observed early in the morning and again on the same day about four hours after a small breakfast. The average oxygen consumption at the later hour was 0.6 per cent higher than before the meal. The authors conclude that the use of the noon hour is satisfactory as a routine procedure, provided the breakfast does not exceed 470 calories with not more than 14 grams of protein and is eaten at least four hours before the metabolism observation. Original data of the observations are given. References.

383 **Baumgardt, Gertrud:** "Über den Einfluss des Basensäurenverhältnisses in der Nahrung auf den Stoff- und Kraftwechsel des Kindes" [Influence of relation between base and acid in diet on metabolism of the child]. *Arch. f. Kinderh.* [Stuttgart], vol. 69–70 (1921–22), pp. 209–238.

Interested in Berg's conclusion that an alkaline diet permits of a smaller calorimetric value than an acid diet the author tests two matters: Is the nitrogen requirement smaller when the base is relatively larger than the acid in the diet? In such a diet is there a saving of calories? In 1919 she studied four lively boys between 11 and 13 years of age on an ordinary diet with an excess of either alkali or acid. Two tests of each kind, each test lasting six days, were made. Nitrogen, ammonia, calcium, blood alkalinity, calories, and air were estimated. There are 2 curves and 14 tables. The author concludes that extensive variation in the relation of base and acid in diet affected neither nitrogen metabolism nor energy; even with large doses of inorganic acid covering 10 weeks the body did not need to use its stock of mineral; the constancy of blood alkalinity corresponded to the constancy of the mineral content of the organism as a whole. Here is to be seen the significance of ammonia for the neutralization of acids and protection of mineral supplies. Thus the author by a different method arrived at the same result as Yansen.

384 **Bedale, E. M.:** "Energy expenditure and food requirements of children at school." *Proceedings of the Royal Society of London*, ser. B. vol. 94 (1922–23), pp. 368–404.

A study carried on from June, 1919, to June, 1921, at the Bedales School in Hampshire, England, where it was possible to observe children from 3 to 18 years of age under carefully controlled conditions. Actual food consumption of individuals was determined by weighing the food taken at each meal, and daily energy output was computed by the method of indirect calorimetry. Many tables and charts accompany the text. The total 24-hour heat production in 11 age groups from 12 to 18 years ranged in value from 2,100 to 3,901 calories, the lowest figure being from an underdeveloped group. In a younger group tentative figures of 24-hour heat production were: Boy, 10 years, 2,695, 8 years, 2,191; girl, 11 years, 2,429, 9 years, 2,223. The author suggests a flat rate of 3,000 calories per diem for both boys and girls from the age of 10 to 16 and of 2,500 to 3,000 for children from 6 to 10. Boys over 16 at school average a daily food intake of 4,000 calories.

385 **Bendix, Bernhard:** "Beiträge zum Stoffwechsel des Säuglings" [Metabolism of the infant]. *Jahrb. f. Kinderh.* [Leipzig], vol. 43 (1896), pp. 23–53.

The author studied the metabolism of five infants on a diet of two parts milk, one part 12.3 per cent sugar solution with 1 to 2 per cent rice flour. One child was examined December 14 to 19 and December 20 and 21, 1895, and another July 2, 3, 4, 1895; for both there are full tables. Tests on the other three infants of 2, 4, and 11 months are more briefly treated. The author points out the tendency of the growing organism to retain protein.

386 ——— "Zur Frage des Zuckerzusatzes bei der unnatürlichen Ernährung" [The problem of sugar added to artificial nourishment]. *Ztschr. f. Kinderh.* [Berlin], vol. 6 (1913), pp. 467–499.

After mentioning how cow's milk for infants must be diluted to reduce the excessive albumin content and how the resultant deficit of fat is usually ignored but the sugar added, the author gives a long sketch of experimentation that has been carried on concerning the matter of sugar in infants' artificial food. Believing that for clinical as well as economic reasons beet sugar might be superior to the much more expensive lactose highly recommended by Soxhlet and others. Bendix investigated the nutrition of 13 normal, artificially-fed infants which he tested with lactose, maltose, beet sugar, cane sugar, and no sugar at all. For each case he gives an account and a curve. He found beet sugar decidedly superior to both lactose and maltose. He says that in his private practice the respective advantages and disadvantages were even more striking.

387 **Benedict, Francis G.:** "Energy requirements of children from birth to puberty." *Bost. M. & S. J.*, vol. 181 (1919), pp. 107–139.

This article summarizes the material given at length in the monographs of Benedict and Talbot on the metabolism of childhood and contains plates of the apparatus used and numerous charts and references.

388 **Benedict, Francis G.:** "Physical factors in predicting the basal metabolism of girls." *Proceedings of the American Philosophical Society* [Philadelphia], vol. 63 (1924), pp. 25–56.

The data on which this study is based consist of: (1) Previously recorded metabolism measurements made by the author in collaboration with Talbot and Hendry; (2) measurements of school children by E. M. Bedale, of the University of Glasgow; (3) an unpublished series on girls from 8 to 18 years of age by Katharine Blunt, of the University of Chicago; and (4) an unpublished series on girls from 10 to 15 years of age by Grace MacLeod, of Columbia University, New York City. For girls and women height was found to be a most important factor correlating with basal metabolism measurements. A newly devised curve of total heat production referred to height is presented for use in predicting the basal metabolism of girls from 1 week to 12 years of age. References.

389 ——— "The basal metabolism of boys from 1 to 13 years of age." *Proceedings of the National Academy of Sciences* [Washington], vol. 6 (1920), pp. 7–10.

A paper read before the academy giving a preliminary report of an investigation conducted by the author in conjunction with Fritz B. Talbot at the Nutrition Laboratory in Cambridge. The data represent 128 observations on boys. The total calories per 24 hours referred to weight are indicated by a chart for all the subjects, and a table gives the most probable heat production of boys per 24 hours predicted directly from body weight.

390 ——— "The basal metabolism of young girls." *Bost. M. & S. J.*, vol. 188 (1923), pp. 127–138.

A report of metabolism experiments with two groups of 12 girl scouts each, one group aged 14 years, the other 18. The technique follows closely that of the many earlier experiments of Benedict and Talbot. Individual measurements of the subjects, amount of insensible perspiration during the experiment, and pulse rate are recorded. Heat production of the 18-year-old girls was found to be 550 calories in 10 hours; of the 14-year-old girls, 368 calories. Basal heat production with reference to age, weight, and body surface is discussed, and curves are plotted.

391 ——— **and Mary E. Hendry:** "The energy requirements of girls from 12 to 17 years of age." *Bost. M. & S. J.*, vol. 184 (1921), pp. 217–222, 257–262, 282–286, 297–306, 329–334.

Detailed description of experiments upon the energy requirements of 95 normal girl scouts from 12 to 17 years old during nine nights in an airtight respiration chamber provided with an aliquoting device for determining carbon dioxide. Having eaten nothing since 2 p. m., they partook in the laboratory of a light supper of about 500 calories containing 20 grams protein, spent a quiet evening, and from 10 to 10.30 prepared for bed. Height and nude weight were taken. At 6.30 a. m. the pulse and weight were again taken. Many tables and curves are given in the article. Comparisons are made with investigations of Magnus-Levy, Emmes, Benedict-Talbot, Wood, Aub, Du Bois, and others. From several tests of carbon-dioxide production each night were computed gaseous metabolism, insensible perspiration, energy transformation, respiratory quotients, and heat production per day per kilogram of body weight and per square meter of body surface. A summary of the last article gives pulse rates per minute on waking in the morning for ages 12 to 17 (71 at 16 years was lowest, and 83 at 15 years was highest). The respiratory quotients ranged from 0.78 to 0.81. The caloric requirement for 10 hours of "bed rest" was on an average 0.55 per hour. The 24-hour basal-heat production was 1,250 calories per individual. The heat production per kilogram of body weight per 24 hours decreases from 29.9 calories at 12 years to 21.7 calories at 17 years. The metabolism can be estimated from the heat production per kilogram of body weight to within an error of ± 3.1 per cent.

392 ——— **and Fritz B. Talbot:** Metabolism and Growth from Birth to Puberty. Carnegie Institution, Washington, 1921. 213 pp.

A continuation of the studies of the authors on the metabolism of infants. A summary is given of earlier studies of the metabolism of children, and apparatus and technique of this investigation are described. Experiments were made on a varying number of children as it was possible to secure them for observation, and results are discussed with reference to normality; growth; normal, average, and ideal states of nutrition; pulse rate; rectal temperature; influence of food; influence of novelty of the experiment; influence of sex and sexual change. A table is derived for the use of clinicians of the basal heat production of boys and girls per 24 hours, predicted from body weight. References.

393 ——— ——— "Some fundamental principles in studying infant metabolism." *Transactions American Pediatric Society* [Chicago], vol. 24 (1912), pp. 96–105.

A preliminary paper, with no definite results, designed to show that muscular activity must be taken into account in any experiments in infant metabolism and that a definite relationship exists between pulse rate and metabolism. For fuller discussion of these subjects see the authors' monographs on metabolism published by the Carnegie Institution, Washington. (See Nos. 392, 395, 396, this section.)

394 **Benedict, Francis G., and Fritz B. Talbot:** "Studies in the respiratory exchange of infants." *Am. J. Dis. Child.* [Chicago], vol. 8 (1914), pp. 1–49.

Data were obtained from observation of 80 infants at the nutrition laboratory of the Massachusetts General Hospital. A comprehensive summary is given of the work of other investigators, which includes the number of cases observed, the nature of the observations, and the findings.

395 ——— ——— The Gaseous Metabolism of Infants with Special Reference to Its Relation to Pulse Rate and Muscular Activity. Carnegie Institution, Washington, 1914. 168 pp.

The authors review the work of investigators prior to this study and describe at length the apparatus and methods used in their own experiments. They give statistics on observations of 37 infants at the Massachusetts General Hospital, the investigation extending over several months. Hospital records of each subject are given and a table showing date of observation; sex, age, and weight of infant; length of period of observation; carbon dioxide produced; respiratory quotient; average pulse rate; and relative activity. Sixty-four pages are devoted to discussion of results. The authors believe their evidence points to the fact that the active mass of protoplasmic tissue determines the fundamental metabolism. References.

396 ——— ——— The Physiology of the Newborn Infant; character and amount of the katabolism. Carnegie Institution, Washington, 1915. 126 pp.

An extremely careful study of 105 infants, most of them at the Boston Lying-In Hospital, to establish the metabolism of a normal infant during the first week of postnatal life. The monograph gives a résumé of work of other investigators and has numerous references. All methods and apparatus are described in detail, and results are given in numerous tables and charts. The authors conclude that the daily energy requirement of a newborn infant, making no provision for growth, is approximately 62 calories per kilogram per 24 hours. They make practical suggestions as to the infant's food supply.

397 **Benjamin, E., and H. Drey:** "Stickstoffansatz und Wachstum bei einem Säugling" [Nitrogen retention and growth in an infant]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 29–30 (1912–13), pp. 120–125.

The authors studied retention of nitrogen and growth for more than 70 days in an infant 1 month old and weighing not much over 2,100 grams at the start. During the 10 weeks, independently of fluctuations in weight curve, the infant retained every day considerable quantities of nitrogen and retained altogether at least 56 grams of nitrogen. Multiplied by 29.5 this should give an increase in flesh of 1,652 grams; yet increase in weight was only 820 grams.

398 **Benson, R. A.:** "A clinical study of 2,000 artificially-fed infants." *Journal of the American Institute of Homeopathy* [Chicago], vol. 14 (1921–22), pp. 811–819.

A record of the work done at four babies' dairies in New York over a period of eight years in feeding poorly nourished infants under 1 year of age from the tenement districts. The author found that infants of this class do better at home than in hospitals; that the expense of feeding the mothers to produce a normal supply of breast milk would often be less than that of feeding the infants, and the results would be better; that each infant requires individual attention and a feeding program of his own.

399 **Berend, N., and E. Tezner:** "Die Wasserverteilung im Säuglingsorganismus bei akuten Gewichtsschwankungen" [Distribution of water in the organism of infants during acute variations in weight]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 10 (1911), pp. 212–238.

The author limits his subject to the alteration of the water content in the blood and tissue effected by variations of weight. He considers how even alterations of refraction of corrected conductivity, viscosity, and volume of blood corpuscles indicate corresponding variations in the water content of the blood; how, if refraction shows an alteration opposed to all others, thickening of blood with absence of albumin or thinning of blood with much albumin is found; and how, if conductivity plays no part or moves in opposite direction, there occurs concentration of salt in watery blood or loss of salt in thick blood. The author discusses the subject under the headings: (*a*) Weight variations conditioned by salt intake; (*b*) losses of weight due to high fever; (*c*) water distribution where nourishment has caused weight variations. He describes his procedure in investigations, quotes case histories, displays results in five tables, lists his bibliography, and concludes with this summary: Oral intake of salt solutions causes accumulations of water and salt in the blood; loss weights in feverish infants are always accompanied by thickening of blood and tissue fluids; salt solutions administered medicinally in cases of dehydration thin the blood; a pronounced influence of changes in nourishment on composition of blood is not to be ascertained.

400 **Bergmark:** "Zuckerresorption und Blutzuckerspiegel" [Resorption of sugar and its effect on blood sugar]. *Jahrb. f. Kinderh.* [Berlin], vol. 80 (1914), pp. 373–385.

The author gives results of testing the effect on the blood of the resorption of dextrose, levulose, lactose, maltose, and saccharose given to two healthy

nurslings 4 months old, weighing 3.7 and 4.4 kilograms; to children 8 months, 10 months, and 13 years old—all three pathological—and to himself, 33 years old. Of each specimen of blood he made two double analyses according to Bang's micromethod. Results are shown in 28 graphs.

401 **Bernabei, C.:** "Oscillazioni addominometriche in rapporto ad alcune influènza fisiologiche e a varie malattie" [Fluctuations in the size of the abdomen in relation to certain physiological influences and various diseases]. *Lavori dei congressi di medicina interna,* 1902 [Rome], vol. 12 (1903), pp. 297–299.

Fourteen hundred measurements of the abdominal perimeter of 63 persons, one-third of them females, from 7 to 80 years old. The author presents the daily fluctuations in the abdominal perimeter according to age, diet, nature of feces, and illness. He found that from childhood to the age of 60 the abdominal perimeter grows 24 to 26 centimeters; the growth is greater in men than in women; the daily fluctuations are greater in women, particularly at puberty; solid food and constipation produce greater daily fluctuations than liquid food and diarrhea. Cardiorespiratory diseases produce greater daily fluctuations than other diseases.

402 **Berster, Hermann Joseph:** "Über Mekonium, insbesondere über seine Bedeutung in gerichtsärztlicher Beziehung [Meconium, Especially Its Significance in Medical Jurisprudence]. Bonn, 1898. 30 pp.

Inaugural dissertation (University of Bonn). After a long historical review of medical literature on the subject the author considers duration of appearance of meconium in infant stools, observing 74 cases. Time during which meconium is eliminated varies between 48 and 96 hours. It disappears latest in artificially-fed infants, which have missed the cathartic influence of colostrum. The presence of meconium does not signify that the infant has died during the first day of life, nor does its absence mean that the child has lived some time, since excretion of meconium may occur during the birth act, though seldom to its full extent.

403 **Bettmann, H. W.:** "The shape of the stomach." *American Journal of the Medical Sciences* [Philadelphia and New York], new ser. vol. 115 (1898), pp. 698–708.

A paper read before the Academy of Medicine, Cincinnati, reporting the results of a study made by the author and Dr. William H. Crane to verify or disprove current textbook statements as to the shape of the stomach. The stomachs studied were inflated with hand bellows and dried in the air, except the fetal stomachs, which were inflated and preserved in weak alcohol. Measurements were recorded of 9 fetal stomachs, 7 from infants and children, and 11 from adults. The author found that the fundus reaches a higher proportionate development in infants and young children than at any other time of life and records as a new observation that the cardiac orifice is much nearer the anterior than the posterior wall.

404 **Beumer, Hans:** "Über Cholesterinbilanzen und ihre Regulierung beim Säugling" [Cholesterin balances and their regulation in the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 184–198.

Tables of this article give cholesterin in different diets, the cholesterin balance and fat absorption of four infants, the cholesterin balance on different diets, etc. There is no difference in final balance between a diet rich or poor in cholesterin. The minimum lies very low. Cholesterin in circulation remains unaltered like an inorganic salt. Its balance depends on endogenous, not exogenous, metabolic processes. Bibliography.

405 ——— "Über den Cholesterinstoffwechsel beim Brustkind und den Cholesteringehalt des Serums bei verschiedenen Krankheiten" [Cholesterin metabolism in the breast-fed infant and cholesterin content of serum in various illnesses]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 15 (1918–19), pp. 581–589.

The article gives percentages of cholesterin in the serum of 31 infants, of whom 3 are healthy. In 2 of the healthy infants there was a negative cholesterin balance; in the third the percentage was 0.12.

406 ——— "Über den Verlauf intravenöser Zuckerinjektionen bei Säuglingen" [On the progress of intravenous sugar injections in infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 29 (1921), pp. 352–367.

The effect of intravenous injections of sugar upon 15 children between the ages of 3 weeks and 11 years, some normal, some ill. Even solutions of 70 per cent, in amounts up to 2.8 grams per kilogram of weight, produced neither fever nor other pathological symptom. The sugar in the blood returned to normal in 12 minutes after amounts of 1.2 grams per kilogram and in 40 minutes after 2 grams. Glycosuria was dependent on the degree of concentration and time of injection and was always stronger in the infant than in the adult. There are three tables. Bibliography.

407 ——— "Über die Kreatintoleranz des Säuglings" [Creatine tolerace of the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 31–32 (1921–22), pp. 236–246.

The author's table includes data on six infants, one child, and the author himself. To measure creatinine he used Autenrieth's colorimeter on very fresh

urine. Merck's creatine was used. Intolerance to exogenous creatin is a peculiarity of infant metabolism, and this facilitates our understanding of endogenous creatinuria in infancy. During metabolic exchanges in the muscles small amounts of creatine pass into the blood, which are decomposed in the adult, but in the infant are eliminated as creatin in the urine. The article contains two tables, a graph, and a short bibliography.

408 **Beumer, Hans, and F. Schäfer:** "Die Adrenalin-Hyperglykämie beim Säugling und ihre Beeinflussung durch Calcium und andere Bedingungen" [Adrenalin-hyperglycemia in the infant and the effect produced on it by the action of calcium and by other conditions]. *Ztschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 34–47.

The author states: Small amounts of sugar by mouth cause alimentary hyperglycemia; small intravenous doses of dextrose prolong it; subcutaneous doses of dextrose prolong it; subcutaneous injection of 0.3 to 0.5 milligram of adrenalin only seldom leads to a mild glycosuria; the blood-sugar curve for adrenalin after doses of dextrose and levulose shows that the formation of glycogen is the same for both; the greater sugar elimination after levulose is due to greater penetrability of the kidneys. The article contains tables, curves, and a bibliography.

409 **Beuthner, Willy:** "Beobachtungen über die Nahrungsmengen von Brustkindern unter Berücksichtigung des Energiequotienten (Huebner)" [Observations on food intake of breast-fed children, with consideration of the energy quotient (Heubner)]. *Jarhb. f. Kinderh.* [Berlin], vol. 56 (1902), pp. 446–471.

The author gives detailed data on the feeding of three breast-fed infants, weighing 2,400, 3,810, and 3,100 grams at birth. The care given is described, and graphs are presented in each case showing weight curve, volume of food consumed, and energy quotient. The energy quotient of 21 breast-fed infants was found to be the following in specified weeks: First week, 59 calories; second, 100 calories; fourth, 106 calories; seventh, 114 calories; tenth, 104 calories; fourteenth, 96 calories; seventeenth, 91 calories; twentieth, 85 calories.

410 **Biedert, P.:** "Die Entwicklung von Säuglingen bei der Minimalnährung" [Development of infants on minimum diet]. *Jahrb. f. Kinderh.* [Leipzig], vol. 19 (1882–83), pp. 291–308.

After a theoretical consideration of minimum diet for infants and the place of albumin in their nourishment the author describes in great detail the diet of eight infants. His system is to use a milk mixture containing about 3.5 to 3.8 per cent fat and 4 per cent sugar and adapt the amount of albumin to age. He notes that infants can thrive on surprisingly small amounts of milk in the first months of life. The valuable results of his investigation he takes to be his precise data on amounts of food to be used. Fat in diet diminishes the need of albumin during the period between the seventh and ninth months. The child's instinct will not protect it from overeating.

411 ——— "Einige Ergebnisse auf dem Gebiete der Säuglingsernährung in den letzten Jahren" [Some results in the domain of infant nutrition in recent years]. *Arch. f. Kinderh.* [Stuttgart], vol. 50 (1909), pp. 90–102.

This discussion includes criticism of works by Bruning, Uffenheimer, Orgler, Bergell and Langstein, Bergell, Cassel, Feer, Schlossmann and Freund; references to author's previous work; and detailed description of four new cases.

412 ——— "Über die für Säuglinge nothwendigen Nahrungsmengen (Nahrungsminima)" [Amounts of food necessary for infants (Food minima)]. *Jahrb. f. Kinderh.* [Leipzig], vol. 17 (1881), pp. 251–293.

Former work on nutrition by the author and others is reviewed. Studies were made on three young infants by methods which are described. A table gives data on age of these infants, length of tests, weights, diets, and analyses of food and excreta.

413 **Bing, H. J., and O. Windelöw:** "Blutzuckerbestimmungen bei Kindern" [Determinations of sugar in the blood of children]. *Ztschr. f. Kinderh.* [Berlin], vol. 9 (1913), pp. 64–71.

Bing and Windelöw used Ivar Bang's micromethod to test the amount of sugar in the blood of young children. Their first table presents 17 experiments on artificially fed infants from 1 to 13 months old. The results are 0.071 to 0.133. The second table concerns 8 experiments on infants of 3½ weeks to 18 months on whom the tests were made 1 hour, 2 hours, 3½ hours, and 12 hours after meals; the results were respectively 0.159, 0.122, 0.106, and 0.087. Table 3 shows that diet on oats causes a higher sugar content than on barley, from which the authors conclude that Cobliner's hyperglycemia in infants is of alimentary origin. The article contains also three tables on pathological cases. The author believes that the amount of sugar in the blood and its variations after mealtime and in pathological circumstances are the same in infants as in adults.

414 Birk, Walter: "Beiträge zur Physiologie des neugeborenen Kindes. I. Mitteilung. Über den Nahrungsbedarf frühgeborener Kinder" [Contributions to the physiology of the newborn child. I. The nutritional requirements of premature children]. *Monatschr. f. Kinderh.* Originalien [Leipzig and Vienna], vol. 9 (1910–11), pp. 279–323.

In careful detail the author discusses, using tables and graphs, the nutrition and development of 19 premature children. Of these two died. Some of the infants were nourished on human milk, some on artificial food. The care given is noted, with a description of two kinds of incubator. These premature infants were not found to be more susceptible to infection than other infants. They flourished best on human milk and next best on buttermilk. Full-strength cow's milk was unsuccessful. Most of the discussion is devoted to the amount of nourishment required by prematurely born infants. It is pretty generally believed that they require relatively more milk than other infants, and this would follow from Rubner's law of surface, since the latter in the premature is relatively larger. But the author has not found that such infants thrive if permitted to take over 110 calories per kilogram daily.

415 ——— "Beiträge zur Physiologie des neugeborenen Kindes. III. Mitteilung. Die Bedeutung des Kolostrums. Analysen und Stoffwechselversuche" [Contributions to the physiology of the newborn child. III. The significance of colostrum. Analyses and metabolism tests]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 9 (1910–11), pp. 595–612.

The author thoroughly tests the food exchange of a few infants in the Empress Augusta Victoria House. Results are put in comprehensive tables. A source of error lies in the fact that the meconium and part of the urine come from fetal life; secondly, the newborn infant is subject to many trying circumstances. And yet, though the young infant loses weight, the nitrogen metabolism is positive on colostrum. On later milk it is negative. Colostrum is radically different from later milk, being richer in nitrogen and salts, and the author believes it is wrong to the newborn to deprive it of this special food.

416 ——— "Stoffwechsel des Kindes während der ersten Lebenstage bei künstlicher Ernährung" [Metabolism of the child on artificial feeding during the first days of life]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 10 (1911), pp. 1–11.

The author describes in detail metabolism of two newborn infants artificially fed, giving a chemical analysis of intake, excretions, and balance, and concludes that with artificial feeding one-half of the total nitrogen excreted is excreted in urine. One infant presented a mineral balance precisely like that of breast-fed infants. The other did not; it took 36 days to recover weight at birth and showed exudative diathesis.

417 ——— "Über den Magnesiumumsatz des Säuglings" [Magnesium exchange in the infant]. *Jarhb. f. Kinderh.* [Berlin], vol. 66 (1907), pp. 300–325.

The author tests magnesium exchange in a few infants fed upon three diets—full milk for fat, half milk and half meal gruel with malt for carbohydrates, and skim milk for albumin and salts. Tables of findings cover many pages. Results obtained by Blauberg and by Cronheim and Müller are also given. There is one-third as much magnesium in human as in cow's milk, but the absorption is much better in the breast-fed child. Of the three diets mentioned skim milk gives the best retention.

418 ——— "Unterernährung und Langenwachstum beim neugeborenen Kinde" [Undernutrition and growth in length in newborn children]. *Berliner Klinische Wochenschrift*, vol. 48 (1911), pp. 1227–1231.

A study of breast-fed infants born at the Empress Augusta Victoria House in Berlin to determine development of length of underfed infants. The number of children is not given nor the time during which the children were studied. The author found that newborn children who for some reason remained undernourished did not grow as rapidly as normal children; as soon as the condition of underfeeding was corrected they gained in weight and length. In cases of children 6 months and over the conditions of underfeeding did not affect the development of length. The author illustrates his point by two cases.

419 ——— "Untersuchungen über den Stoffwechsel des neugeborenen Kindes" [Investigations on the metabolism of the newborn child]. *Sammlung Klinischer Vorträge* [Leipzig], new ser. 1911–15, Gynäkologie, No. 225–255, pp. 409–467.

The author reports results of metabolism investigations made in a hospital upon newborn infants, and his conclusions. A section of the article gives findings of other students who analyzed cadavers of infants or determined the metabolism of the fetus or that of the child after birth. Complete tests by the author dealt with only five infants. They were kept warm in Finkelstein's swing. After 24 hours they received 5 meals daily at intervals of 4 hours. While the infant drank at one breast, milk was taken from the other for analysis. Urine and feces were collected without loss. Tests were made of nitrogen, ash, lime, magnesium, potassium, sodium, phosphorus, and uric acid. Differences are discussed between colostrum and later milk and their effects on newborn and older infants. When a newborn infant receives colostrum its nitro-

gen balance is positive despite loss of weight. Nitrogen metabolism is studied on various diets, single tests comprehending six, seven, or nine children. The article contains numerous tables, six graphs of food intake and weight increase, and a bibliography.

420 **Birk, Walter, and F. Edelstein:** "Beiträge zur Physiologie des neugeborenen Kindes. II. Mitteilung. Ein Respirationsstoffwechselversuch am neugeborenen Kinde" [The physiology of the newborn child. II. A respiratory-metabolism study of a newborn child]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 9 (1910–11), pp. 505–513.

The authors believe that the question of what the initial loss of weight in the newborn infant consists can be answered by the results of their observations upon an infant placed in the Voit-Pettenkofer respiratory apparatus immediately after birth. The boy was the illegitimate child of sturdy young peasants; he weighed 3,200 grams at birth and was 50 centimeters long. His first meal, after 24 hours, consisted of half milk and half water and sugar. Tables show the respiratory exchange in three periods, the nitrogen exchange, excretions and balance, the insensible perspiration, weights, etc. The experiment proved that meconium and urine leave about 100 grams of the 126 grams lost in 12 hours unaccounted for. Probably most of the loss is in water given off through skin and lungs and some in fat and albumin from the tissues.

421 **Blauberg, Magnus:** "Experimentelle Beiträge zur Frage über den Mineralstoffwechsel beim künstlich ernährten Säugling" [Experimental contributions to question of mineral metabolism in artificially fed infants]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 40 (1900), pp. 1–36.

Convinced of the importance of minerals, especially for growing children, the author undertook elaborate studies of three children, all artificially fed infants, in the hygienic institute of the University of Berlin during the summer of 1898. After an explanation of methods used he presents 28 tables showing intake and output of water, sodium oxide, calcium oxide, magnesium oxide, ferric oxide, chlorin, sulphur trioxide, and phosphorus pentoxide, after which he discusses absorption, exchange, and total balance of mineral stuffs. Degree of absorption of a mineral, he says, depends not on the quantity taken but on the form in which it is offered to the organism.

422 ——— "Über den Mineralstoffwechsel beim natürlich ernährten Säugling" [Mineral metabolism in the breast-fed infant]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 40 (1900), pp. 36–53.

For six days the author tested the mineral metabolism of a breast-fed infant 5 months old, normal in every way. Twenty-nine tables show the amounts of milk drunk and the mineral constituents thereof; also mineral analyses of urine and feces. Insensible perspiration is not calculated. During the six days 7.961 grams of mineral stuffs were consumed and 4.297 grams eliminated. The order of greatest exchange is noted. Comparisons are also made with observations of infants fed on undiluted cow's milk, diluted cow's milk, and a prepared food.

423 **Blühdorn, Kurt:** "Eine Demonstration des Einflusses der Reaktion auf den Umsatz von Kalk und Phosphorsäure im Dickdarm des Säuglings" [Demonstration of the influence of reaction on the metabolism of calcium and phosphoric acid in the large intestine of the infant]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 11 (1912–13), pp. 68–79.

Since Schabad proved that of the lime excreted in the feces of infants only about one-tenth is combined with fatty acids, Blühdorn suspected that a large part of the rest of the lime is eliminated in combination with phosphoric acid. The most striking phenomenon of his investigation was that a strongly acid reaction hindered the precipitation of calcium phosphate. It was shown, however, that when lime salts meet phosphates in the large intestine where there is a weakly acid or alkaline reaction insoluble calcium phosphate arises, and thus lime and phosphoric acid can be withdrawn from absorption. Tables give data on health, diet of the infants, etc.

424 **Blunt, Katharine, Alta Nelson, and Harriet Curry Oleson:** "The basal metabolism of underweight children." *Journal of Biological Chemistry* [Baltimore], vol. 49 (1921), pp. 247–262.

Metabolism determinations made on 28 children, mostly underweight, showed that the basal metabolism of underweight children tends to be higher than that of the normal child. The excess metabolism was in some cases as high as 40 per cent above that read from curves of Benedict and Talbot, and in most cases the metabolism was higher than the highest observation of the child of the same weight from which the curve was drawn. Bibliography.

425 ——— **Jennie Tilt, Laura McLaughlin, and Katherine B. Gunn:** "The basal metabolism of girls." *Journal of Biological Chemistry* [Baltimore], vol. 67 (1926), pp. 491–503.

The authors present figures for the basal metabolism of 46 girls from the University of Chicago Elementary and High Schools. The ages range from 8 to 18 years. On 22 of the girls the determination was repeated a second year and on 15 a third year. The 10 to 18 girls observed at each of the ages from

9 to 13 showed a steady increase in total calories per 24 hours from 1,084 to 1,437, a decrease in calories per kilogram from 36.6 to 30.2, and a decrease in calories per square meter per hour from 43.4 to 41.0. The calories per centimeter fluctuated around 8.1 to 9.2. Girls of build different from the average tended to have a basal metabolism differing from the average. Underweight girls tended to show a high basal metabolism if computed in terms of calories per kilogram, a low or normal metabolism in terms of total calories or calories per square meter or per centimeter. For overweight girls the figures were reversed. Comparisons made on the basis of calories per square meter seemed to show the least variation from the average for individuals either of normal or of unusual build. Tables and bibliography.

426 **Bornstein, Karl:** "Stoffwechselversuche mit Albulactin bei künstlich genährten Säuglingen" [Metabolic tests with albulactin on artificially nourished infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 56 (1911), pp. 16–26.

The author tested the advantage of adding albulactin to artificial food. Three tests were completed, and the findings of nitrogen, phosphorus pentoxide, and calcium oxide in urine and feces are shown in three tables. The first subject, 4 months old, received 6 meals of 150 cubic centimeters consisting of one part milk and one part water. Tests with and without albulactin covered 24 days. The second subject, 5½ months old, received 5 meals of 160 cubic centimeters of a two to one mixture. Tests covered 16 days. The third subject was 3½ months old and was tested for 13 days.

427 **Bosworth, A. W., H. I. Bowditch, and Louise Giblin:** "Studies on infant feeding. X. The digestion and absorption of fats. I. Calcium in its relation to the absorption of fatty acids." *Am. J. Dis. Child.* [Chicago], vol. 15 (1918), pp. 397–407.

A report of investigations on calcium metabolism made at the laboratory of the Boston Floating Hospital. Clinical analysis of the stools of many bottle-fed infants receiving modified milk showed the presence of considerable quantities of calcium soaps. Studies were therefore made of the solubility of calcium soaps in bile; the calcium content of cow's milk in its relation to the digestion and absorption of fats in bottle-fed infants; and fat digestion and absorption when reconstructed milk eliminating nearly all the calcium was fed. The author found that the use of such reconstructed milk gave good results.

428 ——— ——— **and B. H. Ragle:** "Whey in infant feding." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 120–125.

A study of the metabolism of an infant admitted to a hospital because of intestinal indigestion, the study having been carried on after recovery. Four observations on metabolism were conducted, the child receiving an abundance of fat, sugar, and protein, and varying amounts of whey. All particulars of ingestion and secretion are recorded. The authors felt that they had confirmed the work of Osborne and Mendel in which they demonstrated the necessity of whey salts to promote growth of the young when fed on pure fats, carbohydrates, and protein.

429 **Bottelli, U.:** "Il sistema alimentare di Pirquet" [Pirquet's system of feeding]. *l'Ospedale maggiore* [Milan], vol. 10 (1922), pp. 21–28.

A description of Pirquet's system of feeding.

430 **Boulin, Marie-Maxime-Henri:** De l'allaitement régulier. Quelques résultats fournis par la méthode des pesées chez les enfants régulièrement nourris [Regular Nursing. Some Results Furnished by the Method of Weighing Infants Regularly Nursed]. Bordeaux, no. 33, 1891. 69 pp.

A thesis (University of Bordeaux) in four chapters: (1) A brief history of the use of weighing in obstetrical practice, with a study of variations in the weight of the newborn (not original observations); (2) nursing in general; (3) an argument for regular nursing with reports of individual cases of the results of regular and of irregular feeding of 16 infants; (4) the influence of different pathological conditions on the weight curves of infants regularly nursed.

431 **Brady, Jules M.:** "Relation of the weight curve of the infant to the food." *Am. J. Obst.* [New York], vol. 67 (1913), pp. 601–609.

The author explains 10 diagrams showing minimum, optimum, and maximum in infants' food with varying weight curves.

432 **Brown, Alan, A. M. Courtney, and I. F. MacLachlan:** "A clinical and chemical study of butter-soup feeding in infants." *Am. J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 368–381.

Following a summary of published work on the value of butter flour in infant feeding, the authors report the results obtained in feeding it to 104 infants. References.

433 **Brown, G. A.:** "The nutrition of the school child." *Journal of State Medicine* [London], vol. 23 (1915), pp. 329–335, 353–358.

A general article based on investigations of McKenzie and Foster as to the physical conditions of Glasgow school children, and of Lindsay as to the diet of the working classes in that city. The prenatal circumstances and in-

dustrial occupation of the mother and the housing conditions of the family are discussed in their relation to the nutrition, and hence the development of the child.

34 **Bruck, A. W.:** "Über den Mineralstoffwechsel beim künstlich genährten Säugling" [The mineral metabolism of the arificially fed infant]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 6 (1907-8), pp. 570-579.

In the Children's Clinic at the University of Breslau and with the technique prevailing there the author conducted a thorough investigation of the mineral metabolism of two healthy, artificially fed infants of 3 and 8½ months. He constantly compares his results with those of other scholars, especially Blauberg. He concludes that the diet has great significance in the matter of mineral absorption and retention. In the artificially fed the intake of ash and its metabolism are much greater than in the breast fed. The alkalis can be almost entirely absorbed . In retention the body tries especially to retain natrium. The alkaline earths are eliminated much more in stools than in urine.

35 **Bryant, L. S.:** "Recent experimental work on children's food needs." *Dietetic and Hygienic Gazette* [New York], vol. 27 (1911), pp. 337–341.

A discussion of protein needs of children at different ages. The results of tests on children of 8, 9, 10, 11, and 13 years are given. Four tables are included, one of which gives estimates for 10-year-old children, as stated by 15 authorities in 6 countries.

36 **Calvary, Martin:** "Der Nährwert des Milchzuckers" [The nutritive value of lactose]. *Ztschr. f. Kinderh.* [Berlin], vol. 4 (1912), pp. 442–450.

Through a discussion of nine infants in whose cases he presents graphs showing weight, nourishment, and stools the author establishes that lactose is an excellent addition to infant food where the stools are alkaline, soapy, and foul. Where there is fermentation in the intestines the lactose causes a flattening of the weight curve.

37 ——— "Über den Energiebedarf künstlich genährter junger Säuglinge" [The energy requirement of artificially fed young infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 1 (1910–11), pp. 99–110.

The author carefully studies the energy requirement of eight healthy young infants fed artificially. For five he gives a curve of growth and a table of the age, weight, increase in weight, amount of food, calories, and energy quotient. Since four showed satisfactory progress and an energy intake of 55 to 82 calories per kilogram of weight he decides that Heubner's energy quotient of 120 is too high.

38 **Camerer, W.:** "Beiträge zur Physiologie des Säuglingsalters" [Physiology of infancy]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 39, new ser. 21 (1899–1900), pp. 37–72.

A treatise based on frequent observations described and compared with those of other investigators. Numerous diagrams give amount of nourishment and increase in weight at certain ages, the weight of foods, and weight of excretions.

39 ——— "Das Energiegesetz in der menschlichen Physiologie" [Law of energy in human physiology]. *Jahrb. f. Kinderh.* [Berlin], vol. 66 (1917), pp. 129–187.

This comprehensive discussion, including constant citation of investigations by other students on the law of energy, includes animals and adults, as well as children. The discussion falls under the headings: Introduction, experiments with varying temperatures, elimination and evaporation of perspiration and vapor, energy exchange and extent of body surface, influence of physical work and food intake on the energy exchange, energy and muscular work, energy and food.

40 ——— "Das Nahrungsbedürfnis von Kindern verschiedenen Alters" [Nutritional requirement of children of various ages]. *Medicinisches Correspondenzblatt des Württembergischen Ärztlichen Landesvereins* [Stuttgart], vol. 59 (1889), pp. 233–234.

After discussing caloric requirements for children and adults the author gives tables showing the number of calories needed by adults, according to Rubner; and according to his own investigations, the number of calories and kinds of foods needed by infants and older children.

41 ——— "Der Nahrungsbedarf von Kindern verschiedenen Lebensalters" [Food requirements of children of various ages]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 33 (1896), pp. 320–332.

Sonden and Tigerstedt in their investigations in human metabolism stress the importance of age and growth in metabolism and criticize the present author's stress on surface area. The latter, therefore, in this article, argues that surface area is the greatest criterion for oxidation processes and food intake, and that secondary factors are muscular action and digestion. His experiments include 594 days of tests on his own children in which food, urine, and feces were weighed and analyzed; insensible perspiration and weight varia-

tions were also determined. Tables are given of his own results and those of Sonden and Tigerstedt, of Rubner, Recklinghausen, and others. In conclusion, figures are given for weight, growth, amount of oxygen and milk consumed (with chemical analysis), and amount of excrements in case of a child 2 weeks old.

442 **Camerer, W.:** "Der Stoffwechsel von 5 Kindern im Alter von 3 bis 13 Jahren" [Metabolism of five children from 3 to 13 years old]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 18 (1882), pp. 220–246.

In 1881 the author conducted investigations on metabolism upon his five children (four girls, one boy) from 3 to 13 years of age. The observations embraced 24 days for each child, 4 days in every 1 of 6 groups of days. He carefully describes meals and the technique of his analyses and shows results in table of growth, urine, perspiration, feces, nourishment, etc.

443 ——— "Der Stoffwechsel von 5 Kindern im Alter von 5 bis 15 Jahren" [Metabolism of five children from 5 to 15 years old]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 20 (1884), pp. 566–583.

Suspecting that a true estimate of everyday metabolism could not be obtained from a special diet of which subjects ate to satiety, the author tested the food intake and excretions during 1 year (1882–83) of his five children aged 5 to 15 on an ordinary diet, which is described. Weights of the children are given for the years 1881–84. Sections of the article treat their growth and health, urine, insensible perspiration, feces, and food intake. The discussion is supported by tables. The article concludes with refutation of Sophie Hasse's work on Children's Nutrition (Ztschrft. f. Biologie, 1882, p. 553). The author insists that young children do not need much protein on account of quicker growth but weaker digestion and that the amount of protein required is not relatively the same for all ages.

444 ——— "Der Stoffwechsel von 5 Kindern im Alter von 7 bis 17 Jahren" [Metabolism of five children from 7 to 17 years old]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 24 (1887), pp. 141–163.

This article describes the metabolism of the author's four daughters and one son, 7 to 17 years old, from December, 1884, to February, 1886. The tests cover 24 days for each child in 6 periods of 4 days each. As usual, the author gives details on growth and health of the children, on the urine, insensible perspiration, feces, and food, with many tables of figures and analyses. This time he makes many more nitrogen determinations of the food for which he uses the Will-Varrentrapp method. He calls attention to the small food intake of the eldest two daughters.

445 ——— "Die Verdauungsarbeit, ihre Grösse, und ihr Einfluss auf den Stoffwechsel, insbesondere den Stoffwechsel des Säuglings" [Work of digestion, its extent, and its effect on metabolism, especially that of the nursling]. *Jahrb. f. Kinderh.* [Leipzig], vol. 51 (1900), pp. 26–54.

This article is divided into an introduction on the generalizing and individualizing methods of research, on the difficulty of metabolism experiment with infants, and on arguments leading to the conclusion that the oxidation process is dependent on the amount of work done; a discussion of the energy balance in the human body; and a description of the influence of work on metabolism processes, the extent of digestive work, an explanation of results of experiments, and a discussion of fever.

The author has much to say of the work of Voit and Pettenkofer, Krug, Rubner, Zuntz and Magnus-Levy on adult human beings and animals. He treats at length the equation $n+k=a+e+l$ (n=energy of food intake and k=energy of oxygen, a=energy of growing body tissue, e=energy of heat radiation and condensed water, l=energy of mechanical work) and accepts these figures. Of heat radiated, 80 per cent leaves the surface of the body and 20 per cent leaves the lungs; one-tenth of energy, or 250 calories, leaves the body in excretion; mechanical work is estimated variously as one-third of total energy, one-sixth, etc. He is especially interested in methods of obtaining energy values in metabolism experiments and suggests determining amount and composition of intake and output, then reckoning the energy according to rules of thermochemistry. He indicates the shorter method of ascertaining intake by generalizing method, deducting values of excretions taken from tables, considering k=a and calculating e+l. He also describes other methods.

For the nursling raised on sweetened cow's milk he gives these values for 24 hours: Nitrogen in urine, 3.3 grams; elimination of carbon dioxide, 198 grams, and intake of carbon dioxide, 163 grams, both through respiration. E+l for human milk=480 calories; e+l for cow's milk=730−60=670 calories. He argues at some length that overfeeding with meat adds little to bodily tissue; carbohydrates and fat with meat give best results.

446 ——— "Metabolism and nutrition during the first year of life." Shaw and La Fetra, editors: Diseases of Children, vol. 1, pp. 359–408. Translation of Handbuch der Kinderheilkunde [Pfaundler and Schlossmann, editors], vol. 1, pp. 181–231. English edition published by J. B. Lippincott, Philadelphia and London, 1908 (4 vols.); German edition by F. C. W. Vogel, Leipzig, 1906 (2 vols.).

This article is a manual of the infant's metabolism and nutrition interpreting the best scientific research for the layman. After describing how the body substance and the digestive system of the infant differ from those of the adult the author explains that the relatively great food requirement of the infant is due to the facts that 85 per cent of elimination is effected through the skin

and that according to the stereometric law the smaller the body the larger its relative surface. Heubner and Rubner's and Camerer's metabolism experiments are cited, and food requirements are discussed. Much information is given on the composition of human and of cow's milk and the analysis of meconium, feces, and urine.

7 **Camerer, W.:** "Prüfung eines neuen Kindernährungsmittels" [Testing a new infant food]. *Medicinisches Correspondenz-Blatt* [Stuttgart], vol. 49–50 (1879–80), pp. 289–292.

The author describes his success in giving a new infant food to three infants 1 month old and to three from 6 to 9 months old. For one infant 9 days old, weighing only 2,850 grams, he presents tables showing meals, food, and feces; chemical analyses of the food and feces; and the child's growth. Till he was 5 months old he received the infant food and cow's milk, at first in equal parts and later in the ratio one to two.

8 ——— "Stoffwechselversuche an einem Mädchen im Alter von 1 Jahr und 2 Monaten" [Metabolism experiments on a girl 1 year and 2 months old]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 29 (1892), pp. 227–232.

The author measured the metabolism for the four days March 16 to 19, 1891, of an artificially fed female infant born January, 1890, weighing 10.33 kilograms and measuring 75.5 centimeters. He gives tables of analyses of food, of feces, and of urine, and nitrogen exchange.

9 ——— "Stoffwechselversuche an meinen Kindern" [Metabolism studies on my children]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 29 (1892), pp. 398–428.

The author gives exact tables on metabolism of his children—tables of their weights with dates, urine, insensible perspiration, feces, chemical analyses of food and of the nitrogen intake and output. The experiments included 24 days for each child, six periods with four days in each period. The three young children between 9 and 14 were tested in the two investigations, December, 1886, to December, 1887, and January, 1889, to January, 1890, and also the eldest two in the third investigation, January, 1891, to March, 1892. Four of the children are girls, the other is a boy.

0 ——— "Über das Nährungsbedürfniss von Kindern verschiedenen Alters" [Nutritional requirement of children at various ages]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Dresden], vol. 6–9 (1888–91), pp. 116–128. See also *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 30 (1889–90), pp. 369–381.

The author describes investigations on the generation of energy in child and adult by Mayer, Stohmann, Vierordt, Meeh, and Rubner. Using experiments by himself or by Forster, Biedert, or Ahlfeldt, according to Rubner's principle of ascertaining the caloric value of food, the author gives tables of calories generated daily per square meter of body surface in the case of breast-fed infants, artificially-fed infants, older children on cow's milk, and older children on mixed diet. He also shows in tables and graphs the caloric value of fat, albumin, and carbohydrate in mother's milk and in mixed fare, according to the age of the child. Only a few children are considered in each case.

1 ——— "Über den Stoffwechsel von Säuglingen" [Metabolism of infants]. *Jahrb. f. Kinderh.* [Leipzig], vol. 22 (1885), pp. 106–117.

After giving warnings against errors in conducting metabolism tests the author presents tables of his own data and those of other workers, on infants' weights, nourishment consumed by them, etc.

2 ——— "Versuch über den Stoffwechsel, angestellt mit 5 Kindern im Alter von 2–11 Jahren" [Tests of metabolism made on 5 children from 2 to 11 years old]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 66 (1880), pp. 24–41.

The author describes six metabolism tests each lasting four days, made on his own children, four girls and one boy, all very healthy, aged 2 to 9 years, between September, 1878, and August, 1879. He carefully describes the children, their meals, and his manner of making and analyzing tests. He remarks that such tests are more authentic for infants than for older children on account of the uniformity of their living conditions, the great importance of growth in their lives, and the absence of differentiating factors like occupation, different foods, etc. Results are shown in one table on weight and growth for each child, three tables on urine, two tables on insensible perspiration, two on feces, and many tables on food and the analysis of it and of the excretions.

3 ——— "Versuch über den Stoffwechsel bei Ernährung mit Kuhmilch" [Tests on metabolism during cow's milk diet]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 16 (1880), pp. 493–496.

During the four days, February 22–25, 1880, the author's two daughters, one 12 years old weighing 26.3 kilograms and the other 10 years old weighing 24.3 kilograms, received as food only milk, as much as they liked, between 7 a. m. and 9 p. m. and coffee at 3 p. m. The elder lost 640 grams and the younger 728 grams. As a control, there was used a test made a year before on mixed diet. Results are shown in tables of weights, food, excretions, and analyses thereof.

454 Camerer, W.: "Versuche über den Stoffwechsel der Kinder" [Experiments on the metabolism of children]. *Medicinisches Correspondenz-Blatt* [Stuttgart], vol. 46 (1876), pp. 81–85.

The author tested food assimilation, by his three daughters, aged 1 year, 6 years, and 8 years, respectively. Tables show food consumed, excretions, including insensible perspiration, etc.

455 ——— "Versuch über den Stoffwechsel von Kindern bei ausschliesslicher Milchnahrung" [Experiments on metabolism of children fed exclusively on milk]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 18 (1882), pp. 488–495.

During the five days June 10–14, 1881, the author tested the assimilation of his three youngest children from 4 to 6 years old. Including similar experiments previously made on his two oldest daughters these results comprehend five subjects. Analyses of the milk and of the urine and feces are carefully described; the amounts are shown in tables.

456 ——— "Zur Physiologie des Säuglingsalters" [Physiology of infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 56 (1902), pp. 543–572.

Besides discussing growth processes in the infant and adult and the significance of various foods in relation to nutrition the author gives data relating to metabolism studies of a few infants, a boy of 10 years, and adults.

457 ——— and O. Hartmann: "Der Stoffwechsel eines Kindes im ersten Lebensjahre" [Metabolism of a child in the first year of life]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 14 (1878), pp. 383–414.

The infant discussed was observed by the author. He treats the child's teething and development; analyzes the mother's milk, cow's milk given to the infant, the infant's urine and feces; and describes methods of weaning the child, of weighing and testing the mother's and cow's milk, the urine and feces, and of measuring the quantities of insensible perspiration. He gives in detail the results of these observations as made on 48 days during the year.

458 Camerer, W., Jr.: "Untersuchungen über das Langen- und Gewichtswachstum bei chronischer Unterernährung" [Investigations on increase in height and weight during chronic undernourishment]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 21–22 (1906), pp. 152–155.

The author discusses four curves, representing the actual increase in weight and height, from birth to 5 years, of his son suffering from geographical tongue and gastroenteritis, as compared with the normal increase. That undernourishment, though it decreased the child's weight, did not affect his height he concludes to be typical of a general law.

459 Cameron, A. T.: "Basal metabolism determinations in 250 Winnipeg school children." *Canadian Medical Association Journal* [Toronto], vol. 15 (1925), pp. 1022–1025.

Metabolism tests were completed with 248 children, 84 of whom were classed as normal. A closed circuit clinical apparatus was used. All tests were made under the supervision of the author. Methods are described. Curves definitely higher than those based on Benedict and Talbot's predicted figures are shown for normal, preadolescent Winnipeg children.

460 Caro, W.: "Über Buttermilch als Säuglingsnahrung" [Buttermilk as infant food]. *Arch. f. Kinderh.* [Stuttgart], vol. 34 (1902), pp. 321–331.

A study of the feeding of 198 infants in a children's hospital. Case histories for 6 infants and 3 tables of gains in weights are presented.

461 Cassel, J.: "Erfahrungen mit Eiweissmilch" [Experiences with protein milk]. *Arch. f. Kinderh.* [Stuttgart], vol. 58 (1912), pp. 241–292.

Development is described in detail of about 61 cases treated with protein milk in the Children's Polyclinic in Berlin from April, 1911, to April, 1912. Forty-one curves and as many entries in tables give data on food, weight, increase, etc.

462. Caternikoff, *Mme.*: Contribution à l'étude de l'emploi du lait stérilisé chez les nourrissons [Contribution to the Study of the Use of Sterilized Milk for Nurslings]. Paris, no. 146, 1899. 50 pp.

Dissertation (University of Paris). The author gives data collected from eight hospitals and nurseries on the development of infants in relation to the feeding of sterilized milk. Bibliography.

463 Children's Bureau, U. S. Department of Labor: Children of Preschool Age in Gary, Indiana. Part II. Diet of the Children, by Lydia Roberts, pp. 53–175. Publication No. 122. Washington, 1922.

In connection with a study of diet in relation to the physical condition of about 3,000 children in Gary, Ind., the author gives her findings as to the state of nutrition of these children. She groups the children according to whether they are (1) of average weight in relation to height and age, (2) less than 7 per cent below the average, (3) 7 but less than 10 per cent below the average, (4) 10 per cent or more below the average weight in relation to height and age. The adequacy of the diet for each of those groups of children is also reported upon.

464 **Children's Bureau, U. S. Department of Labor:** The Nutrition and Care of Children in a Mountain County of Kentucky, by Lydia Roberts. Publication No. 110. Washington, 1922. 41 pp.

According to the standard used (based upon the figures of Bowditch) 20 per cent of the children examined were found to be 7 per cent or more below average weight. The author also reports her findings as to the adequacy of the diet in each of the four groups of children, classified as having poor, fair, good, or excellent nutrition.

465 **Chou, Yenksün:** "Über den Nahrungsbedarf von Kindern jenseits des Säuglingsalters" [Nutritional requirement of children after infancy]. *Ztschr. f. Kinderh.* [Berlin], vol. 34 (1922–23), pp. 150–157.

The author tests the nutritional requirement of 69 children between 2 and 14 years of age who had had at least two months of convalescence after various illnesses. He used the Pirquet system, his tests covering 5,290 days of observation. The system was found applicable to this age. The article contains one table, two graphs, and a bibliography.

Clark, Taliaferro, and Selwyn D. Collins: Dried-Milk Powder in Infant Feeding. *See* U. S. Public Health Service.

466 **Cobliner, S.:** "Blutzuckeruntersuchungen bei Säuglingen" [Investigations into the amount of sugar in the blood of infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 1 (1910–11), pp. 207–216.

The author obtained small quantities of blood from infants by applying a cupping glass below the scapula three hours after meals. The plasma as well as the whole blood was tested for sugar content by Moeckel and Frank's method.

One table gives the age, nourishment, weight, and percentage of sugar in the blood of 28 healthy infants from 9 days to 16 months old. For infants over 3 weeks the content was between 0.09 and 0.15 per cent. For the first year the average was 0.119 per cent. Another table of 14 tests shows the sugar content of the plasma to be a little higher—on an average 0.126 per cent. Therefore the percentage of sugar in the blood of infants is noticeably higher than in that of adults, where it varies from 0.065 to 0.105 per cent. Thirteen tests on four older children showed them to have a lower sugar content than the infants. The author believes that the large amount of sugar in the blood of infants is due to the infant's great need of energy and heat. This would explain why very young infants, who are deficient in energy, have about the same amount of sugar in the blood as adults.

467 **Cohn, Julie:** "Über Verdauungslipämie und Fettgehalt des Blutes beim Säugling" [Digestive lipemia and fat content of blood in the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 90 (1919), pp. 44–66.

To study lipemia following digestion and the fat content in infant blood, the author tests groups of about seven infants on diets of human milk, cow's milk, cod-liver oil, olive oil, and butterflour. Ivar Bang's method and the optic method are compared. During the fast the micromethod shows about 1 per cent of fat in blood. After eating the smaller the amount of fat consumed the more rapidly it disappears from the blood. After a meal of cow's milk the greatest amount of fat appears in the blood in two to four hours; after human milk, in four hours; after cod-liver oil, in five hours; after olive oil, in six hours. The lipemia disappears comparatively rapidly after cow's milk and cod-liver oil, much more slowly after olive oil and cow's milk. Four tables, 11 curves, and several case histories are included.

468 **Coudereau, C. A.:** Recherches chimiques et physiologiques sur l'alimentation des enfants [Chemical and Physiological Investigations on the Nourishment of Children]. Paris, no. 129, 1869. 113 pp.

A thesis for medical degree (University of Paris). The author gives nine tables on his results of feeding infants with a special formula, including eggs and sugar, reporting 156 observations. Bibliography.

469 **Courtis, S. A.:** "Measurement of the relation between physical and mental growth." *American Physical Education Review*, vol. 22 (1917), pp. 464–481.

The author, a supervisor of educational research in Detroit public schools, points out the need for research work on comparative physical and mental growth as a guide in arranging school programs. From data of Hogue, New South Wales, on 4,120 subjects, 1,846 girls, 2,274 boys, age 13, grouped as to school year, height, and weight, he devises a chart showing that in general physical and mental development are synchronous. He derives development curves from Hastings's Manual of Physical Measurements for boys, aged 5 to 20, to illustrate his own theory that lung capacity is the vital element in growth, and adds several individual record charts showing age, height, weight, grip, and lung capacity. No definite conclusions are recorded.

470 **Courtney, Angelia M., and Helen L. Fales:** "Studies on infant metabolism and nutrition. The excretion by infants of magnesium sulphate injected subcutaneously." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 318–321.

Since magnesium sulphate injected subcutaneously has an effect which is only temporary in alleviating convulsions, the authors followed the magnesium

and sulphuric-acid metabolism of three infants on the days following such injection to determine whether the injection could be repeated in 24 hours without producing an accumulation of magnesium in the body. The results, while inconclusive because of the small number of cases, indicated that the injection might be repeated at 24-hour intervals without danger of cumulative effect of magnesium.

471 **Cramer, Heinrich:** "Grundsätze des Geburtshelfers für die erste Ernährung des Kindes" [Principles of the obstetrician for the first feeding of the child]. *Münchener Medicinische Wochenschrift*, vol. 47 (1900), pp. 1585–1587.

The author describes a curve reckoned for 181 full-term, healthy, normal, breast-fed infants. In the case of 3, for whom he gives curves, he calculated the metabolism in intake of milk and excretions of gas, urine, and feces. A table compares the amounts of milk drunk by Ahlfeld's, Krueger's, and Schlesinger's subjects with 2 of his own, 1 naturally and 1 artificially nourished. These data cover the first 7 to 10 days.

472 ——— "Zur Energiebilanz beim Neugeborenen" [Energy balance in newborn infants]. *Münchener Medicinische Wochenschrift*, vol. 50 (1903), pp. 1153–55.

The author compares his findings with those of other workers, especially Heubner and Glaus. He concludes that the newborn infant increases in weight, in spite of small food intake, because of water retention and slight elimination.

473 ——— "Zur Mechanik und Physiologie der Nahrungsaufnahme des Neugeborenen" [Mechanics and physiology of food consumption by the newborn infant]. *Sammlung Klinischer Vorträge* [Leipzig], 1897–1900, new ser., Gynäkologie, no. 68–98, pp. 1683–1706.

The author studies the proper amount of food for healthy, full-term newborn infants, the time they should begin to nurse, the mechanism of nursing in breast-fed and in bottle-fed infants, and the energy required. The four principal tables cite amounts of milk consumed by 8 breast-fed infants described by Habner, Feer, and others, and by 18 artificially-fed infants observed by the author in Breslau. Another table and four curves give data concerning 1 breast-fed and 4 bottle-fed infants carefully tested by the author. In every case the first 10 days of life are covered. Other tables concern weights and power of sucking as measured by the manometer, one table being devoted to figures obtained for 3 premature infants.

The nutritional quotient, $\frac{\text{weight increase}}{\text{amount food}}$, is up to the tenth day 17 to 18 per cent for the artificially-fed and about 10 per cent for the breast-fed infant.

474 ——— "Zur Stoffwechselgleichung beim Neugeborenen" [Metabolic equation in the newborn infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 32 (1901), pp. 1–37.

The author studied the metabolism of five newborn infants in 1900 at the Women's Clinic, Bonn. Tables of milk taken at meals, weighings, urine, feces, and insensible perspiration fill more than 20 pages. Tests lasted 1 week, 10 days, or 2 weeks. Subjects and methods used in experimentation are described. Comparisons are made with others' tests. During the first days of life the infant is more or less dehydrated, therefore urine is scanty. The amount gradually increases. After the tenth day under favorable conditions it amounts to 70 per cent of liquid intake, as with older infants.

475 **Cronheim, W., and Erich Müller:** "Stoffwechselversuche an gesunden und rachitischen Kindern mit besonderer Berücksichtigung des Mineralstoffwechsels" [Metabolism experiments on healthy and rachitic children with special reference to mineral metabolism]. *Biochemische Zeitschrift* [Berlin], vol. 9 (1908), pp. 76–126.

The author made prolonged metabolism tests on two healthy infants aged 4 and 6 months and on two rachitic infants aged 6 and 11 months, feeding them first raw cow's milk and later cow's milk sterilized in the ordinary fashion; for dilution only distilled water was used. Analyses cover specific gravity, nitrogen, fat, sugar, phosphoric acid, ash, lime, magnesia, potassium, and sodium of the milk intake and of urine and feces. The results fill 18 pages of tables at the close of the article. Almost 30 other tables appear in the discussion, which takes up first the metabolism of nitrogen, fat, phosphorus, and alkalis in normal and then in rachitic children. The metabolism of nitrogen and fat is better in the case of sterilized milk, but that of calcium is no better than with raw milk. The slow development of the human infant prevents the striking results obtained in animal experiments.

476 ——— ——— "Untersuchungen über den Einfluss der Sterilisation der Milch auf den Stoffwechsel des Säuglings unter besonderer Berücksichtigung der Knochenbildung" [Investigations on the effect of sterilizing milk upon infant metabolism with especial reference to bone formation]. *Jahrb. f. Kinderh.* [Berlin], vol. 57 (1903), pp. 45–63.

The author desired to ascertain the effect of the sterilization of milk upon the lime metabolism of infants. After commenting on the effect of boiling, upon sugar, fat, and lime of milk, and stating the arguments pro and con of other

Investigators upon the boiling of milk to be fed to infants, the authors describe their own methods in experimenting with raw and boiled milk upon two infants 4 and 6 months old, both healthy and free from rachitis. The authors conclude that in sterilized milk the assimilation of fat is better than in raw milk, and the assimilation of phosphorus and especially lime is worse. Though sterilized milk may not be harmful to healthy infants, it is not recommended. Furthermore, it may affect the enzymes biologically.

477 **Cronheim, W., and Erich Müller:** "Versuche über den Stoff- und Kraftwechsel des Säuglings mit besonderer Berücksichtigung des organisch gebundenen Phosphorus" [Investigation of the metabolism of the infant with special reference to organically bound phosphorus]. *Zeitschrift für Diätetische und Physikalische Therapie* [Leipzig], vol. 6 (1902–3), pp. 92–114, 25–44.

This article contalning a great number of tables begins with a review of the literature on the metabolism of phosphorus. The author studied six healthy children, five from 4 to 11 months old and one 2½ years old. They were weighed daily and the amount of their food was precisely determined. It consisted of skim-milk powder, oatmeal, and sugar. The test consisted in ascertaining the difference produced by adding yolk of egg to this. There were six meals a day at intervals of three hours. The Bendix and Finkelstein apparatus was used. The chemical analyses are explained. The nitrogen of perspiration was ignored. The most important results of their work the authors state thus: Much more phosphorous is absorbed into the body than is needed for the bones and apparently is used for tissue, nerves, and glands. The form in which phosphorus is given is important. The early use of egg yolk for children is recommended. Sterilized milk even in connection with bone-forming mineral stuffs gives a negative lime balance. References.

478 ——— ——— "Zur Kenntnis der Bedeutung des organisch gebundenen Phosphors für den Stoffwechsel des Kindes" [On the study of the significance of the organically bound phosphorus for the metabolism of the child]. *Jahrb. f. Kinderh.* [Berlin], vol. 52 (1900), pp. 360–364.

The authors studied the effect of organically bound phosphorus upon child metabolism by feeding the yolk of egg to a boy 11½ months old at the Charité in Berlin. In the control test milk replaced the lecithin. The yolk-of-egg diet caused an increase in the assimilation of albumin and of phosphorus and greater weight. The metabolism of nitrogen, fat, and carbohydrate for both types of feeding is tabulated.

479 **Czerny, Ad., and A. Keller:** Des Kindes Ernährung, Ernährungsstörungen und Ernährungstherapie. Ein Handbuch für Ärtzte [The Child's Nutrition, Nutritional Disturbances, and Nutritional Therapy. Handbook for Physicians]. Franz Deutlicke, Leipzig and Vienna, 1906. 699 pp.

The 27 chapters of the first part include much discussion of the metabolism (except respiratory exchange) of the newborn infant up to 1 year of age and a discussion of growth in weight and height up to puberty.

480 **Daniels, Amy L.:** "Can yeast be used as a source of the anti-neuritic vitamin in infant feeding?" *Am. J. Dis. Child.* [Chicago], vol. 23 (1922), pp. 41–50.

A study of 16 infants, all normal and in good health except 2, who had sudamina. Details of the feeding mixtures, weights, etc., in a number of the more typical cases are given in charts, and histories of 11 of the cases are recorded individually. The experience pointed to the conclusion that yeast should not be used in infant feeding.

481 **Deneke, Carl:** "Über Ernährung des Säuglings während der ersten neun Tage" [Nutrition of the infant during the first nine days]. *Archiv für Gynäkologie* [Berlin], vol. 15 (1879–80), pp. 281–342.

To study the feeding of nurslings during their first nine days of life the author tested five boys and five girls in a lying-in hospital of Jena, repeatedly weighing them himself. One was fed on Swiss milk, the others were breast fed. All were nourished when showing signs of hunger and were allowed to drink as long as they liked. Ten case histories are given and the weights and amounts of milk consumed. A summary contains tables giving for each of the nine days the amount of milk drunk in grams, the same in percentage of body weight, the average amount taken at each meal, and the number of meals.

482 **Denis, W., J. G. Kramer, and Anna S. Minot:** "The influence of protein intake on creatine excretion in children." *Journal of Biological Chemistry* [Baltimore], vol. 30, no. 2 (1917), pp. 189–196.

The authors studied four children and one infant to determine the source of creatine in children's urine. Details as to the diet, length of the experiments, and effect on the subjects are fully given. The experiments showed that the amount of creatine in children's urine is directly dependent on the intake of protein, and the authors concluded that creatinuria in normal children is due to their relatively high protein intake. The low saturation point of immature muscle is suggested as a contributing cause.

483 **Dennet, Roger H.:** "The caloric requirements of bottle-fed infants." *J. A. M. A.* [Chicago], vol. 59 (1912), pp. 2306–2309.

The author gives feeding records of four infants during the first few months of life, with detailed description of the cases, and states that 25 cases he has followed in the same way show that the average normal infant will do well on 110 to 120 calories per kilogram per day.

484 **Dibbelt, W.:** "Die physiologische Bedeutung des Kalkhungers bei Brustkindern im ersten Lebensjahre" [The physiological significance of calcium starvation in breast-fed children during the first year]. *Berliner Klinische Wochenschrift* [Berlin], vol. 48 (1911), pp. 2062–2064.

Using his own previous work and that of Camerer, Aron, Schabad, Thomas, and others, the author presents tables of calcium requirement and calcium growth from the first to the twelfth month, the percentage of ash in the infant organism, etc., from which it appears that during the first six months of extrauterine life the system develops under the influence of a relative calcium starvation. Cross sections of diaphyses of a newborn infant and of a child 2 years old show the rapid changes that occur after birth, when very lively absorption processes are going on. At this time a diet poor in lime salts predisposes to rachitis.

485 **Dohrn, R.:** "Über die Grösse des respiratorischen Luftwechsels in den ersten Lebenstagen" [Respiratory exchange in the first days of life]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 32 (1895), pp. 25–59.

To test the air exchange of newborn infants the author observes 85 full-term and 15 premature infants during the first 10 days of extra-uterine life for five minutes at a time. He uses a spirometer having a soft rubber mask for the face. The data he collects concern sex, serial number of child in its family, age, weight, length, time of day, number of respirations, amount of air expired, and kind of breathing. The conclusions show that the number of breaths is 62 for quiet breathing, 47 for crying, and 50 for an average. The amount of air in an expiration is about 45 cubic centimeters. Breathing becomes deeper with age. Sex makes no difference.

486 **Dreyer, Georges:** "The normal basal metabolism in man." *Lancet* [London], vol. 2 (1920), pp. 289–291.

This article presents formulas for males and females of many ages based on experiments on basal metabolism conducted by Benedict and other observers.

487 **Du Bois, Eugene F.:** "Clinical calorimetry (xii). The metabolism of boys 12 and 13 years old compared with the metabolism at other ages." *Archives of Internal Medicine* [Chicago], vol. 17 (1916), pp. 887–901.

Eight normal boys, 12 and 13 years old, were studied in the respiration calorimeter four to six hours after a small breakfast in a condition of almost complete muscular repose. Their heat production per unit of surface area was found to be about 25 per cent higher than the adult level. Since boys just before the onset of puberty have almost adult proportions this result points to a specific increase in the metabolism of the growing organism.

488 ——— Basal Metabolism in Health and Disease. Lea and Febiger, Philadelphia, 1924. 372 pp.

Research work of the past two decades on the metabolism of normal children is reviewed on pages 106–164, with description of apparatus used, an exposition of the author's method of determining surface area and numerous references.

489 ——— **W. H. Olmsteád, and D. P. Barr:** "Clinical calorimetry, twenty-seventh paper. Metabolism of boys twelve and fourteen years old." *Archives of Internal Medicine* [Chicago], vol. 21 (1918), pp. 621–626.

The same boys (boy scouts), with one exception, who were studied in March and April, 1915, and reported in paper 12 of this series (No. 487, this section) were examined again in March and April, 1917, all conditions of the experiment being practically identical with those of the previous study. Their histories for the intervening years are recorded, with tabular record of the result of the calorimeter experiment. The authors found that all the individuals showed a marked decrease in metabolism, the average decrease being 13 per cent. The average metabolism at 14 and 15 was 44.1 calories per square meter per hour, which is 11 per cent above the average for adult men between 20 and 40 years of age.

490 **Dubois, Maurice, and Karl Stolte:** "Abhängigkeit der Kalkbilanz von der Alkalizufuhr" [Dependence of calcium balance on the supply of alkali]. *Jahrb. f. Kinderh.* [Berlin], vol. 77 (1913), pp. 21–27.

After a preface on the importance of inorganic matter for the infant organism and a discussion of the speedy effect of alkaline salts and retarded influence of alkaline earths the authors describe their few experiments with and without alkali on two infants. In one instance there was an improvement of calcium retention with alkali of 0.4788 gram of calcium oxide in three days.

491 **Eckert, Marianne:** "Über die Wirkung erhöhter Eiweisskonzentration in der Säuglingsernährung" [On the effect of an increased amount of concentrated protein in the feeding of infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 37 (1924), pp. 1–4.

An account of experiments with eight children free from any symptoms of disease and varying in ages from 1 week to 6¾ months. The children were kept on a diet which contained 30 to 40 per cent of concentrated protein, instead of the 10 per cent usually considered sufficient. The experiments lasted from one to six days. The author found in all cases a decrease in weight without any symptoms of illness; the stools were ill smelling; there was no rise in temperature. Upon return to a normal diet there was an increase in weight. The author disagrees with other writers who believe that an excess of protein brings about "protein fever." Case histories are given. References.

492 **Edelstein, F., and L. Langstein:** "Das Eiweissproblem im Säuglingsalter" [The albumin problem in infancy]. *Ztschr. f. Kinderh.* [Berlin], vol. 20 (1919), pp. 112–194.

This study involves the determination of nitrogen minimum and the biological value of the nitrogen in cow's milk, human milk, albumin, and casein, in the case of five healthy infants. The nitrogen minimum was 0.448 gram nitrogen (urine + feces) or 0.298 gram nitrogen (urine alone). The nitrogen metabolism on a diet free of nitrogen is relatively greater than in the adult. The biological value of lactalbumin and the nitrogen of human milk is higher than that of casein and the nitrogen of cow's milk. The human albumin is more favorable to growth. Thirty-four tables and seven curves are presented.

493 **Ederer, Stefan:** "Die Kreatininausscheidung bei Säuglingen und Kindern" [Creatinine elimination in infants and children]. *Monatschr. f. Kinderh.* [Leipzig], vol. 23 (1922), pp. 157–168.

The author used the calorimetric method of Autenrieth and Müller to test creatinine elimination of infants and other children. Among eight infants with normal muscle tone healthy infants showed coefficients between 8.1 and 11.36 and sickly infants between 5.8 and 7.92. Six hypertonic infants had supernormal values and two hypotonic infants subnormal values. Of 18 children between 2 and 14 years, those between 2 and 6 years had coefficients between 7.37 and 16.9; those between 7 and 10 had coefficients between 14.6 and 20.5; and those between 10 and 14 years had coefficients like adults, between 17.4 and 25.8. Bibliography.

494 **Emerson, William R. P.:** "A nutrition clinic in a public school." *Am. J. Dis. Child.* [Chicago], vol. 17 (1919), pp. 251–263.

Account of an experimental nutrition clinic in Public School 64, New York, in 1918. Eight hundred and ninety-four children were weighed and measured without shoes but with indoor clothing, and results are compared with average weights for heights based on figures of Boas and Burk. A table shows school grade and number and percentage of children 7 per cent or more overweight, between 7 per cent overweight and 7 per cent underweight, and 7 per cent or more underweight. One hundred and sixty children found more than 7 per cent underweight are divided into six groups, treated by different methods, and results are tabulated.

495 ——— Nutrition and Growth in Children. D. Appleton & Co., New York, 1922. 342 pp.

In connection with suggestions for carrying out a nutrition program tables are given showing caloric requirements for children and the average heights and weights of several thousand children that had been examined by the author's methods, as well as weights and heights from other workers' examinations.

496 **Engel, Irmgard, and S. Somelson:** "Der Energiequotient des natürlich und des künstlich genährten Säuglings" [The energy quotient of the breast-fed and the artificially-fed infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 8 (1913), pp. 425–442.

The authors studied the energy quotient of twins of about the same weight, from the eleventh to the seventy-first day. One of the children was breast fed and the other artificially fed. Comparisons are made with the findings of other workers. Many tables give the body weights, amounts of milk consumed, etc.

497 **Faber, H. K.:** "Food requirements in new-born infants"; a study of spontaneous intake. *Am. J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 56–72.

Eighty-five newborn infants at the Lane Hospital were put to the breast every four hours and after nursing given as much as they would take of a formula. These infants gained normally, showing that appetite is probably a fair index of nutritive needs. The average of calories per kilogram increased from 22.5 the first day to 117.3 the twelfth day. Charts and tables give data in various combinations.

498 **Feer, Emil:** "Nahrungsmengen eines gesunden Brustkindes und Energieverbrauch des gleichen Säuglings nach der Entwöhnung" [Food intake of a healthy breast-fed child and energy exchange of the same infant after weaning]. *Jahrb. f. Kinderh.* [Berlin], vol. 64 (1906), pp. 354–369.

The author studied the nutritional requirements of his fourth child, a girl, born May 14, 1903, with a weight of 3,230 grams. She was nursed during the first 22 weeks, was weaned from the twenty-third to the thirty-second week; and during the thirty-third to the forty-sixth week while she was being fed on cow's milk with some sugar and meal, her father noted her weight, amount of food intake, energy quotient, and growth quotient, the last being the increase in grams divided by weight in kilograms times the amount of food in kilograms. A table gives the energy exchange for the thirty-third to the forty-sixth week. In his practice the author acts on the assumption that healthy infants require 100 calories per kilo during the first months and 80 calories in the second half year.

499 ——— "Weitere Beobachtungen über die Nahrungsmengen von Brustkindern" [Further observations on the food requirement of breast-fed children]. *Jahrb. f. Kinderh.* [Berlin], vol. 56 (1902), pp. 421–465.

The author calculates the metabolism for many weeks in the case of healthy infants. He gives case histories of seven infants and presents tables for the intake of nourishment, weights, energy quotients, etc. He discusses at length the number and size of meals, their relation to weight and growth, and the growth quotient. Other scholars are constantly cited.

"The almost constant number of calories per square meter of surface that we find in the whole observation period brilliantly substantiates the correctness of Rubner's law that the nutritional requirement is proportioned to the extent of body surface."

500 **Finizio, G.:** "Ricerche sulla glucosuria alimentare nell'infanzia" [Studies of alimentary glucosuria in children]. *La Pediatria* [Naples], vol. 7 (1899), pp. 7–19.

The author made 32 observations of the limits of assimilation of glucose by six well children, 4 to 7 years old, 2 of whom had diabetic fathers. He found that in well children the limits of assimilation of glucose are higher than in adults; in children 4 to 6 years old the limit is 7 grams per kilogram of body weight, and for the children of diabetics it is only 5 grams.

501 **Finkelstein, H.:** "Die rohe Milch in der Säuglingsernährung" [Raw milk in infant nutrition]. *Therapeutische Monatshefte* [Berlin], vol. 21 (1907), pp. 508–513.

The author discusses whether milk is safer for infants if boiled. Six tests with human milk proved that infants thrive better if milk is not boiled. Cow's milk was tested in the case of healthy infants during the first eight weeks of life. Twenty-nine were fed on raw milk for 34 days and 19 on boiled milk for 27 days. Twelve were fed 33 days on raw milk and 17 days on boiled milk. Fifty-one sick infants were tested in a similar way. Results are expressed in tables. In the case of cow's milk the author believes sterilization makes no difference in the assimilation of the milk by the infant.

502 ——— "Zur Ätiologie der Ernährungsstörungen der Säuglinge" [The etiology of nutritional disturbances in infants]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 23–24 (1906–7), pp. 117–122.

The author attacks the theory that heterogeneous albumin, or any albumin, produces leucocytosis in the infant. He cites instances of infants fed on human or cow's milk and concludes that no specific but only quantitative distinctions exist between them with respect to leucocytosis of digestion. The leucocytosis, the author believes, is caused by other constituents of the diet than albumin, probably by fat.

503 **Fitschen, Eleonore:** "Über Säuglingsernährung mit Vollmilch" [Infant feeding on full milk]. *Arch. f. Kinderh.* [Stuttgart], vol. 37 (1903), pp. 1–44.

In tables covering 14 pages and discussion concerning especially weight increase and stomach and intestinal phenomena the author gives full information on feeding 130 young infants with full strength of cow's milk from October 1, 1900, to August 21, 1902, in the Children's Ambulatorium in Munich. She advises that in weaning from another diet the full milk be introduced gradually and be not used in severe illness nor before the infant is 10 days old. Overfeeding, too, must be avoided. Full milk gives its best results when the infant is 1 month old. The author believes that infants nourished on cow's milk are usually robust like breast-fed infants.

504 **Forsyth, David:** "Breast feeding: The consumption of breast milk." *Lancet* [London], vol. 1 (1913), pp. 1656–57.

A record of an infant's consumption of breast milk from the fifth day after birth to the forty-ninth day. No other food was given. The infant was weighed generally before and after each meal, and 799 weighings were recorded. Tables show the average amount of milk consumed and the largest and smallest amounts for each week.

505 **Foster, Katharine L., and John R. Murlin:** "An attempt to correlate the growth of institutional children with the food supply." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 21 (1923–24), p. 423.

From June, 1921, to June, 1923, eight surveys covering periods of from two to six weeks were made of the food consumption in each of the eight cottages at Hillside Home, Rochester, N. Y. Each cottage, except one for both sexes under 5 years of age, contains from 20 to 25 children of ages ranging from 6 to 16. Calculations of the energy consumption per person per day were compared with the total energy requirements for populations of like age, as postulated by Holt and Fales. Food consumption in the average cottage showed a deficit of approximately 200 calories per person per day. Average growth varied from 81 to 120 per cent of normal as determined by Baldwin, but on the whole followed very close to the rate of gain established by this author.

506 **Frank, Armando:** "Vergleichende Untersuchungen über die Ausnutzung von Vollmilch und Kasein fettangereicherter Kuhmilch" [Comparative investigations on the utilization of full milk and casein-fat cow's milk]. *Monatschr. f. Kinderh.* Originalien [Leipzig and Vienna], vol. 12 (1913–14), pp. 151–156.

The article contains two graphs showing amounts of foods consumed and weight curves of two young infants, and three tables on their metabolism of nitrogen, fat, and carbohydrates. Both cow's milk, undiluted, and John and Heim's casein-fat milk gave good results. Plain cow's milk appeared to offer better possibilities for a perfect utilization of all food elements.

507 ——— **and Lotte Mehlhorn:** "Über den Ablauf der Blutzuckerkurve unter dem Einfluss reiner Nahrungstoffe" [Course of blood-sugar curve under influence of pure foods]. *Jahrb. f. Kinderh.* [Berlin], ser. 3, vol. 91–92 (1920), pp. 41–42, 313–346.

Using Bang's method the authors tested every half hour the curve of sugar in the blood of more than 20 children in the first and second years of life after administration of cane sugar, dextrose, levulose, starch, casein, fat, and adrenalin. The article contains 37 curves. Seven conclusions are listed. The fasting value of blood sugar is 0.086 per cent. All the sugar tests caused glycosuria. The hyperglycemia after different doses is described.

508 **Franz, K.:** "Über das Stillen der Wöchnerinnen" [Mother's nursing during first week]. *Berliner Klinische Wochenscrift*, vol. 48 (1911), pp. 1265–1267.

The author gives statistics based on the weighing of 1,000 infants several times a day during the first six days after birth. He found that first-born children receive less milk from their mothers than other children, but that there is no difference in the initial loss of weight for the two classes.

509 **Freund, Walther:** "Chlor und Stickstoff im Säuglingsorganismus" [Chlorine and nitrogen in the infant organism]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 48 (1898), pp. 137–164.

The author is interested in the rôle played by sodium chlorid in the infant organism. He discusses the work of former investigators on the subject and then takes up his own, wherein he ascertained the sodium-chloride content of milk, urine, feces, and also nitrogen exchange, for one breast-fed and two artificially-fed infants. The chlorine was analysed according to Volhard, the nitrogen according to Kjeldahl. A case history is given for each child and numerous tables of the findings, which show great variations. Bibliography.

510 ——— "Milchnährschaden und Fettresorption" [Disturbances of milk assimilation and fat absorption]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 6 (1907–8), p. 54.

This lecture delivered at a pediatric conference in Dresden shows by a series of experiments on fat metabolism that so-called soapy stools do not show a worse fat absorption than do normal stools. If the intestinal putrefaction is removed through diet or medicine, the stools become normal.

511 ——— "Physiologie und Pathologie des Fettstoffwechsels im Kindesalter" [Physiology and pathology of fat metabolism in childhood]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 3 (1909), pp. 139–185.

This article gives much of the latest research on the subject and a bibliography of 167 references.

512 ———: "Säuren und Basen im Urin kranker Säuglinge" [Acids and bases in the urine of sick infants]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 1 (1902–3), pp. 230–234.

The author discusses the possible meanings of his results obtained from changing the 1.6 per cent fat diet of a convalescent infant 3 months old by the addition of cream to a 5.45 per cent fat diet. In a table he gives details of the two diets and the resulting acids and bases in the urine. The addition of fat brought about an increase of phosphoric acid and a decrease of alkali in the urine, which caused an increase of ammonia. The acidosis produced by a fat diet is inorganic.

513 **Freund, Walther:** "Wasser und Salze in ihren Beziehungen zu den Körpergewichtsschwankungen der Säuglinge" [Water and salts as related to fluctuations of weight in infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 59 (1904), pp. 421–446.

The author determined the metabolism of nitrogen chlorin and phosphorus in the case of eight infants whose case histories are given in detail. Tables give the weight of the infants and the amounts of nitrogen, chlorin, and phosphorus in food, urine, and feces. Many phases of water retention and fluctuation in body weight are discussed, and nitrogen metabolism, chlorin retention, phosphorus metabolism, and behavior of alkalis are considered separately. The author concludes that changes in the water content of the body play the decisive rôle in the occasional wide variations of weight in infants.

514 ——— "Zur Kenntnis des Fett- und Kalkstoffwechsels im Säuglingsalter" [Study of fat and lime metabolism in infancy]. *Biochemische Zeitschrift* [Berlin], vol. 16 (1909), pp. 453–472.

To ascertain how much trouble fat absorption causes and how it is connected with saponification the author carried on experiments in the Children's Refuge at Breslau. He gives case history, fecal analyses, and various tables with results of investigations of six infants. Methods are carefully described.

515 ——— "Zur Wirkung der Fettdarreichung auf den Säuglingsstoffwechsel" [Effect of giving fat on infant metabolism]. *Jahrb. f. Kinderh.* [Berlin], vol. 61 (1905), pp. 36–50.

After discussing the effect of a fat diet on the system the author concludes that fat causes alkali to leave the body and thus apparently raises the proportion of acid. In this article he studies particularly how fat produces a greater excretion of phosphoric acid in the urine. In addition to preliminary research he describes in detail three experiments conducted on young infants in his Child Refuge. The fat was determined by Gerber's method, the feces boiled and put through Soxhlet's apparatus and the ammonia tested by Kruger-Reich's method. Tables show the chemical analysis of food intake and excretions. A diet of fat in cow's milk, human milk, or cod-liver oil produces a better absorption of phosphorus and decreases the excretion of it through the feces; it increases the excretion through the urine but not in proportion to the increased absorption.

516 **Fuhge, G.:** "Eine Stoffwechsel-Untersuchung an Kindern im Alter von 6–14 Jahren im dritten Kriegsjahre" [A metabolic study of children from 6 to 14 years during the third year of the war]. *Jahrb. f. Kinderh.* [Berlin], ser. 3, vol. 88 (1918), pp. 43–59.

Between June 4 and 10, 1917, author studied the metabolism of seven boys between 6 and 8 years of age and of four between 11 and 14, healthy but underweight. They had five meals a day, drank as much water as desired, and played outdoors several hours daily. Their caloric intake was 42 to 57 per kilogram, which was insufficient, largely through lack of fat. Many tables are given.

517 **Gamble, James L., and Samuel Goldschmidt:** "A study of creatinuria in infants. Relation of creatinuria to acidosis; the elimination of ingested creatine and creatinine." *Journal of Biological Chemistry* [Baltimore], vol. 40 (1919), pp. 199–213.

Studies were made of a small number of practically normal infants to determine the effect of ingested alkali and acid upon output of urinary creatine, and the effect of ingested creatine and creatinine upon urinary creatine and creatinine. It was found that variations in the acid-base intake had no effect on the creatinuria of infants; that the cases studied offered no satisfactory evidence that acidosis per se is a factor in the production of creatinuria; that small amounts of ingested creatine led to an increase of the creatinuria; and that there was evidence that the infant differs radically from the adult in his reaction toward ingested creatine. References.

518 ——— ——— "A study of creatinuria in infants. II. Relation of protein intake to urinary creatine." *Journal of Biological Chemistry* [Baltimore], vol. 40 (1919), pp. 215–225.

Observations were made of two practically normal infants as to the effect on creatine excretion of increasing the quantity of milk given, and of five infants, one normal, one undernourished, and three underweight, as to the effect on creatine excretion of varying the quantity of whey in the food. The data indicated that the creatine excretion of infants bears a relation to the quantity of cow's milk fed and that the quantity of whey given is more directly related to the degree of creatinuria than is the total protein value of the food. References.

519 **Ganghofner, and J. Langer:** "Über die Resorption genuiner Eiweisskörper im Magendarmkanal neugeborener Tiere und Säuglinge" [The absorption of protein in the alimentary canal of newborn animals and infants]. *Münchener Medicinische Wochenschrift*, vol. 51 (1904), pp. 1497–1502.

The authors wished to investigate whether or not the passage of homogeneous albumin from the infant intestine into the circulation can be proved by biological methods, and if so, to what age this permeability of the intesti-

nal wall persists. They describe many series of tests on animals. Studies with infants were more difficult, but were conducted with small quantities of albumin in the diet. The authors conclude that heterogeneous albumin given by mouth is in part absorbed in unchanged condition, at least during the first week of life and perhaps longer. It produces antibodies and is injurious.

520 **Gaus, Fr.:** "Über Nahrungsausnutzung des Neugeborenen" [Food utilization in the newborn]. *Jahrb. f. Kinderh.* [Berlin], vol. 55 (1902), pp. 129–156.

The author investigates food utilization during the first 10 days of life in 100 newborn infants, healthy and breast fed, in the Women's Clinic of Breslau University. Weight was taken in the morning before the first meal. After discussing the nutrition quotient, $\frac{\text{weight increase}}{\text{amount of food}}$, of other writers the author presents his own data and 10 tables, one of which gives weight of body and amount of food consumed and excretions, including perspiration, for the first 10 days of life. Gaus found the average nutrition quotient to be 10 per cent; the best, 27.36 per cent. Twelve of the 100 infants showed an energy quotient always under 100 calories and usually considerably under 70. The smallest amount of food accompanying physiological growth was 1,514 grams, with a nutrition quotient of 21.13 per cent. For the newborn, water values are significant in weight increases.

521 **Gephart, F. C.:** "Report of a dietary study of St. Paul's School, Concord, N. H." *Bost. M. & S. J.*, vol. 176 (1917), pp. 17–22.

This study, made in October, 1915, by a member of the Russell Sage Institute of Pathology, reports the average food value of the meals served at the school, which has an attendance of about 350 boys from approximately 14 to 18 years of age. The data were secured from records of the accounting department, which showed purchases and waste, supplemented by a study of the amount and chemical composition of the garbage, and various corrective factors. The authors found the calculated caloric value of the food for 24 hours approximately 5,000 calories per boy, and have no explanation for the high figure, about three times that of the estimated basal requirement.

522 **Gerhartz, Heinrich:** "Experimentelle Wachstumsstudien" [Experimental studies in growth]. *Pflüger's Archiv für die Gesammte Physiologie* [Bonn], vol. 135 (1910), pp. 104–170.

This paper is a technical discussion of experiments in growth with constant comparison of others' researches. It gives the results of the author's repeated studies made on puppies and their mothers, their weights, and the amount of food, natural or artificial, they consume; also chemical analyses of the organs after death. The author is especially interested in the energy requirements of growing creatures. He contends that by determining the surface area identity can be established between the maintenance requirements of the infant and the adult. Albumin in the human being, as also in the dog and the sheep, decreases with increasing age.

523 **Gerstenberger, H. J., H. O. Ruh, and others:** "A report of three years' clinical experience with the feeding of S. M. A. (synthetic milk adapted)." *Am. J. Dis. Child.* [Chicago], vol. 17 (1919), pp. 1–38.

Three hundred and eleven infants, regarded as practically normal, were fed with synthetic milk, of which the composition is given for periods of 6 to 60 weeks. The results, presented in tables, show that it is possible to obtain an excellent nutritional result, without the aid of butterfat in the food, if the substituting fat contains an adequate amount of fat-soluble growth factor and is similar to breast-milk fat in saponification number, iodine number, Reichert-Meissl number, and melting point.

524 **Gillett, Lucy H.:** A Survey of Evidence Regarding Food Allowances for Healthy Children. New York Association for Improving the Condition of the Poor Publication No. 115. New York, 1917. 34 pp.

A survey summarizing in convenient form the net results of modern research upon the energy expenditure or total food requirements of children of all ages and both sexes. Bibliography.

525 **Ginsburg, H., I. Tumpowsky, and A. J. Carlson:** "The onset of hunger in infants after feeding." *J. A. M. A.* [Chicago], vol. 64 (1915), pp. 1822–1823.

The authors made 55 observations on 30 normal infants, from 24 hours to 4 weeks old, by the balloon method. They found that the average time between nursing and the appearance of the period of hunger contractions was 2 hours 40 minutes; the maximum, 3 hours 30 minutes; and the minimum, 2 hours 20 minutes. References.

526 **Greenfield, Albert:** "Die Assimilationsgrenze für Zucker im Kindesalter" [Limit of sugar assimilation in childhood]. *Jahrb. f. Kinderh.* [Berlin], vol. 58 (1903), pp. 666–686.

To compare the assimilation of sugar by children with that of adults the author fed dextrose to 33 children from 1 month to 13 years old who were free from kidney disturbances, diabetes, fever, and diarrhea. Technique and results of experiments are described, and experiments by Finizio and Nobecourt

are discussed. The author concludes that the assimilation of sugar by childre is not affected by weight, or nutrition, or disease, but increases in direct propor tion with age up to 10 years, when it equals that of adults.

527 **Gross, Julius:** "Beobachtungen über Glycosurie im Säuglingsalter, nebst Versuchen über alimentäre Glycosurie" [Observations on glycosuria in infancy, with studies of alimentary glycosuria]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 34 (1892), pp. 83–106.

The author made 378 observations of the urine of 50 male breast-fed infant from 1 day to 4 weeks old, of whom 24 were healthy and well developed. He determined that glycosuria does not occur in normal infants; the specific gravity of their urine is 1,001 to 1,003. In pathological cases the specific gravity is 1,005 to 1,010; glycosuria is common. In further tests the author studied the assimilation limit of sugar. Having assured himself that the urine was free of sugar, he gave to the infants two or three hours after a meal 15 to 20 grams of lactose in a 60 to 80 cubic centimeter solution in two doses, and after another hour placed them at the breast. He found that healthy infants in the first month of life can assimilate 3.3 grams of sugar per kilogram of weight. The limit is much lower in pathological cases. In healthy children of 5 to 6 years the limit is 1.4 to 1.8 grams, and in healthy adults about 1.4 grams.

528 ——— "Untersuchungen bezüglich des Eiweissstoffwechsels des Neugeborenen und des Säuglings" [Investigations on metabolism of the newborn and the young infant]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 44 (1897), pp. 380–393.

The author conducted 26 metabolism experiments covering 24 hours each on 15 healthy boy infants from 5 to 19 days old. A table gives age, weight, and data on urine and feces. The daily amount of feces was usually 17.5 to 28 grams; of urine, 85 to 430 cubic centimeters. The specific gravity of the urine was 1,002 to 1,006. In 19 cases the nitrogen utilization was determined and is explained in three tables. The nitrogen quotient equals nitrogen content of urine divided by that of feces. It is larger when the digestion is good. The author carried through total metabolic tests of a healthy, bottle-fed infant on its fourteenth, twenty-second, twenty-seventh, and forty-first day of life. The nitrogen utilization was 83.17, 90.76, 86.5, and 90.51. He did the same with two healthy breast-fed infants, weighing them before and after nursing to obtain amounts of milk ingested. Taking Heubner's figures for albumin, 1.0 per cent for human milk, and dividing it by 6.7, according to Wroblewski, for the nitrogen he found the nitrogen utilization to be in these two cases 89.3 and 92.27. The author compares with his own results the nitrogen utilization as found by Camerer, Uffelmann, and Sauge.

529 **Grosser, Paul:** "Beitrag zur Bewertung des Albumingehaltes der Frauenmilch" [Contribution to the valuation of albumin in human milk]. *Jahrb. f. Kinderh.* [Berlin], vol. 73 (1911), pp. 101–107.

The author believes he has proved by the following experiments that the value of human milk lies in its whey elements. He first became convinced from tests on kids that the growing organism can form glycocoll from proteid free from glycocoll. Then he experimented on four infants, three premature and one underweight, by feeding them first a mixture of human milk, freed of its protein by the use of iron hydroxid, and cow's milk, on which all thrived. Then he changed to cow's milk alone, on which three thrived and one did not. Results are shown in three graphs.

530 ——— "Untersuchungen über den Eiweissstoffwechsel beim Kinde" [Investigations on protein metabolism in the child]. *Biochemische Zeitschrift* [Berlin], vol. 24 (1910), pp. 346–353.

Interested in the question raised by Abderhalden, whether or not nitrogen exchange is to be identified with protein exchange, Grosser undertook two prolonged experiments on the effect of water on nitrogen exchange in childhood. One child was a healthy-looking infant of 7 months with slight rachitis; the other a boy of 4 years, very healthy, except for alkapton-uria. Two long tables of results give in each case time of experiment, weight of child, intake of nitrogen, excretion of urine and feces, retention, intake of water, and calories in the nutrition. The author agrees with Falta that the elimination of the protein molecule is not complete within 24 hours. He also concludes that in childhood the nitrogen metabolism is not to be influenced by water and that we are justified in identifying nitrogen metabolism with protein metabolism.

531 **Grulee, C. J., and B. E. Bonar:** "Precipitins to egg white in the urine of new-born infants." *Am. J. Dis. Child.* [Chicago], vol. 21 (1921), pp. 89–95.

An investigation to determine the permeability of the intestinal tract of the newborn infant to egg albumin. Specimens of urine, 136 in all, from 23 infants who were given 2 per cent solution of egg white instead of plain water between nursings, were tested for precipitin reactions, by means of an anti egg-white rabbit serum of a titer of at least 50,000. The first positive reactions were found in the urine obtained on the fourth day of life; no reactions were obtained after the eleventh day, but the small number of tests made this result inconclusive. The authors conclude that the intestinal wall of the newborn infant, from the fourth to the tenth day, inclusive, is permeable to small quantities of egg white.

532 **Gundobin, N.:** "Die Albuminurie der Neugeborenen" [The albuminuria of the newborn]. *Arch. f. Kinderh*, [Stuttgart], vol. 46 (1907), pp. 267–275.

As the author discusses various phases of albuminuria in newborn infants, he refers constantly to the work of other investigators, commenting on the fact that French scholars consider the albuminuria pathological and German scholars consider it physiological. He cites in particular Sesenewsky's tests of the urine obtained by catheter from 50 newborn girl babies during each of the first 6 days of life, and presents findings in a table. By the fifth day albumin was discovered in only three cases, mucin in 38 cases. Such factors as length of the birth act, temperature, loss of weight, infarct, etc., are considered. The author concludes that albuminuria in the newborn is not a normal phenomenon; that usually only traces are found that soon disappear; to find causes one can not begin with birth but must go back to fetal life.

533 **György, P.:** Über den Einfluss der Ernährung auf die Säureausscheidung durch den Urin im Säuglingsalter" [Effect of nutrition on acid elimination through urine in infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 99 (1922), pp. 109–146.

Tables show weight, diet, amount of urine, nitrogen, ammonia, hydrogen-ion concentration, ammonia coefficient, and primary and secondary phosphates, in repeated experimentation upon six infants varying in age from 2 to 5½ months. The diets consisted of milk of varied strength and butter-flour foods. Former tests proved that in the breast-fed child acid is low and ammonia is high, and in the bottle-fed child acid is high and ammonia is low. These tests prove that the effect of concentrated food is to increase acid elimination in urine. Total phosphate elimination often increases simultaneously with increase in acid elimination. Total nitrogen elimination also reaches relatively high values, whereas ammonia elimination remains the same or decreases. Increased acid elimination due to concentrated nourishment is not pathological; it is caused by lack of water and concentrated action of the kidneys and not by injury in intermediary-cell metabolism.

534 **Haehner, H.:** "Weitere Beobachtungen über die Nahrungsaufnahme des Kindes an der Mutterbrust und das Wachsthum im ersten Lebensjahre" [Further observations on food intake of the child at the breast and its growth in the first year of life]. *Jahrb. f. Kinderh.* [Leipzig], vol. 21 (1884), pp. 289–317.

Following the same procedure as with his first child, described in volume 15 of the same journal, the author describes the growth of two other children, a son born January 27, 1880, weighing 2,950 grams, and a daughter born prematurely February 13, 1882, weighing 1,620 grams. The first child was nursed 11 weeks, the second 22 weeks. Most of the tables of amounts of meals and of weights extend up to the twenty-second week. Some of these cover many pages. Both infants took comparatively little milk during the first weeks. Their development is contrasted with that of other infants discussed in medical literature.

535 **Hahn, H., and E. Moro:** "Über den Einfluss der Molke auf das Darmepithel" [Effect of whey on intestinal epithelium]. *Jahrb. f. Kinderh.* [Berlin], vol. 79 (1914), pp. 664–673.

Besides animals the authors tested seven infants and two older children for effect of whey on intestinal epithelium. With premature and newborn children the human whey showed a distinctly more favorable effect, but with older children and artificially nourished infants oxidation values in cow, goat, and human whey were about equally great.

536 **Hamburger, F.:** "Über Eiweissresorption beim Säugling" [Protein absorption in the infant]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 23–24 (1906–7), pp. 103–110.

The question whether protein is or is not absorbed unchanged by the infant is here discussed theoretically. The author's experiments on healthy infants are barely referred to. He treats of the precipitin and antitoxin methods for studying the problem and mentions the latest investigations of other scholars. He is especially interested in what protein bodies are absorbed, how great is the amount, and how long after birth absorption continues. He concludes that the newborn infant on breast milk does absorb unchanged protein from its food, but in small quantity; such absorption seems to cease about the fourth week. The protein of cow's milk may be absorbed by the very young infant, but there is no proof as yet of this.

537 ——— **and B. Sperk:** "Biologische Untersuchungen über Eiweissresorption vom Darm aus" [Biological investigations on absorption of protein in the intestine]. *Wiener Klinische Wochenscrift* [Vienna], vol. 17 (1904), pp. 641–644.

The author discusses absorption of homologous and heterologous protein in the intestine. He discusses his own studies and those of others on adult human beings and animals and describes four tests on infants from 5 days to 13 weeks old, who were given 1 cubic centimeter of calf serum to drink. No transition of unchanged calf albumin into the blood could be ascertained, yet calf serum injected subcutaneously could be distinctly detected. "Evidently

in the case of food all heterologous albumin is completely altered in the alimentary canal, so that it is not absorbed as such; and unaltered heterologous albumin, once in the blood stream, can only after days be assimilated by the organism."

538 **Hammatt, F. S., and Lyle G. McNeile:** "Concerning the effect of ingested placenta on the growth-promoting properties of human milk." *Science* [New York], new ser. vol. 46 (1917), pp. 345–346.

The author gives a table of the weights (for the first 11 days of life) of eight infants nursed by mothers not receiving desiccated placenta and a similar table for infants nursed by mothers being fed desiccated placenta. From these data he assumes the presence of a growth-promoting factor in placenta which passes into the milk. He suggests that the placenta may have an inherent influence on growth aside from its function of transmitting nourishment.

539 **Hasse, Sophie:** "Untersuchungen über die Ernährung von Kindern im Alter von 2 bis 11 Jahren" [Investigations on the nutrition of children from 2 to 11 years of age]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 18 (1882), pp. 553–611.

A detailed study of the food consumed over a period of several days by six healthy girls of well-to-do Russian families who were allowed to eat what they chose. The rations were weighed and analyzed. Numerous tables give data on height, weight, and chest girth. Comparisons are made as to the proportion of the different food constituents, with the findings of Camerer, Uffelman, and others. Weight was found to play a more important part than age in determining the amount of food consumed.

540 **Hauser, O.:** "Die neueren Arbeiten über den Stoffwechsel beim Kinde, speziell biem Säugling" [Recent work on the metabolism of the child, especially the infant]. *Zeitschrift für Diätetische und Physikalische Therapie* [Leipzig], vol. 3 (1899–1900), pp. 233–242.

A critical review of noteworthy work on the metabolism of infants and children. The authors whose writings are examined are Camerer, Lange, and Berend, Zuntz, Bendix, Herbst, Gross, Freund, Keller, Heubner, and Rubner, and the summaries of their treatises are accompanied by constructive criticism.

541 ——— "Eine neue Methode der Säuglingsernährung" [A new method of infant feeding]. *Berliner Klinische Wochenschrift*, vol. 30 (1893), pp. 796–800.

Observations of weight increases, etc., covering many months are given for 39 infants from a few weeks to 1½ years old, fed successfully with albumose milk.

542 **Haven, H. C.:** "A study of infant feeding." *Arch. Pediat.* [Philadelphia], vol. 3 (1886), pp. 530–550.

The author observed and tabulated the results of 19 different kinds of feeding on several hundred children at a public nursery, the observations extending over periods of three to seven days. Increase in weight was used as the test of the value of the food. The number of observations was felt to be too small to serve as a basis for conclusions but perhaps valuable as a starting point for further investigations.

543 **Hecht, Adolf F.:** "Über das Verhalten der eiweiss- und fettspaltenden Fermente im Säuglingsalter" [Action of proteolytic and steatolytic ferments in early infancy]. *Wiener Klinische Wochenschrift*, vol. 21 (1908), pp. 1550–1552.

The author, by Stade's method, has tested the steapsin, and by Eduard Miller's method, the trypsin in the feces of young infants in the Schanta Clinic (14), in the Anna Hospital for Children (5), and in the Children's Clinic of the University of Vienna (2). In the first days of life, after the meconium has ceased, both trypsin and steapsin are found in the stools. The amount is independent of the state of health. Digestive disturbances seem not to be caused by deficient secretion of trypsin or steapsin.

544 ——— "Untersuchungen über Fettresorption auf Grund der chemischen Zusammensetzung der Fette" [Experiments in fat absorption on the basis of the chemical composition of fats]. *Jahrb. f. Kinderh.* [Berlin], vol. 62 (1905), pp. 613–659.

After a survey of existing literature on the chemical analysis of human fat the author describes his methods of testing the feces and their results in many cases of healthy and sick breast-fed and artificially nourished infants. He gives the iodine number, the melting point, and Geitel's test in tables on human-milk fat, cow's milk fat, and the fat contained in the feces. In human milk there is no parallel between the iodine number and the melting point. In the first week of life, after the meconium, the stools of breast-fed infants show a high amount of oleic acid—iodine number up to 48 per cent, melting point below 40 per cent. But after the first week the fat is like that of older infants. A normal stool of a normal breast-fed infant 2 months old has iodine number 20 per cent, melting point 47 to 48 per cent. Many fat-dyspeptic but healthy breast-fed infants had iodine number 31 to 41 per cent, and melting point 40 to 44 per cent. The article contains seven curves and many tables.

545 **Helbich, H.:** "Die Bedeutung der Kohlehydrate bei fettreicher Ernährung" [Significance of carbohydrates with a diet rich in fat]. *Monatschr. f. Kinderh.* Originalien [Leipzig and Vienna], vol. 9 (1910–11), pp. 351–366.

In connection with a discussion of infant diet the author presents 10 curves for infants to show the relation of methods of feeding to weight increases.

546 ——— "Die Bedeutung der Molkenreduction für die Ernährung junger Säuglinge" [The importance of removing part of the whey from milk-fed young infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 71 (1910), pp. 655–669.

To determine the effect of whey upon infants the author experimented in feeding the same children two diets, one rich and one poor in whey. During the period January to July, 1909, in the orphanage of Frederick the Great at Rummelsburg, the author tested 23 children, mostly from 3 to 4 months old, on cow's milk containing 5 per cent of its natural sugar, all of its fat, two-fifths of its albumin, and two-fifths of its whey, and as comparative diet, the same with all of the whey. In another series of experiments on nine young infants he used a milk containing all of its fat, sugar, casein, and two-fifths of the whey and as alternative the same with all of the whey. Whereas the infants thrived on the diet with only two-fifths whey, they suffered from dyspepsia, loss of weight, general indisposition, and sometimes severe intestinal disturbances on the diet containing all whey.

547 **Heller, Fritz:** "Eine vergleichende Untersuchung des Stoffwechsels bei einem Zwillingspaar" [A comparative investigation of the metabolism of twins]. *Ztschr. f. Kinderh.* [Berlin], vol. 18 (1918), pp. 159–166.

The author gives in nine tables the results of a metabolism experiment upon newborn twins, a boy and a girl, born in the eighth month, both well developed, weighing 2,220 and 2,210 grams, respectively. Their progress is compared with that of other infants. The twins presented marked differences in physical development.

548 **Helmreich, E.:** "Die Besonderheit des kindlichen Kraftwechsels" [The peculiarities of transformation of energy in the child]. *Klinische Wochenschrift* [Berlin and Munich], vol. 4 (1925), pp. 540–542.

The author studied 14 children 3 to 16 years old for the purpose of determining the energy expenditure caused by the same amount of muscular activity in very young children and in adolescents. He found that after the same amount of muscular work the metabolism rises only 20 to 25 per cent in the cases of children 3 years old and weighing 14 kilograms and 80 to 100 per cent in the cases of children 16 years old and weighing 61 kilograms.

549 **Hepner, Gertrud:** "Über den Ernährungszustand der Schulanfänger im Kriegsjahre 1915" [Nutrition of children beginning school in 1915]. *Zeitschrift für Schulgesundheitspflege* [Leipzig], vol. 28 (1915), pp. 545–550.

The author reports on the weight, height, and nutrition of 250 boys and 250 girls in Mannheim schools for the three years, 1911, 1914, 1915. Nutrition was determined by the appearance of the ribs. Most of the examinations were made by the author. Girls were taller, heavier, and in better state of nutrition in 1914 and 1915 than in 1911. Boys in 1915 had the same height as boys in 1911, but weighed less and were in a worse state of nutrition. This the author ascribes to their greater activity in the absence of their fathers.

550 **Herbst, Oskar:** "Beiträge zur Kenntnis normaler Nahrungsmengen bei Kindern" [Contributions to the knowledge of the normal food requirements of children]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 46 (1897–98), pp. 245–262.

This article contains many tables of the amounts of food eaten by six healthy children of good families (three boys and three girls) from 2¼ to 14½ years old. In one case the experiment lasted 7 days; in the other cases, 10 days. The experiments belong to the year 1897, in Munich, Berlin, and Altenburg. All food consumed was weighed and analyzed as to protein, fat, and carbohydrates, and calories were calculated. The resulting figures are arranged in various combinations and compared with those obtained by other authors.

551 ——— "Beiträge zur Physiologie des Stoffwechsels im Knabenalter mit besonderer Berücksichtigung einiger Mineralstoffe" [Contributions to the physiology of metabolism in boyhood with special attention to certain minerals]. *Jahrb. f. Kinderh.* [Berlin], vol. 76 (1912), pp. 40–130.

The technical and detailed discussion describes carefully six-day metabolism tests conducted on four strong boys from 6 to 14 years old and two subnormal boys of 11 and 14 years to determine the nitrogen and fat, and particularly the important minerals in food, feces, and urine. A description is given of the boys' habits of life, their mixed nourishment, the analyses made, etc. There are 41 tables and a bibliography.

552 **Herbst, Oskar:** "Bemerkung zu dem Aufsatze von P. Riebesell Über die Wachstums- und Ernährungsgesetze des Menschen" [Remarks on P. Riebesell's article "Laws of the growth and nutrition of mankind"]. *Berliner Klinische Wochenschrift*, vol. 54 (1917), p. 175.

The author declares that the weight and nutritional requirement determined from age by mathematical formulas by Riebesell can not be accepted in practice; Riebesell calculates for too much protein for children.

553 ——— "Calcium and Phosphor beim Wachstum am Ende der Kinderheit" [Calcium and phosphorus in growth at the end of childhood]. *Ztschr. f. Kinderh.* [Berlin], vol. 7 (1913), pp. 161–192.

The author studies the part played by calcium and phosphorus in the growth of two boys in the Orphanage of Frederick the Great at Berlin, one being 14 years and 3 months and the other 13 years and 10 months. The boys were taken on long tramps on each of six days and given moderate exercise on the other six days of observations. The analyses of the food, of the urine and feces, of the perspiration (determined from shirts and hose), and the nitrogen retention are shown in tables. The boy in the sudden and pronounced growth of puberty showed a calcium-oxide retention daily of 0.4543 gram; the other boy, of much more gradual growth, showed a calcium-oxide retention of 0.2172 gram daily. The lime retention was slighter in the rest period than in the tramping period and was independent of intake. Somewhat more phosphorus pentoxide remains in the body, it seemed, than could be attributed to protein and lime combinations.

554 **Hess, Alfred F., and M. A. Lundagen:** "A seasonal tide of blood phosphate in infants." *J. A. M. A.* [Chicago], vol. 79 (1922), pp. 2210–2212.

The infants tested were from 6 to 18 months of age, living under excellent hygienic conditions, and were on a diet of certified raw milk or of dried milk, as well as the usual amount of orange juice, the older ones receiving cereal in addition. In the summer of 1921 the phosphate content of the blood was 4.34 milligrams per cent; in December it had fallen to 3.92 milligrams per cent. Monthly examinations, some 300 in all, "comprising about 60 infants," demonstrated a steady decrease of the inorganic phosphate, the lowest ebb being in March. At 3.75 milligrams heliotherapy was instituted. In April the tide began to rise, ascending markedly in May, and becoming almost normal in June. In somewhat older children the variations were found to be less marked.

555 ——— **G. C. Supplee, and B. Bellis:** "Copper as a constituent in woman's and cow's milk. Its absorption and excretion by the infant." *Journal of Biological Chemistry* [Baltimore], vol. 57 (1923), pp. 725–729.

Having analyzed cow's milk and human milk and found copper present in both, the authors made similar analyses of the urine of infants to learn whether copper is absorbed from the alimentary tract or must be regarded as an extraneous substance. All but two of the infants studied were 6 to 12 months of age; two were under 6 months. Urine was also collected from a group of children 2 to 3 years of age receiving a general diet of milk, vegetables, meat, etc. In all cases copper was present in small amounts. Bibliography.

556 **Hess, J. H.:** "A study of the caloric needs of premature infants." *Am. J. Dis. Child.* [Chicago], vol. 2 (1911), pp. 302–314.

A record of 17 cases selected because they presented different phases of underfeeding and overfeeding as estimated by the caloric standard of Budin, Meyer, and others. All were observed in the hospital, while being fed human milk exclusively, according to scale and not caloric intake. Individual weight and food curves, and curves of calories per pound of weight are reproduced. The author concludes that estimates of Budin and others do not hold for premature infants, but that the energy quotient varies inversely with age and birth weights. Tables are given.

557 **Hess, Rudolph:** "Über Frauenmilchernährung an der Brust und aus der Flasche" [Nourishment on human milk from the breast and from the bottle]. *Ztschr. f. Kinderh.* [Berlin], vol. 19 (1919), pp. 1–17.

To determine differences between breast and bottle feeding the author studied female twins, very similar in development, who were given breast milk from the breast and from a bottle. Both breasts of the nurse were used. Born in April, 1917, the infants were studied from July to November. Tables give amounts consumed and weights. In 34 days the breast-fed child gained 430 grams, its twin only 280; the child previously bottle fed gained 60 grams in 10 days when fed at the breast, and her twin, now fed on the bottle, lost 10 grams. When these infants and a few others were examined by Röntgen rays a number of differences due to sucking from the bottle instead of breast were noted, chief of which was a large air bubble in the stomach of the bottle-fed infant. The time in which the stomach was emptied is also discussed.

558 **Heubner, Otto:** "Betrachtungen über Stoff- und Kraftwechsel des Säuglings bei verschiedenen Ernährungsmethoden" [Observations on the metabolism and energy exchange of the infant on various diets]. *Berliner Klinische Wochenschrift* [Berlin], vol. 36 (1899), pp. 1–5.

The author gives the details of metabolic and caloric tests upon three infants, a breast-fed child of 9 weeks, a healthy bottle-fed infant of 7 months, and an atrophic infant of 3½ months. The first child consumed 73 calories per kilo-

gram of weight and remained well; the second child consumed 96 per kilogram and increased in weight; the third child consumed 126 calories per kilogram and did not increase in weight satisfactorily. The author discusses metabolism at some length, especially utilization of protein and retention of water.

559 **Heubner, Otto:** "Die Energiebilanz des Säuglings" [The energy balance of the infant]. *Zeitschrift für Diätetische und Physikalische Therapie* [Leipzig], vol. 5 (1901–2), pp. 13–35.

A study of the energy balance of infants whose nutrition has been investigated for long periods by Finkelstein, Camerer-Soldner, Feer, Schlossmann, Rubner, and others. The four quarters of the first year are considered. An infant may subsist on a maintenance diet even for months, and the margin for growth is usually only one-ninth of the caloric intake. Premature infants require relatively more calories than infants born at term. For satisfactory growth the breast-fed child requires at least 100 calories and the artificially-fed child at least 120. Four tables and five curves are included.

560 ——— "Ein weiterer Beitrag zur Kenntnis der Energiebilanz beim Säugling" [A further contribution to the knowledge of the energy balance of the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 61 (1905), pp. 429–437.

A study made with a healthy boy of 5½ months. Tables give intake of food and output in excretions, changes of weight, output of carbon dioxide and water, etc.

561 ——— "Ein weiterer Beitrag zur Kenntnis der Energiebilanz beim Säugling" [A further contribution to the knowledge of the energy balance of the infant]. *Verhandlungen der Gesellschaft für Kinderheilkunde*, 1904–5 [Weisbaden], vols. 21–22 (1905–6), pp. 13–21.

Results are given of metabolism tests carried out with 6½-months-old boy on a fasting diet and on a rich diet. Weight, length, chest, and abdominal measurements are given.

562 ——— "Über die Ausnützung des Mehls im Darm junger Säuglinge" [The assimilation of flour in the intestine of young infants]. *Berliner Klinische Wochenschrift*, vol. 32 (1895), pp. 201–204.

The author and Carstens tested the assimilation of flour in infants put on this diet for therapeutic purposes. The intake was carefully determined and the feces examined by Allihn's method. The feces never contained sugar. All four children tested—ages being 14 weeks in two instances, 7 weeks and 1 year in the others—digested the starch excellently; one very sick child died and the intestines were dissected. The author deprecates the use of flour for infants, since it is deficient in proteid, fat, and calories; but he has cured many infants of intestinal disturbances by giving them flour 8 or 10 days and avoiding overfeeding. Rice and oat flour are better than wheat flour and the simple grains better than preparations.

563 ——— "Über die Stoff- und Kraftbilanz eines jungen Brustkindes" [Food and energy balance of the young breast-fed child]. *Allgemeine Wiener Medizinische Zeitung*, vol. 42 (1897), p. 549.

A study of the metabolism of a breast-fed infant 10 weeks old and 5 kilograms in weight. Food exchange was investigated nine days and respiratory exchange six days. The child received 613 grams of milk daily, 70 calories per kilogram of weight. Its weight remained at a standstill. Physiological utilization was 91.6 per cent. Insensible perspiration was great. More carbon was eliminated than taken in. Protein was utilized by the system even at cost of its fat.

564 ——— and **W. Heubner:** "Zur Lehre von der energetischen Bestimmung des Nahrungsbedarfes beim Säugling" [The theory of energy determination in the nutritional requirement of the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 72 (1910), pp. 121–148.

The authors describe the nourishment of a thoroughly healthy child born June 4, 1909, with a weight of 3.16 kilograms. She received only mother's milk for 30 days and then mixed feeding. The number of meals was six to the fifty-sixth day and then five. Tables give the amounts of milk drunk and the body weight from the first to the one hundred and fifty-second day. Chemical analyses were made of the mother's milk, with determination of the caloric value and also of the artificial food. Five graphs represent the mean growth quotient and energy quotient of the infant of the study and four other infants. The authors believe that 100 as the energy quotient of a breast-fed infant is scarcely high enough.

565 **Hillebrand, Franz:** "Untersuchungen über die Milchzufuhr und über die Jodkaliumausscheidung des Säuglings" [Investigation into the intake of milk and elimination of iodide of potassium in the infant]. *Archiv für Gynäkologie* [Berlin], vol. 25 (1884–85), pp. 453–481.

In the obstetrical clinic at Bonn the author studied 25 newborn girls, of whom 16 were absolutely normal, during their first 10 days of life. He gives case histories of the normal infants, nine of whom were first born, and tables of weights and food intake. Perspiration was not determined. Results obtained by other students are discussed and shown in comparative tables. The

author concludes that first-born infants are 1½ days behind others in weight and appetite. He injected a 7.5 : 100 solution of iodide of potassium after birth and after one or two days, and found from the urine, which he obtained by catheter, that the length of the second elimination was shorter and less subject to variation than the first.

566 **Hillenberg: "Betrachtungen über den Einfluss der natürlichen und künstlichen Ernährung auf die körperliche Entwicklung der Säuglinge im Stadt- und Landkreis Zeitz"** [Considerations of the effect of natural and artificial feeding on the physical development of infants in the urban and rural district of Zeitz]. *Zeitschrift für Säuglingsfürsorge* [Leipzig], vol. 6 (1912), pp. 157–169.

A study made by the author of 616 infants in the city of Zeitz and 1,000 in the rural district around that city to compare the effects of breast feeding and artificial feeding. Eighty-three per cent of the city children and 79 per cent of the country children were fed at the breast for varying periods of time. The breast-fed children were heavier than the others, and a smaller percentage had rickets. Of the breast-fed infants 23 per cent in the city and 12.7 per cent in tthe rural district had rickets; for the artificially-fed infants the percentages were 38 and 33.8 per cent, respectively. The author does not draw any general conclusions.

567 **von Hoesslin, H.: "Über die Ursache der scheinbaren Abhängigkeit des Umsatzes von der Grösse der Körperoberfläche"** [Cause of apparent dependence of metabolism on extent of body surface]. *Archiv für Anatomie und Physiologie (Physiologische Abtheilung)* [Leipzig], 1888, pp. 323–379.

This technical article discusses the theory that the calories formed in the body equal the product of a constant by the cube root of the square of the body weight. After much space given to statistics of animals and to mathematical calculation the author determines the constant for infants, using the data of Ahlfeld, Hähner, Rubner, Camerer, Forster, Bouchut, Bouchaud, Bartsch, Kruger, Hasse, and Uffelmann.

568 **Hoffmann, Eva: "Fermentuntersuchungen und Fettresorption beim Säugling"** [Investigation of the ferments and the fat absorption of the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 72 (1910), pp. 280–284.

The author describes her studies on infants in the Hilda Hospital for Children. The studies with the Löffler serum plate for trypsin were not very satisfactory, nor were those with wax plates for the lipolytic ferment, but she obtained very useful results with Müller's starch-paste plate for the amylolytic ferment. This last she found in the stool of a healthy breast-fed child of only 3 weeks. She came to the conclusion that subnormal functioning of the pancreas is a factor in disturbances of nutrition.

569 **Hofmeier, M.: "Beitrag zur Lehre vom Stoffwechsel des Neugeborenen und seine Beeinflussung durch die Narcose der Kreissenden"** [Contribution to the theory of metabolism of the newborn and its susceptibility to narcosis of mother in labor]. *Virchow's Archiv* [Berlin], vol. 89 (1882), pp. 493–536.

The author studied urination, etc., during the first 10 days in 56 newborn infants, of whose mothers 22 were given chloroform during the birth. In determining urea alone he made 257 ests. After a long discussion he recapitulates as follows: Urine at first light in color becomes deep and later light again; the specific gravity rapidly rises till third day, then sinks. Likewise urea increases greatly during the first four days and then decreases; so do uric-acid content and albumin. Tables give amounts of urine voided. The section on loss of weight is interesting in that one cause of loss given is effort of infant organism to maintain heat level.

570 **Hohlfeld, Martin: "Über rohe Milch als Säuglingsnahrung"** [Raw milk as infant food]. *Jahrb. f. Kinderh.* [Berlin], vol. 62 (1905), pp. 22–34.

The author believes in the superiority of raw over boiled cow's milk as infant food from his experience with eight infants, including parallel tests on two infants. The article contains four graphs as well as detailed case histories.

571 **Holt, L. E., A. M. Courtney, and H. L. Fales: "A study of the fat metabolism of infants and young children. I. Fat in the stools of breast-fed infants."** *Am. J. Dis. Child.* [Chicago], vol. 17 (1919), pp. 241–250.

The first of a series of studies of fat metabolism of infants by analysis of the stools (method of analysis described in Am. J. Dis. Child., vol. 17, 1919, p. 38). This paper reports the result of examination of 48 collections of feces from 34 breast-fed infants from 10 days to 10 months of age, 30 of whom were well nourished and, with few exceptions, gaining normally. The remaining 4 were ill. The authors found that the fat in the stools of normal, breast-fed infants was from 34.5 to 50 per cent of the dried weight; that the average stool showed a soap fat of 43.1 per cent of the total fat, neutral fat, 20.2 per cent; that there was no constant relation between percentage of fat in mother's milk and percentage of total fat and its distribution in the stool; that the range of absorption was from 90.3 to 99.2 per cent of the total intake.

572 **Holt, L. E., A. M. Courtney, and H. L. Fales:** "Fat metabolism of infants and young children. II. Fat in the stools of infants fed on modifications of cow's milk." *Am. J. Dis. Child.* [Chicago], vol. 17 (1919), pp. 423–439.

The results are reported on an analysis of 128 stools of 77 infants, aged 2 to 18 months, at the Babies' Hospital of New York. The average percentage of fat in the feces, and of soap, neutral fat, and free fatty acid in the total fat excreted are given. The percentage of fat retained after ingestion was also estimated. There was no striking relation between fat intake and the percentage of the fat retention except when the intake was very low.

573 ——— ——— ——— "Fat metabolism of infants and young children. III. Fat in the stools of children on a mixed diet." *Am. J. Dis. Child.* [Chicago], vol. 18 (1919), pp. 107–126.

About 100 analyses of feces for fat were made on 47 normal children 1 to 10 years of age. The results are compared with similar analyses on sick children. The fat percentage of the dried weight of feces, the percentage of soap, free fatty acid, and neutral fat were estimated and percentage of fat retention with a known diet. The fat retention averaged 94 per cent.

574 ——— ——— ——— "Fat metabolism of infants and young children. IV. The digestion of some vegetable fats by children on a mixed diet." *Am. J. Dis. Child.* [Chicago], vol. 18 (1919), pp. 157–172.

Results of 44 observations on 14 children between 1 and 5 years old receiving varying proportions of their fat intake in nut butter or corn oil, and of 9 children observed over a long period and reported individually who received vegetable fat in place of milk fat in varying proportions in a mixed diet. The authors conclude that corn oil and nut butter are valuable foods for children but should not entirely replace milk fat.

575 ——— ——— ——— "Calcium metabolism of infants and young children and the relation of calcium to fat excretion in the stools. I. Infants taking modifications of cow's milk." *Am. J. Dis. Child.* [Chicago], vol. 19 (1920), pp. 97–113.

An analysis of infants' stools was made to determine the relation of the calcium intake to the calcium excreted, the effect of fat on calcium absorption and excretion, the effect of cod-liver oil and vegetable fats on calcium metabolism in normal and sick children. The results of the analyses are tabulated. The excretion and absorption of calcium were found to be generally dependent on the calcium intake, 35 to 55 per cent of the calcium intake being absorbed. The best absorption of the calcium occurred when the fat intake was ample. Only a small part of the calcium excreted was bound in soaps. Calcium absorption was low when diarrhea and rachitis were present. Both cod-liver oil and recovery from rickets increased the calcium absorption.

576 ——— ——— ——— "Calcium metabolism of infants and young children and the relation of calcium to fat excretion in the stools. II. Children taking a mixed diet." *Am. J. Dis. Child.* [Chicago], vol. 19 (1920), pp. 201–222.

Children on a mixed diet absorb less calcium per kilogram than infants taking modifications of cow's milk. "The best absorption of calcium oxide occurred when the intake of fat exceeded 3 grams per kilogram," and at the same time there was in the diet 0.03 to 0.05 gram of calcium oxide for every gram of fat. There was no relation between calcium absorption and age of child, irrespective of weight. Other observations corresponded to the findings for infants on formulas of cow's milk.

577 ——— ——— ——— "Is the amount of calcium usually given in dilutions of cow's milk injurious to infants?" *Am. J. Dis. Child.* [Chicago], vol. 16 (1918), pp. 52–56.

A reply to the article, "Calcium in its relation to the absorption of fatty acids," by Bosworth, Bowditch, and Giblin (see No. 427 of this section). The authors give the results of various studies made at the Babies' Hospital, New York, showing, as they believe, that a high calcium intake does not necessarily cause a large fat loss in the feces, while a great reduction of the calcium in the food of infants may be attended with considerable risk.

578 ——— **and H. L. Fales:** "Calcium absorption in children on a diet low in fat." *Am. J. Dis. Child.* [Chicago], vol. 25 (1923), pp. 247–256.

In an attempt to establish definitely the relation of fat intake to calcium absorption the authors carried out a series of metabolism experiments on seven healthy children between 2 and 6 years of age. The calcium metabolism was determined while they were taking a modification of the usual house diet of the hospital. Thereafter the fat was eliminated from the diet as far as practicable, total calories, protein intake, and calcium intake being kept at about the previous figure; and after a week or more the calcium metabolism was again determined. Individual case histories and tables are given. The results indicated that a diet low in fat greatly diminishes calcium-oxide absorption.

579 **Holt, L. E. and H. L. Fales:** "The food requirements of children. I. Total caloric requirements." *Am. J. Dis. Child.* [Chicago], vol. 21 (1921), pp. 1–28. See also *Transactions of the American Pediatric Society*, vol. 32 (1920), pp. 21–51.

The original observations reported in this article were based on dietary records from over 100 selected children of both sexes from 1 to 16 years of age, healthy, well cared for, and normal as to digestion. The records included a report of the net weight, height, activity, appetite, and general condition, with the exact amounts of the food taken by the child for four consecutive days. From these the caloric value of the average daily diet was calculated, as well as the distribution of the calories as fat, carbohydrate, and protein.

580 ——— ——— "The food requirements of children. II. Protein requirements." *Transactions of the American Pediatric Society*, vol. 33 (1921), pp. 140–151.

The authors first discuss the importance of the amino acids in the protein and compare animal and vegetable proteins. A higher protein requirement is to be expected in children to suffice for maintenance and growth. A nursing child's daily average protein intake is 1.5 grams per kilogram. The adequacy of this low intake is explained by the character of the proteins in mother's milk—twice the amount of protein is needed when cow's milk is used for infants. Observations of 100 healthy children on a mixed diet showed the protein intake to be 44 grams daily in the second year to 130 grams daily in the fifteenth year, or 4 grams per kilogram of body weight at 1 year and 2.6 grams per kilogram from the sixth year to the end of growth. Two-thirds of the protein was of animal and one-third of vegetable origin.

581 ——— ——— "The food requirements of children. III. Fat requirement." *Am. J. Dis. Child.* [Chicago], vol. 23 (1922), pp. 471–480.

A general discussion of the value of fat to the body. Its relation to caloric intake, vitamins, calcium metabolism, and protein intake is considered. A child under 1 year takes approximately 4 grams of fat daily per kilogram of body weight. This amount is gradually decreased until 3 grams per kilogram are taken at 6 years, and this ratio is maintained through the growth period. Charts of more than 100 older children's fat intake are the basis for the statement of fat intake for children older than 1 year.

582 ——— ——— "The food requirements of children. IV. Carbohydrate requirement." *Am J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 44–55.

A general discussion of the metabolism of carbohydrates, their physiological and commercial economy. In studying the diets of 100 healthy children 1 to 18 years of age the carbohydrate intake was found to average 10 grams per kilogram of body weight. Of this, 51 per cent was sugar and 49 per cent starch.

583 ——— ——— "The food requirements of children. V. Percentage distribution of calories." *Am. J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 311–319.

A continuation of the analyses of the diets of 100 healthy children 1 to 18 years of age living in private families. The expected and actual caloric intakes agreed closely. The average distribution was protein 15 per cent, carbohydrates 51 per cent, and fat 34 per cent. This may be considered a balanced ration.

584 ——— **P. A. Levene, Alan Brown, Martha Wollstun, Angelia M. Courtney, and Jessie A. Moore:** "The influence of high protein feeding on the general metabolism, on the intestinal flora, and on the body temperature of infants." *Am. J. Dis. Child.* [Chicago], vol. 4 (1912), pp. 265–300.

A study originally undertaken to discover a possible correlation between the influence of intestinal bacterial flora and the utilization of ingested foodstuffs. Studies were made of an infant placed on a diet of modified milk containing 2.6 per cent of fat, 3 per cent of sugar, and 2.4 per cent of protein for about three weeks to determine the normal flora for this child. The formula was then modified by increasing the amount of protein, and bacterial changes were observed. Under high protein feeding, however, fever developed, and the investigation turned to a study of febrile conditions due to high protein intake. A "synthetic" food—fat, 2 per cent; sugar, 1.8 per cent; protein, 6 per cent—was devised and made the basis of a careful and extended study, consisting of clinical observations, bacteriological investigation, and observations on the metabolism of three infants admitted to the Babies' Hospital, New York, as patients, who were in varying degrees of health during the course of the study.

585 **Hoobler, B. R.:** "Nitrogen metabolism in healthy (artificially fed) infants." *Arch. Pediat.* [New York], vol. 27 (1910), pp. 853–861.

This paper discusses a portion of an extended investigation which was undertaken by the author to supplement the work of Rubner and Heubner, and others on the metabolism of normal infants fed on cow's milk. A healthy infant 9 months old, fed from birth on modified cow's milk, was under observation for three 3-day periods, during which he was fed on three different cow's milk mixtures representing a low-fat, a medium-fat, and a high-fat formula. Feeding on the formula to be tested began at least two days before the 3-day period and the child was given a 10-day period of feeding on certified whole milk before each experiment. Urine and feces were collected and analyzed.

Tables are given of the absorption, retention, and forms of elimination of food nitrogen. Results are carefully compared with other observations, but no definite conclusions are reached. References.

586 **Hoobler, B. R.:** "The protein need of infants; being metabolism studies of a two months' old infant fed with varying proportions of cow's milk protein." *Am. J. Dis. Child.* [Chicago], vol. 10 (1915), pp. 153–171.

This article summarizes briefly, with references, the work of a number of investigators of this subject, and describes the author's experiment on a 2-months-old male infant, observed during 16 days for 37 periods of 1 hour each, 6 of these in the Murlin respiration chamber, and the remainder in the Atwater-Rosa calorimeter. The caloric value of food given was determined by bomb calorimetry and the nitrogen content by the Kjeldahl method. An extended tabular record was made of the observations. The author concludes that protein fed in excess of need causes an increase in energy metabolism in proportion to the amount of protein oxidized but does not reduce the amount of fat and carbohydrate metabolized; that the protein need of the growing infant is 7 per cent of its caloric need; that excess protein tends to produce stupor.

587 ——— "The rôle of mineral salts in the metabolism of infants." *Am. J. Dis. Child.* [Chicago], vol. 2 (1911), pp. 107–140.

The author begins this discussion with a historical review of work already done, a general statement of the physiological action of mineral salts, and a summary of information as to the ash content of the human organism at different ages. He combines the results of his own observations on a 9-months-old infant (Arch. Pediat., New York, vol. 27, 1910, pp. 853–861) with many observations of others and discusses separately the absorption, retention, and elimination of the total ash, and of its constituents. He concludes that salts are best absorbed and utilized when in organic combination with foodstuffs; that most dilutions of cow's milk contain an excess of salts which may be neglected in feeding normal infants but must be considered in disease. Reference.

588 **Hottinger, A.:** "Studien über Säuren-Basenhaushalt im kindlichen Organismus. I Mitteilung: Ausscheidung organischer Säuren im Urin" [Studies of acid and basal metabolism in the child's body. I. Excretion of organic acids in the urine]. *Monatschr. f. Kinderh.* [Leipzig], vol. 30 (1925), pp. 497–546.

The author studied the acid and basal metabolism of 16 infants from 1 week to 6 months of age and 2 children each 10 years old. He ascertained the quantity of organic acids excreted through the urine and the relation between that quantity and the following: Nature of the food, intake through the mouth of organic acids and minerals, reaction of the urine, the amount of discharged phosphorus, nitrogen, ammonium, amino acids, and the quantities of substances used for the titration of the urine. The effect of muscular work on the excretion of organic acids is also discussed. Comparing his findings for the children with the data obtained by other writers for adults the author concludes that a young child excretes a relatively larger amount of organic acids than an adult. The figures for the infants were from 10.1 to 12.5 cubic centimeters per kilogram of body weight; for adults, 8.2 cubic centimeters. An increase in the intake of nitrogen produces an increased excretion of organic acids. The various organic acids given through the mouth produce different effects. The author found no definite relation between the excretion of phosphates, ammonium, and organic acids. About one-half of the report is taken up with an account of experiments with pathological cases and a description of methods used by the author in his study. Numerous tables and references.

589 **Howland, John:** "Der Chemismus und Energieumsatz bei schlafenden Kindern" [The chemistry and energy exchange of sleeping children]. *Zeitschrift für Physiologische Chemie* [Strassburg], vol. 74 (1911), pp. 1–12.

In determining the chemical and energy exchange of sleeping children the author gives eight tables of weight, body surface, diet, condition, oxygen intake, carbon-dioxide output, and calories expended, of four children—one healthy boy of 3 months, one healthy but small infant of 7 months, one emaciated infant of 6 months, and one idiot of 8 years. He used a calorimeter of the Atwater-Rosa-Benedict type and made his observations only while the children were sleeping. Experiments with nutrose caused greater heat production and more nitrogen in excretions. The author concludes that the law that the heat production is proportional to the body surface is proved only for the normally nourished child.

590 ———"Direct calorimetry of infants, with a comparison of the results obtained by this and other methods." *Transactions of the 15th International Congress on Hygiene and Demography, 1912* [Washington], vol. 2 (1913), pp. 438–451.

A study of the metabolism in sleeping hours of two normal and of two undernourished infants from records made with the Atwater-Rosa-Benedict apparatus, which measures heat production as well as carbon-dioxide excretion and oxygen consumption. The formula by which surface measurements were determined is fully explained, also full details of the experiments. Results are compared with the work of other investigators; and heat production directly measured is compared with that measured by methods of Zuntz and Schumberg. Tables are included.

591 **Howland, John:** "Fundamental requirements of an infant's nutrition." *Am. J. Dis. Child.* [Chicago], vol. 2 (1911), pp. 49–54.

The author measured the metabolism of a healthy infant 3 months old and 4.75 kilograms in weight in a calorimeter of the Atwater-Rosa-Benedict type. He was fed every four hours and the metabolism noted in three hours he slept. He produced 9.52 calories per square meter per day. Two experiments were made in giving children nutrose, which contains 90 per cent protein and which greatly increases the metabolism and is undoubtedly harmful to the organism. The author accepts as facts a great increase of metabolism during waking over sleeping state; the Rubner law, that heat production and dissipation are proportional to the surface area of the body; and the practicability of the formula for determining said area—$\sqrt[3]{\text{weight in grams}^2}$ multiplied by a constant 12.3 or 11.9—for all except extremely thin persons.

592 ——— "The metabolism, directly determined, of healthy children during sleep." *Proceedings of the Society for Experimental Biology and Medicine*, vol. 8 (1910–11), p. 63.

Data are given on metabolism during sleep of two infants 3 and 8 months old. DuBois apparatus was used. The number of observations is not given. The children were normal, healthy, and gaining in weight.

593 ——— **and K. Stolte:** "Die Bedeutung von Eiweisszulagen beim Säugling" [Results of additions of albumin to the infant diet]. *Jahrb. f. Kinderh.* [Berlin], vol. 88 (1918), pp. 85–97.

The authors studied the metabolism of a healthy breast-fed child when albumin was added to the diet. There were four tests, each of three days with eight days between. A case history of the infant is given. Pure casein was given up to amount of 5 grams. A graph gives amounts of food and increase in body weight. Tables show the chemical composition of milk, feces, urine, losses, and balance, also absorption and retention in each of the tests. Addition of casein did not increase the nitrogen in the stool, but the author believes that if chemically pure it is totally absorbed.

594 **Huth, Albert:** "Ernährungszustand und Körpermasse" [Nutritional condition and body proportions]. *Ztschr. f. Kinderh.* [Berlin], vol. 30 (1921), pp. 39–43.

The writer contends that no reliable nutritional index has yet been discovered. Seventy undernourished children were examined. The clinical diagnosis coincided with Rohrer's index in only 20 per cent of these cases; in 50 per cent of them it coincided with the author's weight index; that is, the quotient obtained by dividing the real weight of the child by the height which corresponds to the normal weight. Again in the case of 31 pupils of average age of 10¾ years, examined clinically by Doctors Kaup and Regensburger and measured in height, weight, shoulder breadth, thigh, upper arm, chest girth, and waist, the correlation was found to be −0.15 for Martin's breadth index; −0.13 for Kaup's girth difference; −0.12 for Pfaundler's height quotient; −0.10 for Oppenheimer's nutritional quotient; −0.04 for author's index; −0.02 for Simon Pignet's index of constitution.

595 **Ide, Toshio:** "Tryptophanaufnahme und Tryptophanbedarf im Kindesalter" [Tryptophan absorption and requirement in childhood]. *Ztschr. f. Kinderh.* [Berlin], vol. 31 (1921–22), pp. 257–289.

This is a complete discussion of tryptophan requirement in childhood. This essential bulks largest in colostrum and decreases on the second to fourth day to the regular proportion. Throughout childhood the minimum of tryptophan per square centimeter of nutritional surface is 0.15 to 0.2 milligram and the optimum is 0.3 to 0.4 milligram. The 19 tables give amounts of tryptophan on each of the first 10 days in human milk, amounts in various foods, and amounts in relation to surface. There are 15 graphs. Constant reference is made to Pirquet and other workers.

596 ——— **and Edmund Nobel:** "Beitrag zur konzentrierten Ernährung des Säuglings" [Concentrated nourishment of infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 33 (1922), pp. 1–23.

The authors devoted 2,000 days to studying 202 newborn infants and 30 of different ages, reducing their milk to one-half or two-thirds its volume, either through boiling or in a vacuum. Stools became very voluminous. This method of feeding may have value for premature children. The article contains many curves and tables.

597 **de Jager, L.:** "Die Verdauung und Assimilation des gesunden und kranken Säuglings nebst einer rationellen Methode zur Säuglingsernährung" [Digestion and assimilation of healthy and sick infants, with a rational method of infant nutrition]. *Allgemeine Medicinische Centralzeitung* [Berlin], vol. 67 (1898), pp. 541–543, 553–556, 565–567, 577–579.

In these four articles the author discusses the general features of infant digestion and the difficulties of artificial feeding; different composition of human and cow's milk, especially in regard to casein; the problem of milk sterilization; and finally his own unusual success with buttermilk treatment, four cases of which he describes in detail. The recipe is 1 liter of buttermilk plus 12 grams of wheat or rice flour, boiled, plus a tablespoonful of sugar and a bit of butter.

98 **Jaschke, Rud. Th.:** "Neue Beiträge zur Physiologie und Technik der natürlichen Ernährung des Neugeborenen" [New data on the physiology and methods of natural feeding of the newborn infant]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 74 (1913), pp. 494–541.

A detailed discussion of methods of natural feeding as applied to 153 newborn infants under the author's observation. The infants were all fed at the breast; 89.5 per cent progressed well and gained in weight regularly. The author emphasizes the importance of natural feeding.

99 ——— "Neue Erfahrungen in der Technik der Ernährung sowie zur Physiologie und Pflege des Neugeborenen" [New experiences in the technique of nutrition as well as in physiology and care of the newborn]. *Monatsschrift für Geburtshülfe und Gynäkologie* [Berlin], vol. 35 (1912), pp. 60–75.

In connection with a discussion of the care and nutrition of infants the author gives six tables giving the amounts of milk drunk by three infants, one of whom was premature.

00 **Johannessen, Axel, and Eyvin Wang:** "Studien über die Ernährungsphysiologie des Säuglings" [Studies on the nutrition of the infant]. *Zeitschrift für Physiologische Chemie* [Strassburg], vol. 24 (1897–98), pp. 482–510.

In studying the amount and composition of the milk consumed in infancy the authors chose four healthy mothers nursing their own healthy children. The children were from 4 to 5 months old. They nursed every 3 hours from 6 a. m. to 9 p. m. and also at 1 a. m. The length of each meal and the amount of it were measured for six days in all four cases; also the amount of insensible perspiration. As for the chemical composition of the milk, Kjeldahl's method was used for nitrogen, Hammersten and Sebelin's coefficient 6.37 for albumin, Gerber's acid-lacto butyrometer for fat, and Ritthausen's method for sugar. For six successive days the milk of each of the four mothers was tested, some milk being extracted before, during, and after an afternoon nursing. Detailed results are shown in 36 tables and 2 plates of graphs.

01 **Kahn, Walther:** "Über die Toleranzgrenze für Traubenzucker im Kindesalter" [The limit of toleration for glucose in childhood]. *Jahrb. f. Kinderh.* [Berlin], vol. 44–46 (1921), pp. 15–26.

The author administered pure glucose to 20 infants between 2 months and 1 year and to 20 children between 1½ years and 13. For the urine he used the Nylander test, Fehling test, phenylhydrazin test, and polarization method. The limit of tolerance for glucose is very high in the infant if reckoned per kilogram of weight. The lowest values lay between 6.7 and 11.1 grams, and the highest between 13.5 and 17.2. At about the age of 1½ years comes a rapid sinking of the limit of assimilation. It is on an average of 3.5 grams in the older child. Bibliography.

02 **Karnitzky, A. O.:** "Zur Physiologie und Pathologie der Säuglingsernährung" [Physiology and pathology of infant nutrition]. *Arch. f. Kinderh.* [Stuttgart], vol. 56 (1911), pp. 387–399.

The author discusses natural versus artificial feeding of infants: How long must human milk be an exclusive diet? How should the child be weaned? His method was to observe a healthy infant up to the third or fourth month. He speaks in particular of 2 infants and in less detail of 80 in the first month of life and 52 from 2 to 4 months old. Two short tables are given.

03 **Kassowitz, Max:** "Der grössere Stoffverbrauch des Kindes" [The more active metabolism of the child]. *Ztschr. f. Kinderh.* [Berlin], vol. 6 (1913), pp. 240–252.

A discussion, without description of original experiments, of the probable reasons for the increased metabolism of the child as compared with that of the adult.

04 **Kaupe, Walther:** "Die Ernährung des frühgeborenen lebensschwachen Kindes" [Nourishment of the premature, weak child]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 15 (1918–19), pp. 367–375.

The author gives eight curves and a description of the development of three premature infants. He found that feeding must be started as soon as possible, that only five or six meals need be given daily, that the energy quotient is relatively great, and that even artificial feeding is possible.

05 ——— "Muttermilch und Krieg" [Mother's milk and war]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 15 (1918–19), pp. 83–88.

In a table and discussion the author treats of the effect of war on 35 breast-fed infants between the ninth and the seventeenth day. They drank on an average about 450 grams of milk daily—a sufficient amount, but their weights were not satisfactory. The author believes changes in milk secretion due to war are not yet understood, being perhaps due more to psychological than to physiological factors.

606 **Keilmann, Alexander:** "Beitrag zu den Erfahrungen über die künstliche Ernährung gesunder Säuglinge" [Contribution to experiences in the artificial nourishment of healthy infants]. *Jahrb. f. Kinderh.* [Leipzig], vol. 41 (1895–96), pp. 312–327.

This article contains a plate of 14 curves and 2 tables and discussion on nourishment of a series of infants observed through a period of two years in the Breslau Women's Clinic. One table compares weights of 197 breast-fed infants, 65 fed on 1 part cow's milk to 3 parts water plus 2 tablespoonfuls of lactose to the liter, and 42 fed on 1 part cow's milk plus 1 part water. As regards initial loss, etc., breast-fed infants show best results. Tests of the effect of lime water upon one group of 47 and another group of 27 children failed to demonstrate any benefit from it. Fifty children were tested on Gartner's fat milk. There are other series of children for whom the results of treatment are shown in curves.

607 **Keller, Arthur:** "Organische Phosphorverbindungen im Säuglingsharn, ihr Ursprung und ihre Bedeutung für den Stoffwechsel" [Organic phosphorus combinations in infant urine, their origin and significance for metabolism]. *Zeitschrift für Physiologische Chemie* [Strassburg], vol. 29 (1900), pp. 146–184.

The author investigated phosphorus metabolism in about a dozen infants, including three healthy breast-fed infants. All were in their first year. Bottle-fed infants were found to eliminate much more phosphorus pentoxide relatively than breast-fed infants. In human milk the relation of phosphorus pentoxide to nitrogen equals 1 : 55 and in cow's milk 1 : 25. In the urine of breast-fed infants it is 1 : 7 and of bottle fed, 1 : 2. The process of analysis is described. Results are shown in six pages of tables. Many more pages are devoted to discussion of organic phosphorus combinations, etc. Case histories conclude the article.

608 ——— "Phosphorstoffwechsel im Säuglingsalter" [Phosphorus metabolism in infancy]. *Zeitschrift für Klinische Medicin* [Berlin], vol. 36 (1898), pp. 49–76.

After a preliminary discussion of phosphorus metabolism in infancy, in which he cites results obtained by other students, the author presents two tables of his own tests, 46 tests on the breast-fed and 46 tests on artificially-fed infants between 3 and 11 months old. He used Raudnitz's recipient, tested nitrogen according to Kjeldahl, and phosphorus pentoxide according to Neubauer. More phosphorus pentoxide was eliminated by the artificially-fed than by the breast-fed infants. The relation of phosphorus pentoxide to nitrogen in human milk was 1 : 3.3; in the urine of the breast-fed child, 1 : 7; in cow's milk and urine of the child fed on cow's milk, 1 : 2.3. Other tables give the effect of various diets on a given child.

609 ——— "Phosphor und Stickstoff im Säuglingsorganismus" [Phosphorus and nitrogen in the infant organism]. *Arch. f. Kinderh.* [Stuttgart], vol. 29 (1900), pp. 1–95.

The author made 14 tests of phosphorus metabolism on two healthy and four sick infants fed on human and cow's milk and malt soup, diets rich and poor in phosphorus, using for these tests many organic and inorganic phosphorus combinations. Findings fill 20 pages. The author asserts that the phosphorus of human milk is better utilized than that of cow's milk. The absorption is only slightly dependent on amount consumed. The urine elimination of phosphorus is absolutely less than for an adult, but relatively greater. The phosphorus comes only in part from food and in part from the decomposition of substance or secretions of organs. Therefore, phosphorus in the urine is not significant for utilization of phosphorus in food. On a diet of human milk the nitrogen is mostly in urine, only slightly in feces; on artificial diet there is almost as much nitrogen in feces as in urine. On the latter diet, feces are richer in phosphorus and poorer in nitrogen than on the former diet, and this is partly due to favorable absorption of the nitrogen in cow's milk. There are 19 tables.

610 ——— "Über den Einfluss der Zufuhr anorganischer Säuren auf den Stoffwechsel des Säuglings" [Effect of a dose of inorganic acids on metabolism of the infant]. *Centralblatt für Allgemeine Pathologie und Pathologische Anatomie* [Jena], vol. 8 (1897), pp. 947–953.

The article presents eight tables showing amount of urine, total nitrogen, nitrogen in ammonia, total phosphoric acid, total sulphuric acid, chlorin, soda, potassium, etc., in 6 to 10 tests upon each of eight infants, some breast fed and some bottle fed, from 3½ to 8 months old, to whom were administered hydrochloric acid, and in one case sulphuric acid. The two doses acted in the same fashion. Chlorin is almost completely eliminated in 24 hours. On the first day ammonia elimination is increased, but is high also on following days. Chlorin eliminated can not all be combined with ammonia or changed from simple to double phosphate; it must be combined by alkalis of the blood and tissues.

611 ——— "Über Nahrungspausen bei der Säuglingsernährung" [Intervals between meals in infant nutrition]. *Centralblatt für Innere Medicin* [Leipzig], vol. 21 (1900), pp. 393–398.

After discussing number of meals daily accorded the nursling in common practice and in textbooks the author explains that in the university clinic at

Breslau neither sick nor healthy infants are fed oftener than five times in 24 hours. From the time required for digestion and the appearance of free hydrochloric acid Czerny, in a report published in 1893, stated that breast-fed infants require an interval of three hours, and bottle-fed infants four hours between meals. From tests on two sick infants, in which he determined the nitrogen and phosphorus pentoxide in food, urine, and feces, the author has concluded that the absorption and retention of nitrogen and phosphorus and thus the assimilation of albumin bodies are not affected by the length of time between meals.

12 **Klein, Wilhelm, Erich Müller, and Maria Steuber:** "Beitrag zur Kenntnis des energetischen Grundumsatzes bei Kindern" [Contribution to the study of basal metabolism in children]. *Arch. f. Kinderh.* [Stuttgart], vols. 69–70 (1921–22), pp. 164–169.

A defense of Rubner's law concerning the relation of body surface to basal metabolism. The author gives reasons for disagreeing with Benedict and Talbot's conclusions concerning the basal metabolism of infants.

13 ——— ——— ——— "Ein Beitrag zum Grundumsatz bei älteren Kindern" [Basal metabolism in older children]. *Archiv f. Kinderh.* [Stuttgart], vol. 74 (1924), pp. 286–292.

As a continuation of their earlier experiments the three authors of this article studied the basal metabolism of 12 boys ranging in age from 7 to 11 years. They give an account of the physical condition of each of the boys and in a separate table the original data of the experiments. The average basal metabolism was 1,110 calories per square meter of body surface in 24 hours; there were great individual variations, which they attribute to the restlessness of some children. Quotations and references.

14 **Klose, Heinrich:** "Rationelle Kinderernährung von der Geburt bis zum Alter von zwei Jahren" [Rational diet for children from birth to the age of 2]. *Arch. f. Kinderh.* [Stuttgart], vol. 45 (1906–7), pp. 161–235.

This article for the most part presents scientific knowledge on the subject collected by other students. Graphs and case histories of six infants in the author's experience who thrived on Theinhardt's food are included. The article discusses, first, general aspects of the subject, then human versus cow's milk, and then takes up various diets according to age. Graphs and 13 tables are included. Bibliography.

15 **Klotz, Max:** "Milchsäure und Säuglingsstoffwechsel" [Lactic acid and infant metabolism]. *Jahrb. f. Kinderh.* [Berlin], vol. 70 (1909), pp. 1–61.

Many tables show the results of the author's experiments with lactic acid as affecting infant metabolism. Nitrogen, fat, carbohydrates, ash, sodium chlorid, potassium chlorid, magnesium oxide, calcium oxide, etc., were determined in food, urine, feces, and also the percentage of retention and absorption, in a three-day test before and again in a three-day test during the taking of a small dose of lactic acid administered by mouth. Case histories of the young infants are given. Doses of the acid from 1.5 to 2 grams daily aided assimilation but did not increase weight. Large doses had an injurious effect. It seems that the fermentation produced by the acid checks putrefaction, regulates peristalsis, and under physiological conditions is of great significance for the absorption and retention of organic and inorganic materials. Small doses reduce saponification; large doses increase it.

16 **Knöpfelmacher, Wilhelm:** "Kuhmilchverdauung und Säuglingsernährung" [Digestion of cow's milk and infant nutrition]. *Wiener Klinische Wochenschrift*, vol. 11 (1898), pp. 69–72. See also *Aerztlicher Central-Anzeiger* [Vienna], vol. 10 (1898), pp. 71–74.

The author discusses the difference between human and cow's milk as food for human infants, describing tests (number not stated) on feces of breast-fed and of artificially-fed infants. Cow's milk is far richer in protein than human milk, and of that protein a much larger proportion is casein. Casein of human milk is entirely absorbed, but not that of cow's milk. Feces tests showed that a product of the latter is eliminated unaltered and also that a large part of the phosphorus of cow's milk is lost in excretions. Again, cow's milk contains much less phosphorus in lecithin and nuclein. To supply phosphorus and iron author suggests adding to diluted cow's milk an egg as well as fat and sugar.

17 ——— "Untersuchungen über das Fett im Säuglingsalter und über das Fettsklerem" [Investigations of fat in infancy and of fat sclerema]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 45 (1897), pp. 177–203. See also *Wiener Klinische Wochenschrift*, vol. 10 (1897), pp. 228–229.

Hubl's method was used in testing the fat of seven infants of whom one died at birth, two when 7 weeks old, and the others at the ages of 6, 10, 12, and 17 months. The oleic-acid content and the melting points were studied. The oleic-acid content was found to be 43.3 per cent for the newborn and to increase with age until at 1 year it is about the same as for an adult. This value differs in various parts of the body.

618 **Knöpfelmacher, Wilhelm, and Heinrich Lehndorff:** "Das Hautfett im Säuglingsalter" [Cutaneous fat in infancy]. *Zeitschrift für Experimentelle Pathologie und Therapie* [Berlin], vol. 2 (1905–6), pp. 133–142.

In these further experiments on the cutaneous fat of young infants the authors give the iodine number of the fat, and not, as previously, of the oleic acid. They melted the fat by the lowest possible temperature and followed all the suggestions of Benedikt-Ulzer. Their tables with the results obtained from their full material contain body weight, iodine number, and other pertinent information. The iodine value is dependent on the state of nutrition. On an average it is 44.92 for the newborn and 57.95 for the infant 4 months old, oleic acid being much less in the fat of infants than of adults. Breast-fed infants show an essentially higher iodine number in the cutaneous fat than do infants artificially nourished on cow's milk. Three experiments with animals on decrease of oleic acid through hunger are described.

619 **Köppe, Hans:** "Studien zum Mineralstoffwechsel" [Studies in mineral metabolism]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 73 (1911), pp. 9–49.

The article contains long tables and discussions of experiments upon the mineral metabolism of infants. Twelve atrophic children fed on buttermilk soup (Vilbeler H. S.) drank very freely and gained greatly in weight with best results. In 15 healthy children, temporarily feverish, there was no loss but a gain in weight unless diarrhea occurred or food was limited. Most of the experiments concerned healthy bottle-fed infants from 14 days to 1 year old, and the elimination of phosphoric acid in their urine. The phosphorus pentoxide eliminated appeared to depend on the kind and quantity of food taken; that is, the phosphate in the urine was dependent on the phosphate in the nourishment. The tests included the H. S. mentioned, mother's milk, and cow's milk of varying strength. Other experiments had to do with fat in the food and the effect of salt added to the food, the latter causing fever, increase of weight, and increased elimination of phosphorus pentoxide.

620 ——— "Über einige Grundbegriffe der 'physikalischen Chemie' und die Wandlung unserer Anschauungen über die Bedeutung der anorganischen Salze" [Some basic principles of "physical chemistry" and the change in our views on the significance of inorganic salts]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 9 (1910–11), pp. 73–82.

The author discusses the important work done by physical chemistry. Through it the nature of salt solutions and the reactions between salts was recognized and foundations laid for a theory of analytical reactions. All analytical reactions with few exceptions are ion reactions. Until 1895 the inorganic salts were regarded only as a surrogate for lost tissue and as not serving as a source of power. It is necessary to know at least approximately how many and what ions are in food. This is not shown in ash analyses, for the ash and salt content of food are different things. Besides the osmotic pressure of a solution the sum of the pressures of the constituents must be known. In two kinds of feeding the same amounts of food may be given to same organism, the ash analysis for both may be the same, and yet the elimination of ash constituents is different. This is true in the case of full milk, buttermilk, and sour milk, owing to the form of the inorganic salts. The author shows the differing values of phosphoric acid found in the urine of a healthy infant on three different diets.

621 **Koplik, Henry:** "Die Gewichtszunahme bei künstlich ernährten Kindern" [Weight increases in artificially nourished children]. *Jahrb. f. Kinderh.* [Leipzig], vol. 50 (1899), pp. 331–341.

The author discusses his experience covering nine years in artificial feeding of children under 9 months of age. Some breast milk added to artificial diet produced better results. Experiences of other authors are compared. Diets are described and short tables given of daily amounts drunk during various months.

622 ——— "The nutrition of infants fed upon raw, boiled, pasteurized, and sterilized milk." *New York M. J.* [New York], vol. 61 (1895), pp. 455–461.

After discussing the amount of nitrogen taken up in the system as a definite index of the assimilation of albuminoids the author reports, by individual case records of five infants, the nitrogen assimilation in six and seven day experiments with varied combinations of feeding. References.

623 **Kott:** "Zur Ernährungstechnik frühgeborener Säuglinge" [Nutrition technique for premature infants]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 5 (1912–13), pp. 134–174.

The article contains a case history, growth curve, and table of body weights and amounts of milk imbibed by each of 13 infants. Five, over a week old, entered a Berlin hospital in a moribund condition. Of the 8 brought in soon after birth, 4 were not fed with the tube till about 1 week old and 4 were so fed from the beginning. This first group of 4 suffered longer from asphyxia, did not increase in weight till the fifth to the ninth day, and suffered losses in weight of 60 to 260 grams. The other group of 4, at once fed with the tube, lost from 40 to 170 grams only and began to gain from the third to the sixth day.

624 **Krasnogorsky, N.:** "Opit izucheniia obmiena zhelesa u dietiei grudnago vosrasta" [Study of metabolism of iron in infants]. *Russkii Vrach* [St. Petersburg], vol. 5 (1906), pp. 1410, 1478, 1511, 1549.

An original study of metabolism of iron in 14 infants under 1 year old. Each experiment lasted five days. During two days the infant was kept on a selected diet; during the next three days his urine and feces were studied to ascertain the amount of iron eliminated, absorbed, and assimilated. Some children were fed on human milk, others on milk from animals, still others on egg and spinach in addition to animal milk. The author gives in 30 tables the results of his experiments. He found that the iron of woman's milk was absorbed and assimilated in larger quantities than that of the other three articles. In conclusion, the author says that insufficient intake of iron with infants' food may result in disorders not only of formation and functioning of hemoglobin, but also of formation and oxidation of tissue. Bibliography.

625 ——— "Über die Ausnutzung des Eisens bei Säuglingen" [The utilization of iron in infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 64 (1906), pp. 651–675.

After discussing previous work on the subject the author describes his own experimentation on the utilization of iron by the infant. There were 14 experiments, results of which are shown in 30 tables. Each food was given for five days, the last three of which were included in the test. Neumann's method of analysis was used. The foods were human milk, boiled goat's milk, boiled cow's milk, and raw cow's milk; also spinach or egg in the milk. The absorption and retention are, respectively, for human milk 80 per cent and 75 per cent; for goat's milk, boiled, 33 per cent and 28 per cent; and raw, 15 per cent and 9 per cent; for spinach, 64.2 and 61.5 per cent; and yolk of egg, 64.9 per cent and 61.9 per cent; for proprietary preparation, 23.78 per cent and 23.39 per cent. Therefore the low iron content of human milk is compensated for by its high percentage of retention. Insufficient intake of iron in food can have unfavorable consequences for the child organism not only for the formation and functional activity of the blood hemoglobin, but, above all, for the oxidizing and plastic processes of the tissues.

626 **Kuntze, George:** "Fettpolster und Ernährungszustand bei Kindern" [Layer of fat and condition of nourishment in children]. *Monatschr. f. Kinderh.* [Leipzig], vol. 22 (1921–22), pp. 449–457.

The author examined 458 boys and 583 girls of the Leipzig public schools, studying especially the layer of fat in relation to the condition of nutrition. Also 16 high-school boys who had lived largely on carbohydrates for 7½ weeks were examined. The methods of Broca, Bornhardt, Oppenheimer, and Rohrer for estimating fat are discussed, and the author's technique is described.

627 **de Lange, Cornelia:** "Die Zusammensetzung der Asche des Neugeborenen und der Muttermilch" [Composition of ash residue of the newborn and of human milk]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 40 (1900), pp. 526–528.

The author here studies the ash residue of the newborn infant and of human milk. The latter was taken from 33 women in the Municipal Lying-in Hospital of Amsterdam between the fourth and the tenth day after delivery. Their diet was plain but abundant. The newborn infant was a full-term boy asphyxiated at birth. The material is treated after manner of Camerer and Soldner. Figures are given for potassium, calcium, magnesium, sodium, phosphorus, iron, and chlorin as ascertained by Soldner, Hugouneng, and the author.

628 ——— "Zur Darmvegetation gesunder Säuglinge" [Intestinal flora of healthy infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 54 (1901), pp. 721–733.

The feces of 16 infants, 8 breast fed and 8 bottle fed, were examined. Tables give the age of infant, dry content of feces, and bacterial and fungous content. Tests were made chiefly in the Institute for Hygiene and Bacteriology of Amsterdam University.

629 ——— "Zur normalen und pathologischen Histologie des Magendarmcanals beim Kinde" [Normal and pathological histology of the alimentary canal in the child]. *Jahrb. f. Kinderh.* [Leipzig], vol. 51 (1900), pp. 621–649.

To study the histology of the alimentary canal the author dissected 20 infants from 2½ to 19 hours after death. The canal was normal in only four cases. The author observes with Beginsky that the follicles of the intestine are already well developed in the very young infant. The streptococcus seems to be very frequently found.

630 **Lange, Jerome:** "Über den Stoffwechsel des Säuglings bei Ernährung mit Kuhmilch" [The metabolism of the infant fed on cow's milk]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 39 (1895), pp. 216–240.

After a prolonged discussion of the work done by Camerer, Prausnitz, Uffelmann, and others, the author describes his own metabolic experimentation with infants. The nitrogen in the excretions he determined according to Kjeldahl's method as modified by Argutinsky. He examined the feces of 24 infants, of

whom 1 was breast fed; of the 23 artificially fed, 9 had digestive disorders and 14 were normal. The fecal dry residue was twice as great in the case of the 9 as in the 14, but the percentage of nitrogen content was much smaller. The author also studied both feces and urine of 4 infants during two days and 5 infants for one day. Their artificial food was 2.25 per cent albumin, 2.16 per cent fat, and 7 per cent lactose. The scanty urinary output of water, as compared with the total water intake, he ascribed to perspiration, and the nitrogen deficit to the formation of new cells and a reserve store of protein in the infant organism.

631 **Langer, Ludwig:** "Über die chemische Zusammensetzung des Menschenfettes in verschiedenen Lebensaltern" [Chemical composition of human fat at different ages]. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften* [Vienna], vols. 83–84 (1881–82), pp. 94–109.

The author details quite essential differences in quantitative chemical composition of fat of the newborn infant and of the adult. Almost all fat of the newborn is concentrated in the subcutaneous region. The paniculus of the child is relatively at least five times as thick as that of a stout adult. Melting points of fat are given. That of the newborn contains three times as much solid fatty acid as that of the adult. Technique is described.

632 **Langlois, P.:** "Beitrag zum Studium der directen Calorimetrie beim Menschen" [Contribution to the study of direct calorimetry in mankind]. *Centralblatt für Physiologie* [Leipzig and Vienna], vol. 1 (1887–88), pp. 237–239.

Continuing Richet's work, the author measured the calorimetry of children in a clinic for two years with a siphon calorimeter, which does good work up to 11 kilograms. Seventeen careful tests on healthy children of about 7 kilograms showed a maximum heat radiation of 18°. Tests on two children of 7 kilograms and a number of infants at different times of day placed maximal values at 11 a. m. and 3 p. m. Tests on weight and surface gave 15 to 17 calories per unit of surface for children as against 14 for adults.

633 **Langstein, Leo:** "Die Beurteilung der Fäulnis bei verschiedenartiger Ernährung, nach Versuchen von Soldin" [Determination of putrefaction with different kinds of diets]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vols. 23–24 (1906–7), pp. 115–116.

The author presents a table on 11 young infants, giving their weight, diet, and determination of putrefaction in intestines in nitrogen, sulphuric acid, phenol, organic acid, indican, urobilinogen, etc. This putrefaction is seen to be least with breast milk. Buttermilk is accompanied by less of it than ordinary cow's milk.

634 ——— "Die Ernährung gesunder und kranker Säuglinge mit gelabter Kuhmilch" [The nourishment of healthy and sick infants on coagulated cow's milk]. *Jahrb. f. Kinderh.* [Berlin], vol. 55 (1902), pp. 91–103.

The author recounts his experiences in watching the development of 25 normal and sick infants in the first year of life, when nourished for several weeks on coagulated cow's milk.

635 ——— **and Edelstein, F.:** "Der Eisenhaushalt im Säugling" [Iron economy in the infant]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vols. 29–30 (1912–13), pp. 3–10.

The authors studied iron economy in three infants fed on extracted human milk, one a newborn infant, one 10 weeks, and another 12 weeks old. Iron was determined by Knecht's tetrachloride method. The iron balance was in every case positive, being contrary, therefore, to Soxhlet's supposition of a negative balance. In one case nitrogen and ash were tested and found positive. Results are fully tabulated and compared with those of other authors.

636 ——— **and Ludwig F. Meyer:** "Die Acidose im Kindesalter. I. Die Acidose des älteren Kindes" [Acidosis in childhood. I. Acidosis of the older child]. *Jahrb. f. Kinderh.* [Berlin], vol. 61 (1905), pp. 454–485.

The authors describe methods used in studying six children between 6 and 14 years for acetone in expired air, acetone in urine, oxybutyric acid in urine, as well as total nitrogen and ammonia elimination in urine. Each child was studied about seven days on different diets. Results are shown in many tables. Acetone in the urine was about 1 centigram per diem (3 to 4 centigrams for adults), and in air about 69 milligrams (79 to 102.8 for adults). Urine acetone of the child is relatively greater than that of the adult and is more intense the younger the child. Acetone, expired, is greatly increased (more in children than in adults) on a carbohydrate-free diet. In young children most of the acetone eliminated is in the expired air. Young children have an inclination to acidosis.

637 ——— ——— Säuglingsernährung und Säuglingsstoffwechsel [Infant Feeding and Metabolism]. Bergmann, Wiesbaden, 1914. 408 pp.

The authors discuss metabolism of the infant; its physiological development; breast, artificial, and mixed feeding; feeding of the newborn and of the prematurely born of normal constitutions; nutritional disorders of the artificially fed infant; infection as related to feeding; vomiting; hunger in connection

with underfeeding and Möller-Barlow disease; tetanus; spasmophilia; and rickets. Numerous tables and charts are included.

638 **Langstein, Leo, and Albert Niemann:** Ein Beitrag zur Kenntnis der Stoffwechselvorgänge in den ersten vierzehn Lebenstagen normaler und frühgeborener Säuglinge" [Contribution to the knowledge of metabolic processes of normal and premature infants during the first 14 days of life]. *Jahrb. f. Kinderh.* [Berlin], vol. 71 (1910), pp. 604–611.

The authors treat of the metabolism of three newborn and one premature infant, bottle fed on human milk. Comprehensive tables give in each case weights, amounts of milk consumed, and chemical analyses of urine and feces. The nitrogen and phosphorus eliminated through the urine rose from the second to about the seventh day and then fell in quantity. The initial loss is due not only to the excretion of urine and meconium but also to the enormous loss of tissue and water.

639 ——— **F. Rott, and F. Edelstein:** "Der Nährwert des Colostrums" [Nutritive value of colostrum]. *Ztschr. f. Kinderh.* [Berlin], vol. 7 (1913), pp. 210–225.

The author studied eight infants for the first 10 days after birth. He presents data on their weight changes and milk intake, giving the caloric value of the latter.

640 **Laumonier:** "De l'utilisation physiologique du lait de vache stérilisé et pur dans l'alimentation des jeunes enfants" [The physiological utilization of pure, sterilized cow's milk in the digestion of young infants]. *Journal de clinique et de thérapeutique infantiles* [Paris], vol. 6 (1898), pp. 141–144.

The author reports analyses of the feces of two infants—one breast fed, aged 21 weeks; the other, aged 17 weeks, fed with pure, sterilized cow's milk. He derives from the results an argument for the use of sterilized milk.

641 **Lawatschek, Rudolf:** "Die enterale Resorption von genuinem Eiweiss bei Neugeborenen und darmkranken Säuglingen und ihre Verwertbarkeit als Funktionsprüfungsmethode" [The intestinal absorption of genuine albumen in newborn and infants with intestinal disturbances, and its value as a functional test]. *Prager Medizinische Wochenschrift*, vol. 39 (1914), pp. 185–189.

The author studied two problems: The physiological enteral permeability to heterologous albumin in the newborn, and the pathological aspect of the same thing in older infants. After a discussion of the results of previous investigators he explains his own tests according to Lust's methods upon 38 newborn infants in a maternity hospital. The healthy infants all showed a positive reaction in the urine to the 10 to 15 grams of albumin given them. From tests on 29 sick infants between 3 weeks and 15 months old the author concludes that severe enterogenic disturbance depends on the degree of permeability of the wall of the alimentary canal.

642 **Lederer, Richard:** "Die Bedeutung des Wassers für Konstitution und Ernährung" [The significance of water for the constitution and nutrition]. *Ztschr. f. Kinderh.* Originalien [Berlin], vol. 10 (1914), pp. 365–502.

The author discusses at length the significance of water for the newborn and young infant, the physiological phenomena in the infant's life that stand in direct connection with water metabolism, the physiological loss of weight in the newborn, the water content of the blood in the healthy breast-fed child, etc. Beside his own studies, illustrated by 15 curves and 7 tables, the author quotes results obtained by others. He explains in detail his method of working with the smallest possible amount of blood. In two years he made about 800 blood tests and 3,000 weighings. The newborn shows an exceedingly low water value, about 71 per cent. The nursling rapidly increases it, requiring almost 150 grams' intake daily. From the third month begins the slow physiological drying of the body tissue.

643 ——— "Die Kriegsernährung der Wiener Kinder" [War diet of Vienna children]. *Ztschr. f. Kinderh.* [Berlin], vol. 23 (1919), pp. 112–124.

This article presents the results of a metabolism test covering 12 days, at the end of the third year of the Great War, in Vienna, upon a healthy boy of 12, whose weight was 26.2 kilograms and height 140 centimeters. He had 5 meals a day, slept 10 to 11 hours, and played freely with other children. Animal protein was readily utilized by the system; fat caused no better utilization of nitrogen and fat, but sugar did. There are seven tables. Bibliography.

644 **Leichtentritt, Bruno:** "Erfahrungen über die nach dem Verfahren von Engel hergestellte Eiweissmilch" [Experiences with protein milk prepared according to Engel's process]. *Arch. f. Kinderh.* [Stuttgart], vol. 63 (1914), pp. 61–93.

The author describes protein milk made according to Engel's prescription with fine coagulation and removal of part of the whey. A table contains numerous chemical analyses of the albumin, fat, sugar, calcium, and ash. For

the infants successfully treated there are 22 case histories and 10 curves showing temperature, amounts of food, body weights, and stools. Bibliography.

645 **Leopold, Jerome S.:** "Experiences with whey-modified milk in infant feeding." *Am. J. Dis. Child.* [Chicago], vol. 8 (1914), pp. 196–209.

After describing the composition and method of preparation of whey-modified milk the author gives 54 case histories of infants from 2 days to 13 months of age who were successfully fed with this preparation.

646 **Leschziner, Leo:** "Über die Buttermilch als Säuglingsnahrung" [Buttermilk as an infant food]. *Arch. f. Kinderh.* [Stuttgart], vol. 40 (1904–5), pp. 102–125.

This article discusses buttermilk in its chemical aspect, its use in various clinics, its success as a food for infants. For use with infants in his own care the author adds to 1 liter of the milk 2 tablespoonfuls of sugar and 1 of wheat flour. He cites details of his observations on 16 infants.

647 **Levy, Jacob:** "Untersuchungen über die Notwendigkeit von Milchverdünnungen bei der Ernährung junger Säuglinge" [Investigations on the necessity of milk dilution in the nutrition of young infants]. *Deutsche Medizinische Wochenschrift* [Leipzig], vol. 46, pt. 2 (1920), pp. 1329–1331.

Observations are given for eight weeks or more of the progress made by 294 infants fed different dilutions of milk. Separate groups were made of those 1 to 2 weeks old and 3 to 8 weeks; of those below and those above 3,250 grams. Three graphs and three tables are presented.

648 **Lichtenstein, A., and G. Lindberg:** "Molkenaustauschversuche" [Studies in exchange of whey]. *Jahrb. f. Kinderh.* [Berlin], ser. 3, vol. 89 (1919), pp. 329–358.

The article contains 17 curves and 34 case histories, presented in connection with the results obtained in feeding infants with the whey of cow's milk plus the curd of human milk, and the whey of human milk plus the curd of cow's milk.

649 **Lindberg, Gustaf:** "Über den Stoffwechsel des gesunden, natürlich ernährten Säuglings und dessen Beeinflussung durch Frauenmilchfett" [The metabolism of the healthy breast-fed infant and the effect upon it of the fat of human milk]. *Ztschr. f. Kinderh.* [Berlin], vol. 16 (1917), pp. 90–175.

A study of the metabolism of an infant of 2½ months over four periods of three days each. Cream from human milk was used, in addition to ordinary human milk. Besides giving in detail the data collected by himself the author compares with them the findings of other students and discusses each phase of metabolism at length. On normal diet the fat absorption was 94.3 per cent and 92.5 per cent; on the fat diet it was 90.08 per cent and 90.99 per cent. No difference appeared in the nitrogen metabolism, but the mineral metabolism showed changes in both absorption and retention. The absorption fell from 64.26 per cent and 60.42 per cent in the normal periods to 49.53 per cent and 41.24 per cent, and the retention from 0.4235 gram and 0.4543 gram to 0.2213 gram and 0.1176 gram. The article contains 40 tables and a bibliography.

650 **Litzenberg, Jennings C.:** "Long-interval feeding of premature infants." *Am. J. Dis. Child.* [Chicago], vol. 4 (1912), pp. 391–409.

The author records 14 case histories in support of the practice of 4-hour feeding of premature infants. References.

651 **Lubsen, J.:** "Gegebens over den voedingstoestand der Amsterdamsche schoolkinderen in Januari 1917" [Data on the state of nutrition of Amsterdam school children in January, 1917]. *Nederlandsch Tijdschrift voor Geneeskunde* [Amsterdam], vol. 61, pt. 2 (1917), pp 1865–1879.

In January, 1916, and in January, 1917, the weight and height of 9,284 school children in Amsterdam were recorded by the author, who compares his data with those obtained by other writers in other countries before the World War. He found in his cases very little deviation from the normal height and weight in spite of the war and high prices. He noticed that the children of the well to do were superior to the other children in regard to height and weight at the time of entering school. But later rich and poor children alike showed the same rate of gain in height and weight. Bibliography.

652 **Lusk, G.:** "The fundamental requirements of energy for proper nutrition." *J. A. M. A.* [Chicago], vol. 70 (1918), pp. 821–824.

An article dealing largely with food requirements in adult life but containing a chart showing metabolism in calories per day of boys from birth to 15 years of age. Average height and weight in feet and inches and in centimeters and kilograms are also shown, and caloric requirements are indicated graphically for basic needs, and for the very quiet, active, and very active boy. All data are from the work of other investigators. References.

653 **Lust, F.:** "Die Bedeutung des Kalkes für den wachsenden Organismus" [Significance of calcium for the growing organism]. *Medizinische Klinik* [Berlin], vol. 10, pt. 1 (1914), pp. 316–322.

The author discusses previous studies on calcium and its salts. The brain at birth contains more calcium than at any other period. The effect of calcium on the nervous system depends first of all on its concentration. Calcium is an antispasmodic remedy.

654 **MacLeod, Grace:** Studies of the Normal Basal Energy Requirement. Columbia University, 1924. 37 pp.

A thesis (Columbia University) based on a study of the normal basal energy requirement of girls from 11 to 14 years of age. The results of 362 determinations made on 43 different girls are presented and compared with existing figures and proposed standards. The author finds the average basal metabolism for girls of this age somewhat higher than that indicated by other investigators.

655 **Magnus-Levy, A., and Ernst Falk:** "Der Lungengaswechsel des Menschen in den verschiedenen Altersstufen" [Lung metabolism in man at various ages]. *Archiv für Anatomie und Physiologie;* supp. vol., *Archiv für Physiologie* [Leipzig], 1899, pp. 314–367.

Experiments were conducted in the municipal hospital at Urban in Berlin from 1895 to 1897, according to the Geppert-Zuntz method and with the apparatus recommended by Zuntz. The subjects included, besides adults, 16 boys from 2½ to 16 years old and 9 girls from 6½ to 14 years. Data for infants were borrowed from other investigators. The authors discuss and illustrate by tables the results of their research, the air exchange per person and kilogram for both sexes, also the air exchange as related to body surface and as affected by age and sex. Former investigations are considered in detail. Children showed the greatest gaseous metabolism. Females had a lower exchange than males only in childhood and old age. Bibliography.

656 **Margolis, Alexander:** "Zur Frage vom Einfluss der vermehrten Wasserzufuhr auf den Stoffwechsel des Säuglings" [Question of effect upon infant's metabolism of increased consumption of water]. *Wiener Klinische Rundschau*, vol. 26 (1912), pp. 593–595, 611–613, 627–629, 645–647.

The author studied four infants, ranging from 3 to 5 months in age, over several days, first on normal fare, then with a considerable amount of distilled water added to their diet. In each case body weights are given and a table on water, ash, nitrogen, and urea in the urine. The author says in conclusion that large amounts of water did not injure children, but also did not benefit them. Weight and general health were unaffected. Bibliography.

657 **Marsh, M. Elizabeth, and John R. Murlin:** "Energy metabolism of premature and undersized infants." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 310–320.

The subjects of this study were 21 premature and undersized infants, including 5 sets of twins. Procedure of the experiments and methods of calculating heat production are described in a previous article (Am. J. Dis. Child., vol. 29, 1925, pp. 1–28). In the case of premature infants the temperature of the box was kept slightly higher than in the case of normal, full-term infants. The results of 48 experiments and 82 individual periods are given in tabular form. The average basal respiratory quotient was low (0.74) through the fifth day, rose to 0.79 on the sixth day, was never above this figure through the ninth day. Basal metabolism averaged 6.48 calories per hour, or 26.25 calories per square meter (Lissauer), and 2.04 calories per kilogram per hour. Averaged by days of age, it showed a fluctuation during the first week, the lowest value on the seventh day. Increases in heat production with activity varied from 2.5 per cent with slight restlessness to 40.3 per cent when the child cried 39 per cent of the time. A few cases with variations in the amount of food showed a definite increase in heat production as the amount of food was increased.

658 **Mayerhofer, E., and F. Roth:** "Klinische Beobachtungen über die calorische Betrachtungsweise der Säuglingsernährung" [Clinical observations on the method of calculating infant nourishment in calories]. *Ztschr. f. Kinderh.* [Berlin], vol. 11 (1914), pp. 117–132.

The author discusses his experiences for over two years in feeding breast-fed and bottle-fed infants so as to attain the best weight increase. He follows Heubner's method of calculating calories and is much interested in determining the existence minimum, tolerance limit, and optimum in nourishment. The best energy quotient for one infant was 85.11 at the breast and 73.52 to 76.93 on the bottle. Another infant became ill on more than 87.9, and still another lost weight on more than 98. Infants incapable of motion lived on 51.7 and 64.5. One normal child gained weight with a quotient of 55.6. On the other hand, a syphilitic child required a quotient of 166.2, and an atrophic child 189.8; and two weak children failed to gain on exceedingly high quotients. A premature child, weighing 750 grams, required a quotient of 168.87, another a quotient of 133.7. Most normal infants showed such values as 95.4, 101.65, 119.4, 111.14, 139.16, and 148.5.

659 **Mensi, E.:** "Contributo allo studio del ricambio dell'azoto nei primi giorni di vita" [Data on the study of nitrogen metabolism in the first days of life]. *Giornale della Reale Accademia di medicina di Torino* [Turin], ser. 4, vol. 18 (1912), pp. 35–58.

An original study of the nitrogen metabolism of 19 infants from 2 to 8 days old fed on cow's milk diluted with sweet water. The author took into account in most of his cases only the nitrogen excreted with the urine in the form of urea. The purpose of the study was to find (1) the extent of nitrogen metabolism and (2) the normal assimilation of nitrogen, particularly in infants artificially fed. The author found that in 12 newborn infants the daily nitrogen balance was positive. He gives for each case sex and age, and also for each of three to eight days of observation, weight, quantity of food and nitrogen, amount of urine, urea, and metabolism of nitrogen. Fourteen cases were studied to solve the second problem; the extent of assimilation varied from 3 to 71 per cent. The author gives for each case the quantity of nitrogen produced, assimilated, and retained, and also the percentage of assimilation. Bibliography.

660 **von Mering, I.:** "Zur Frage der Säuglingsernährung" [Problem of infant nutrition]. *Therapeutische Monatshefte* [Berlin], vol. 16 (1902), pp. 173–176.

On the theory that cow's milk is harmful to nurslings not so much on account of albumin as on account of volatile fatty acids, which are 10 per cent in cow's unskimmed milk, and only 1.5 per cent in human milk, and which are split in the stomach, the author made up an infant food without these fatty acids, using for the fat mostly egg yolk and cocoa butter. The entire chemical analysis is given. This food was used by Zuntz and other physicians. Six double tests on six children from 4 months to 2 years old in the author's laboratory are described, as well as a metabolic test on himself.

661 **Meyer, Ludwig F.:** "Beitrag zur Kenntnis der Unterschiede zwischen natürlicher und künstlicher Ernährung" [Distinctions between natural and artificial nourishment]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vols. 23–24 (1906–7), pp. 122–129.

To verify his surmise that the difference in effect of human and cow's milk lies in the inorganic salts of the whey, the author made two mixtures—one of human whey with cow's fat and albumin, and one of cow's whey with human fat and albumin. He describes his methods in treating the two kinds of milk, the necessity of adding acid to make the human milk coagulate, and of adding sugar to the cow's milk whey. He experimented in a Berlin asylum for children on three young infants not sick but delicate. With the first milk combination (human whey and cow's fat and albumin) the infants thrived just as well as on normal human milk. With the second combination they were at once afflicted with digestive disturbances. The author, therefore, maintains that cow's milk injures human infants not on account of its casein but of its whey, which differs quantitatively and qualitatively in inorganic constituents from human whey.

662 ——— "Über den Wasserbedarf des Säuglings" [Water requirement of the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 5 (1912), pp. 1–30.

An account of experiments with 11 infants to determine the amount of water needed by the infant. The author found that in all cases addition of water to the diet brought about a gain in weight, but the quantity of water required and the amount of gain varied with individuals.

663 ——— "Zur Kenntnis des Mineralstoffwechsels im Säuglingsalter" [Study of mineral metabolism in infancy]. *Biochemische Zeitschrift* [Berlin], vol. 12 (1908), pp. 422–465.

A study made by the author to determine the effect of undernourishment and organic food constituents on mineral metabolism in infancy. Two healthy infants were observed. Many tables give data on food, excretions, absorption, and metabolism.

664 ——— and **Leo Langstein:** "Beiträge zum Fettstoffwechsel im Kindesalter" [Data on fat metabolism in childhood]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 21 (1904–5), pp. 71–81.

The authors tested three children, two of them 6 years old and one 14 years old, for about a week on a diet of albumin and fat without carbohydrates, determining acetone in the urine by the Messinger-Huppert titration method, acetone in the breath by Waldvogel's apparatus, oxybutyric acid in the urine by Magnus-Levy's method, nitrogen according to Kjeldahl, and ammonia in vacuum according to Reich. Three similar series were conducted, but not tabulated. The authors conclude that young children have a tendency to acidosis; most of the acetone is eliminated in the breath; oxybutyric acid is always to be found where carbohydrates are lacking; increase of ammonia elimination results from acidosis; a fat diet is injurious during any disturbance of carbohydrate metabolism.

665 ——— ——— Die Acidose des Säuglings [Acidosis of infancy]. *Jahrb. f. Kinderh.* [Berlin], vol. 63 (1906), pp. 30–35. See also *Verhandlungen der Gesellschaft für Kinderheilkunde*, 1905 [Wiesbaden], vol. 22 (1905), pp. 182–187.

To investigate the acidosis of infancy the authors fed healthy infants on a hunger diet, tea with saccharin, and examined the urine for acetone and am-

monia. They found that hunger, or lack of carbohydrates, causes an acidosis with increase of the ammonia coefficient. The watery feces of children with entero-catarrh they found to show a marked increase in volatile fatty acids and a high ammonia coefficient. They conclude that acidosis is a symptom, not a cause, of illness.

666 **Meyer, Selma, and Georg Stern:** "Über den Galaktosestoffwechsel im Säuglings- und Kleinkindesalter" [Galactose metabolism in infancy and early childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 68 (1920–21), pp. 241–254.

The authors studied the metabolism of galactose in children up to 6 years old, giving them 10 to 60 grams of galactose per os in 100 to 150 cubic centimeters of tea at midnight, the preceding meal being at 5 p. m. and the following of unsweetened tea at 9 a. m. Tables give age, weight, amount of galactose, and the elimination of it as found with the polarimeter and as corrected according to R. Bauer by being multiplied by 0.62. Fifteen tests were made for the first year, 15 for the second, 5 for the third, 12 for the fourth, and 16 from the fifth to the seventh year. Age seemed to have no effect on the elimination of galactose. In children of the first and second year it did not exceed 5 grams for a dose of 20 grams nor 3 for a dose of 40 grams. That is, the assimilation was neither greater nor less than that of the adult, nor was there any relation between elimination and body weight.

667 **Michel, Charles:** "Recherches sur la nutrition normale du nouveau-né; échanges nutritifs azotés et salins" [Researches in the normal nutrition of the newborn; nutritive exchanges of nitrogen and salts]. *Obstétrique* [Paris], vol. 1 (1896), pp. 140–158.

Report of observations of five infants, each observation lasting from three to six days. Average weight, quantity of milk consumed, quantity of urine and of feces, nitrogen in food taken, gain in nitrogen, salts, lime and phosphoric acid, and gain in weight are reported in detail in tabular form.

668 ——— "Sur le lait de femme et l'utilisation de ses matériaux nutritifs dans l'organisme du nouveau-né sain" [On human milk and the utilization of its nutritive materials in the organism of the healthy newborn child]. *Obstétrique* [Paris], vol. 2 (1897), pp. 518–533.

After a discussion of various analyses of human milk the author reports the result of 10 analyses of infants' stools made by himself by methods described in detail. He found that 100 parts of stools, dried at 100°, contained organic matter, 89.22 parts; mineral salts, 10.78 parts. Observation of seven infants over periods of four or five days as to quantity of milk taken, separated into its components, and feces, also analyzed, showed utilization of 96.11 per cent of the food taken; utilization of fat, 96.35 per cent; of nitrogenous material, 93.60 per cent; of mineral salts, 78.26 per cent; of lime, 59.42 per cent; of phosphoric acid, 91.63 per cent. References.

669 ——— "Utilisation des matériaux nutritifs du lait; comparison, chez le nourrisson, des deux modes d'alimentation: lait de femme et lait de vache" [Utilization of the nutritive material in milk; comparison in the nursling of feeding with human milk and with cow's milk]. *France médicale* [Paris], vol. 45 (1898), pp. 402–404.

A résumé of the author's work on utilization of human milk, followed by a similar investigation of the utilization of cow's milk. Examination of the stools of four infants receiving sterilized cow's milk showed that 93.60 per cent of the components of the milk were utilized (2.51 per cent less than is the case with human milk).

670 ——— and **Perret:** "Étude des échanges nutritifs azotés et mineraux chez un nourrisson de 2 mois ½" [A study of the nitrogen and mineral metabolism of a nursling 2½ months old]. *Bulletin de la Société d'obstétrique de Paris*, vol. 2 (1899), pp. 98–105.

A report of observation of the metabolism of an infant during three days. The breast milk was drawn into a glass before feeding, measured, and the sample analyzed. The daily amount of materials retained was found to be: Nitrogen, 0.784 gram; mineral salts, 0.526 gram; lime, 0.149 gram; phosphoric acid, 0.121 gram; chloride, 0.069 gram.

671 ——— ——— "La ration alimentaire de l'enfant depuis sa naissance jusqu'à l'âge de deux ans" [Diet of the infant from birth to the age of 2 years]. *Revue d'hygiène et de médecine infantiles* [Paris], vol. 5 (1906), pp. 477–662.

The author gives data on weight of infants at different ages, caloric requirements with relation to surface area, methods of feeding, etc.

672 **Moll, Leopold:** "Über Fettvermehrung der Frauenmilch durch Fettzufuhr nebst einem Beitrag über die Bedeutung der quantitativen Fettunterschiede für das Gedeihen des Brustkindes" [Increasing the fat of human milk through fat in food, with a contribution on the significance of different amounts of fat for the good health of the breast-fed infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 48 (1908), pp. 161–185.

The author describes in detail his study of the development of three young infants. The mother of one infant he fed with bacon having an iodine number

of 51. She was a slim woman who had always hungered for fat; both she and her child improved noticeably in general health during the periods she ate the bacon. A second infant did very poorly when drinking the milk of his mother or of a nurse with fat milk, but improved when nursed by a nurse having thinner milk. The contrary happened to the third infant. Tables give the figures obtained from the tests, especially in the instance first described.

673 **Monti:** "Über einige Ergebnisse der Frauenmilch-Untersuchung" [Some results of human-milk investigation]. *Arch. f. Kinderh.* [Stuttgart], vol. 13 (1891), pp. 1–31.

This article shows effect of mother's milk on infant's weight. Fourteen curves give weight of infant, age of mother, and specific gravity of mother's milk. In 250 out of 299 observations specific gravity fluctuated between 1.030 and 1.034, and in these cases the child's weight increased regularly. If the milk varies considerably, the child's development is disturbed. The relations between specific gravity of milk and mother's age and condition and complexion are also treated. Fat content of milk was determined in 412 cases; the results, also specific gravity and weight of children, are given in 12 tables.

674 **Moro, E.:** "Buttermehlbrei und Buttermehlvollmilch als Säuglingsnährung" [Butter-flour gruel and butter-flour with whole milk as infant food]. *Monatschr. f. Kinderh.* [Berlin], vol. 18 (1920), pp. 97–122.

The author gives 28 case histories with graphs, mostly pathological cases, of infants fed on butter-flour gruel and butter-flour with whole milk. The former is composed of 100 grams of milk, 7 grams of fine wheat flour, 5 grams of cane sugar, and 5 grams of fresh butter, boiled and given with a spoon. The second, administered when a fluid diet seemed desirable, is composed of 100 grams of whole milk, 3 grams of wheat flour, 7 grams of cane sugar, and 5 grams of butter. Especially interesting to the author was the relation of fat to carbohydrates (F : C=1 : 1.9 – 1.6).

675 **Morse, Arthur:** "The amino-acid nitrogen of the blood in cases of normal and complicated pregnancy and also in the newborn infant." *Bulletin of the Johns Hopkins Hospital* [Baltimore], vol. 28 (1917), pp. 199–204.

The author reports that in 18 normal infants the amino-acid nitrogen of the blood at birth varied between 10 and 15.8 milligrams to 100 cubic centimeters. Values for whole blood were higher than for plasma; the latter had 9.1 to 11.6 milligrams to 100 cubic centimeters.

676 **Morse, J. L.:** "A study of the caloric needs of premature infants." The *American Journal of the Medical Sciences* [Philadelphia and New York], new ser. vol. 127 (1904), pp. 463–477.

The original work in this article is based on a study of the feeding of six premature infants, carefully recorded as to calories ingested daily and average daily gain in weight within the first 160 days. The author concludes that the caloric need of premature infants is relatively greater than that of full-term infants. Bibliography.

677 **Müller, Erich:** "Beitrag zur Frage der natürlichen Nutzstoffe in der Frauenmilch" [Contribution to the problem of the natural nutriments in human milk]. *Berliner Klinische Wochenschrift*, no. 22, vol. 45, pt. 1 (1908), pp. 1058–1060.

The author experimented in feeding a premature child 3½ weeks old. Preparation I consisted of whey from human milk boiled, plus proteid and fat from unboiled cow's milk. Preparation II consisted of whey from cow's milk and proteid and fat from human milk. For 17 days the author gave the infant human milk and it gained 12 grams daily, then for 5 days, Preparation I, on which it gained 44 grams daily. For the next 14 days it was given Preparation II, whereupon it soon suffered from gastrointestinal disturbances and ceased to gain in weight. On again receiving Preparation I it gained 17 grams a day and gave every manifestation of perfect health. Results are presented in graphic form.

678 ——— "Stoff- und Kraftwechsel des Kindes in dritten bis sechsten Lebensjahr" [Food and energy exchange of the child from 3 to 6 years old]. *Jahrb. f. Kinderh.* [Berlin], vol. 66 (1907), pp. 503–513.

In the Orphanage of Frederick the Great at Kummelsburg the author tested the metabolism and strength of 32 boys and girls from 3 to 6 years old. They were all healthy, though in some cases below normal weight. This article describes the diet of the children, in which 14 out of 100 calories were from protein and 86 from fat and carbohydrates. Eighty-seven per cent of the nitrogen was digested. Reckoned daily per kilogram of weight the nitrogen consumption was 0.55 gram (3.44 grams of protein) and the intake of energy amounted to 104 calories. The author found that subtracting loss of nitrogen and energy, the nitrogen retained was 0.04 gram and the energy at the disposal of the body 93 calories. Of 100 calories consumed in the food 6 are lost in the feces, 4 in the urine. The average number of calories per day for each kilogram of body weight was found to be 83 for the maintenance and 87 for growth. The author gives other results of tests according to sex, age, appetite, and disposition. Reckoned daily per square decimeter of body surface, the calories consumed were 20.1; the losses in feces and urine, respectively, being 1.2 and 0.9, about 18 remained for use. Reckoned daily per kilogram of weight, the loss in insensible perspiration amounted to 48.6 grams.

679 **Müller, Erich:** "Stoffwechselversuche an 32 Kindern im 3. bis 6. Lebensjahre mit besonderer Berücksichtigung des Kraftwechsels auf Grund direkter calorimetrischer Bestimmungen" [Metabolism tests on 32 children in the third to the sixth year, with special regard to energy exchange on the basis of direct calorimetric determinations]. *Biochemische Zeitschrift* [Berlin], vol. 4 (1907), pp. 143–303.

In addition to discussing the work of other students the author describes his tests carried out with 23 boys and 9 girls between 3 and 6 years of age, representing many types. Each test lasted six days. The 13 articles of diet are enumerated, and data are given on amounts consumed at meals, methods of analysis, gain in weight, excretions, respiratory quotient, sleep, body surface versus metabolism, insensible perspiration, etc. In 17 of the children appetite was good, in 11 it was moderate, in 4 it was poor. Their nutritional requirements of 83 to 87 calories is more than the normal. A lower energy quotient was ascertained in the third and fourth years than in the fifth and sixth. Energy loss in feces amounted to 5.9 calories; energy value of digested food, 97.8 calories; energy loss in urine, 4.6; utilization by body, 93.2. Of 100 grams of nitrogen, 10 were eliminated in the feces and 80 in urine, and 10 were retained in the body. Bibliography.

680 **Müller, F.:** "Der Stoffwechsel des wachsenden Menschen" [Metabolism of the growing human being]. *Zentralblatt für Physiologie* [Leipzig and Vienna], vol. 28 (1914), pp. 749–752. [Sixth convention of German Physiological Society, Berlin, June 2–5, 1914.]

The author studied the metabolism of 36 children between 8 and 14 years belonging to the working class. Food was weighed and analyzed; nitrogen, fat, and caloric value were determined. The same children were studied at home and also for one to four months at a rural resort. Cases are discussed of normal increase in weight and of retarded weight. When at home the gross food consumption of a child per day was 74.7 calories per kilogram and 0.308 gram nitrogen per kilogram; at the resort, 88.5 calories per kilogram and 0.390 gram nitrogen per kilogram. When at home exchange was liveller in April and May than in summer and fall. At the resort an unusually rainy spring kept children in doors so that activity was much limited.

681 **Murlin, John R.:** "A respiration incubator for the study of the energy metabolism of infants." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 43–58.

Description of an electric incubator, devised by the author in collaboration with other experimenters to secure perfect control of the temperature to which a child is exposed during studies of metabolism. The mechanism of the apparatus is fully explained, and control tests with animals and burning alcohol are described in detail.

682 ——— "The energy metabolism of infants in relation to age and nutritive condition." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 12 (1914–15), pp. 15–16.

From studies by various investigators of heat production of infants, of which details are not given, the author concludes that 2½ calories per kilogram an hour may be regarded as the average normal heat production of sleeping infants between the ages of 2 months and 1 year.

683 ——— **Ruth E. Conklin, and M. Elizabeth Marsh:** "Energy metabolism of normal new-born babies." *Am. J. Dis. Child.* [Chicago], vol. 29 (1925), pp. 1–28.

A study of two problems: (1) The amount of the specific, dynamic action of food; and (2) the effect of crying on the energy exchanges. Because of the difficulty of obtaining complete muscular repose in an infant without food the authors define as "basal" the metabolism during quiet sleep soon after feeding. Two hunded and thirty-four observation periods on 50 newborn infants, ranging in age from 6 hours to 15 days are recorded. Of this number, 98 periods with 38 infants may be described as truly basal; i. e., when the infant slept quietly throughout. The average basal metabolism for these 38 was 2 calories per kilogram, and 29.16 calories per square meter (Lissauer), per hour. Respiratory quotient in these basal periods ranged from 0.66 to 1.16. Basal heat production was highest in the second 24 hours, falling gradually, on the basis of surface, to the sixth day, when it again rose steadily. Practically no correlation was found between heat production and pulse rate. In the average infant, active, healthy crying required just as much again expenditure of energy as the basal (sleeping) metabolism. The respiratory quotient, accurately determined, was found to be an index of the state of nutrition. The dynamic action of ordinary feedings, or of supplementary feedings of lactose and dextrose solutions within the first eight days, was very small. The increase in the basal heat production due to addition of 24 grams of food or of sugar solutions to a feeding of 26.7 grams, was approximately 7 per cent. The article contains elaborate tables and many references.

684 ——— **and B. R. Hoobler:** "The energy metabolism of ten hospital children between the ages of two months and one year." *Am. J. Dis. Child.* [Chicago], vol. 9 (1915), pp. 81–119.

Noting from studies of energy requirements that thin infants produced more heat per unit of surface and much more per unit of weight than fat infants observed under the same conditions, the authors made a study of 10 infants from 2 to 12 months of age, varying from the last stage of marasmus to con-

siderable overweight, to discover the significance of this fact. The Murlin respiration incubator was used for the experiments. All processes are described in detail; and records of the periods of observation are given in tabular form, showing muscular activity, pulse and respiration rate, and calories produced per hour. The approximate specific gravity was determined by Kastner's method in the hope that it might serve as a measure of proportion of fat to active tissue. The authors conclude that this specific-gravity determination is valueless; that almost identically the same average heat production per unit of weight and per unit of surface is obtained when all the infants between 2 and 12 months in this series and in the series of Howland, Benedict, and Talbot are compared; that the average deviation from the mean on the basis of weight for all these children is 12.1 per cent and on the basis of area (Meeh) 11 per cent; that there seems to be no sufficient reason for estimating food requirements on the basis of area rather than weight. References.

685 **Murschhauser, Hans:** "The fasting metabolism of infants." *Bost. M. & S. J.*, vol. 171 (1914), pp. 185–191.

The author, with Doctor Schlossmann, conducted several experiments on infants in order to determine their fasting metabolism. In this article are given only typical examples. Four experiments are reported, one with a breast-fed infant and three with bottle-fed infants, the fasting period lasting from 48 to 60 hours. All details of body weight, elimination of nitrogen, water balance, and respiratory exchange are recorded, as well as elimination of acetone and B-oxybutyric acid. The author found the metabolism greatly increased in the first few hours of fasting, and supplied largely by carbohydrate combustion; 28 hours after feeding, carbohydrate combustion was diminished and fat largely drawn upon, a condition which became more evident as the fast was prolonged.

686 **Neff, F. C.:** "Recent experiences in the artificial feeding of 100 infants during the first three months of life." *J. A. M. A.* [Chicago], vol. 57 (1911), pp. 2068–2071.

The author noted his experiences in feeding 100 foundlings in a maternity home during the period of one year and drew the following conclusions: (1) The average length of time for regaining initial weight is 11 days; (2) rectal temperature in infants under 6 months averaged 98.6° F., 99° F., or above, probably pathologic; (3) peptonization of milk in the newborn showed no advantage, but it occasionally helped older infants; (4) buttermilk, skimmed milk, malt soup, and casein milk were useful in specific conditions which the author describes; (5) maltose answered the sugar requirements. References.

687 **Netter, M. L.:** Éxchanges nutritifs dans l'allaitement artificiel [The Nutritive Exchanges in Artificial Feeding]. Paris, no. 483, 1900. 78 pp.

Thesis for medical degree (University of Paris). The original work consists of observations of the nutritive exchanges of seven normal infants fed with sterilized milk, the urine and feces having been collected for a period of three or four days at each experiment. All processes are described with care, and results of observations are tabulated. The author found that in nurslings aged 7 to 10 months fed with pure sterilized milk, the quantity of urine excreted, related to time and weight, is about the same as that of breast-fed infants; density, and content of nitrogen, lime, and phosphoric acid are greater. The feces are most abundant in artificial feeding. Gains in nitrogen, lime, and phosphoric acid are about the same; gain in weight is greater with breast feeding. Bibliography.

688 **Niemann, Albert:** "Der Gesamtstoffwechsel eines künstlich genährten Säuglings mit Einschluss des respiratorischen Stoffwechsels" [The total metabolism of an artificially-fed infant, including the respiratory exchange]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 74 (1911), pp. 22–70, 237–251, 650–683.

At the Children's Clinic of Berlin University in 1910 the author conducted four complete metabolic tests covering 36 days, upon a healthy bottle-fed male infant, born October 10, 1909, and fed at the breast for 4 weeks. Each day the child remained in the Volt-Pettenkofer respiratory apparatus from 6 p. m. (except for short intervals at 10 p. m., 6 a. m., 10 a. m., and 2 p. m.) until toward 5 p. m. the next day and was evidently healthy and happy throughout the experiment. The baby drank buttermilk during the first test of 7 days in January, skim milk during the second test of 6 days in March, meal decoction during the third test of 6 days in June, and full cow's milk during the fourth test of 17 days in July. The author gives full data in tables and discussion on carbon dioxide and water, on digestive exchange of food, feces, urine, nitrogen and calcium balance, caloric values, and water balance. The infant showed good assimilation and growth (except in the matter of water) and a remarkable similarity in metabolism throughout the four experiments, about 1,300 calories per day and square meter. The author believes that an artificially-fed infant excretes relatively more carbon dioxide and water than a breast-fed infant and that Heubner's energy-quotient theory is correct.

689 ——— "Der respiratorische Gaswechsel im Säuglingsalter" [The respiratory exchange in infancy]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 11 (1913), pp. 32–71.

A compilation on the gaseous exchange of the infant. The Pettenkofer apparatus is described as well adapted for testing carbon dioxide and vapor, and the Reynault-Reiset for testing oxygen consumption. Discussion and

tables are devoted to respiratory experiments on infants by Rubner, Heubner, Niemann and Schlossmann, and Murschhauser. From his own and other studies the author calculates the hourly carbon-dioxide elimination of a breast-fed child to be 13.5 to 15.5 grams per square meter of surface area and for an infant fed on cow's milk to be 17 to 18 grams. The author discusses also the relations between vapor production and urine secretion, and the respiratory quotient. Bibliography.

690 **Niemann, Albert:** "Die Kalkbilanz eines künstlich genährten Säuglings" [Lime balance of an artificially nourished infant]. *Jahrb. f. kinderh.* [Berlin], new ser. vol. 75 (1912), pp. 533–539.

Interested in the results found by Kochmann, from experiments with dogs, that fat and casein in the diet increase the elimination of carbon dioxide in feces, the author tested a healthy, normal infant of 10 months on three diets. For 8 days it received a moderate amount of fat, on days 9 to 11, a deficient amount, and on days 12 to 17, an excessive amount. In every case it drank 1 liter of milk daily. Both food intake and excretions were chemically analyzed for nitrogen, carbon dioxide, fat, sugar, and ash. The variation of fat percentage in the liter of milk was ascertained to have no effect on the elimination of calcium oxide in urine and feces, and the lime balance remained positive. A younger child, the author suggests, might not show so favorable a reaction to fat.

691 ——— "Über den Purinstoffwechsel des Kindes. I. Mitteilung: der Purinstoffwechsel beim Säugling" [The purin metabolism of the child. I. The purin metabolism in the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 71 (1910), pp. 286–295.

The author was especially interested in the uric-acid excretion, the endogenous uric-acid values, and nuclein given in the food. He tested the relation of the uric-acid nitrogen to the total nitrogen by the Krüger-Schmidt method, which permits determining the uric acid and purin bases separately. His first tests were on three normal newborn infants nourished on extracted human milk, wherefrom it appears that the endogenous uric-acid and bases elimination reckoned per kilogram of body weight is in the infant double that of the adult, but otherwise is like that of the adult both in the concentration of urine and in the relation of the bases to the uric acid. In his further tests on one of the above infants fed on extracted human milk and two artificially fed children of 8 and 13 months the author experimented with nucleic acid in the food. It did not increase the purin bases nor change the number of leucocytes. The exogenous uric-acid elimination was 28 per cent, like that of adults. The article contains five tables.

692 ——— "Über die Möglichkeit einer Fettanreicherung der Säuglingsnährung" [The possibility of adding fat to infant food]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 79 (1914), pp. 274–287.

The author gives four case histories and graphs for infants with whom he tried diets containing special kinds and amounts of fat, and discusses the relative merits of various fats for infants.

693 ——— "Zur Physiologie der Ernährung an der Brust" [Physiology of nourishment at the breast]. *Charité-Annalen* [Berlin], vol. 35 (1911), pp. 235–246.

Author gives table and two graphs of breast milk and buttermilk given for four months to one infant and a graph of breast milk fed during one month of observation to the other. The energy quotient of the infant fed on a mixed diet was first 120, then 100 calories; that of the infant nursed at the breast was much higher.

694 ——— **and Käte Foth:** "Für und Wider die Buttermehlnährung" [For and against butter-flour food]. *Jahrb. f. Kinderh.* [Berlin], vol. 93 (1920), pp. 137–155.

The authors recount their experience covering two years in feeding 62 infants with butter flour. Their failures with this form of nourishment amounted to 11 per cent and with ordinary mixtures to 50 per cent. They mixed the cow's milk and flour in the proportion of three to four except for weak newborn infants. With this diet they noticed no especially rosy color in the children, as observed by other investigators, but a resistance to lung infections and infectious diseases. However, the butter-flour food they claim to be only a food, not a medicine. They warn against overfeeding. The effect in a few cases is described.

695 **Nobécourt, P., and G. Schreiber:** "Les sucres dans l'alimentation du nourrisson" [Sugars in infant food]. *Paris médical*, vol. 5–6 (1911–12), pp. 23–29.

The author discusses the action of different sugars on infants, considering a normal, excessive, and deficient amount in the case first of a healthy infant and then of one having poor digestion. The natural quantity of lactose is completely absorbed by a normal infant but appears in excretions of a subnormal one. Large doses produce diarrhea; small doses, underweight. Since there is 7 per cent lactose in human milk and only 5 per cent in cow's milk, sugar must be added to the latter when given to infants. But commercial lactose is expensive and often impure; maltose is not beneficial; glucose is harmful; cane sugar is to be favored.

696 **Nothmann, Hugo:** "Beitrag zur Zuckerausscheidung im Säuglingsalter" [Contribution to sugar elimination in infancy]. *Ztschr. f. Kinderh.* [Berlin], vol. 2 (1911), pp. 503–518.

The author lays great stress upon sugar as a factor in irregularities in digestion and places the seat thereof in the intestine. The results of numerous experiments upon six young infants are given in tables showing weight, sugar intake, and urinalysis for sugar. The author finds that the limits of assimilation of sugar vary greatly for children of the same age; that they rise in general in the first few weeks but after the first months change little. During this early period premature infants differ little from normal infants in this respect.

697 **Olin, Hanna:** Über die Kohlenstoffabgabe bei Knaben im Alter von 10 bis 18 Jahren" [Elimination of carbon in boys from 10 to 18 years of age]. *Skandinavisches Archiv für Physiologie* [Leipzig], vol. 33–34 (1915–16), pp. 114–440.

Since the conclusion of Sondén and Tigerstedt that elimination of carbon in growing boys depends not only on body surface but also on age, does not agree with conclusions of Camerer, Rubner, Benedict and Talbot, Murlin and Hoobler, the author investigated elimination in healthy schoolboys from 9 to 19 years of age belonging to the better classes of Helsingfors. Each one, after a light breakfast, was tested while sitting reading from 9 to 11 a. m. Tables covering six pages show age, weight, height, elimination of carbon, and deviation from mean of 200 boys. Five pages of tables give age, weight, body surface, and carbon excretion per kilogram of body weight and square meter of body surface of each of 162 boys for two hours. The author concludes that in boys between 10 and 18 elimination of carbon not only depends on body surface but decreases with age.

698 **Oppenheimer, Karl:** "Über das Verhältnis des Nahrungsbedarfes zu Körpergewicht und Körperoberfläche bei Säuglingen" [Relation between food requirements of infants and their weight and surface areas]. *Zeitschrift für Biologie* [Munich and Berlin], vol. 42 (1901), pp. 147–160.

In this article, containing 10 tables, the author from personal observations compared with the results of others, shows that nourishment required by an infant depends neither on age nor on weight but on body surface; i. e., the Rubner law includes children. To obtain the amount of food consumed children were weighed on decimal scale before and after nursing, and for the surface measurements Camerer's table according to Meeh's formula was used.

699 ——— "Über den Nahrungsbedarf debiler Kinder" [On the nutritional requirements of delicate children]. *Monatschr. f. Kinderh.* [Leipzig], vol. 6 (1907), pp. 92–99.

An account of the feeding under the author's supervision of three delicate artificially fed infants who were underweight at birth. This experimental feeding lasted 2½ months in the first case, 5 in the second, and 8 in the third. The author gives the history of the development of the children, including their weight and the quantity of food taken, and concludes that in proportion to their weight they need more food than children of normal weight. His findings agree with those of several other writers whom he quotes. Bibliography.

700 ——— "Über den Nahrungsbedarf künstlich ernährter Säuglinge" [Nutritional requirements of artificially-fed infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 50 (1909), pp. 355–384.

The author gives details on the nutritional requirement of four artificially fed infants, three of the cases being in private practice. Weights of meals and daily body weight were taken by parents. In connection with them the author made 31 milk analyses between May 30 and December 2, 1908. Six tables and three curves contain data on age, weight, calories, energy quotient, etc. Development of these four children is compared with that of children observed by other students. The author is convinced of the efficacy of full milk after first month of life. Bibliography.

701 ——— "Über Säuglingsernährung durch unverdünnte Milch" [Infant nourishment on undiluted milk]. *Arch. f. Kinderh.* [Stuttgart], vol. 31 (1901), pp. 321–358.

The author discusses the progress made by 11 healthy children and 48 children who were ill, fed with undiluted cow's milk. Graphs and tables are given.

702 **Orgler, Arnold:** "Beiträge zur Lehre vom Stickstoffwechsel im Säuglingsalter" [Contributions to the knowledge of nitrogen metabolism in infancy]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 7 1908–9), pp. 135–142.

From experiments on three convalescent infants put on artificial diet after a natural diet, for which he gives tables of nitrogen in food, urine, feces, and nitrogen retained and absorbed, the author concludes that on a suitable artificial fare the nitrogen retention can be even better than on a natural diet and the utilization almost as good. Tests on one child with a large and one child with a small intake of nitrogen showed a difference of only 0.008 gram of nitrogen in the feces. Addition of fat to the diet did not favor the assimilation of albumin.

703 **Orgler, Arnold:** "Der Eiweissstoffwechsel des Säuglings" [Protein metabolism of the infant]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 2 (1908), pp. 464–520.

This comprehensive article reviews studies made by the author and others on protein metabolism. Thirty-nine tables are given. The metabolism of fats, carbohydrates, and ash is also considered, and the metabolism of artificially-fed and breast-fed infants.

704 ——— "Der Kalkstoffwechsel des gesunden und des rachitischen Kindes" [Calcium metabolism of the healthy and the rachitic child]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 8 (1912), pp. 142–182.

A comprehensive survey including a discussion of the calcium requirement of the infant, lack of calcium in the diet, calcium metabolism of the infant, influence of albumin and of fat on calcium asbsorption, also of carbohydrates, of salts, and of various components in diets. Many tables and a bibliography are included.

705 **Ostrowski, Stanislaus:** "Zur Frage über Urobilinurie und Urobilinogenurie bei Brustkindern" [Question of urobilinuria and urobilinogenuria in breast-fed children]. *Jahrb. f. Kinderh.* [Berlin], vol. 76 (1912), Supp. vol., pp. 645–653.

The author studied urobilinuria and urobilinogenuria in breast-fed infants between 1 month and 1 year in age. The former was studied in 91 children according to Schlesinger's method, the latter in 1,923 children according to Ehrlich's method. Of the 12 entirely healthy children 3 showed a weak Ehrlich reaction, 1 a weak Schlesinger reaction. Among the others, more or less sick, urobilinogen was positive in 38.9 per cent and urobilin in 19 per cent. The author discusses the origin and metabolism of urobilin and urobilinogen in the organism and reviews former literature on the subject. Bibliography.

706 **Paffenholz:** "Beitrag zur Kenntnis der Nahrungsmengen natürlich ernährter Säuglinge" [Contribution to the knowledge of amounts of food taken by breast-fed infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 37 (1903), pp. 104–122.

The author investigated amounts of mother's milk taken at each meal by his own healthy children, his first child being a girl born in 1898 and his second a boy born in 1899. The 3,500 weighings made by the parents fill 14 pages of tables. They cover the first 19 weeks of life until the milk secretion failed and the infants were weaned. Other tables condense facts on body weight and food intake and compare such figures with those for twins born in 1902. The author's own children received six meals a day, at 6 and 10 a. m., and at 1, 4, 7, and 10 p. m.

707 **Passini, Fritz:** "Beitrag zur Ernährung frühgeborener Kinder" [Data on the nourishment of premature children]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 49 (1899), pp. 411–424.

The author describes in detail the care bestowed upon 15 premature infants, of whom 5 died. On entering the clinic they weighed 1,220 to 1,800 grams, were chilled, and were not expected to live. When they attained a weight of 2,200 to 2,300 grams they were removed from the apparatus and placed in a temperature of 18° R. They were about 2,600 grams in weight when taken home. Most of this article discusses their nourishment. In the beginning they were fed on human milk, extracted artificially until the infants could be taught to nurse. Varying success with different preparations is also described. There is one full table on the 15 subjects.

708 **Peiser, Amalie:** "Vergleichende Untersuchungen über den Stoffumsatz bei Ammenmilch und Eiweissmilch mit besonderer Berücksichtigung des Schwefelhaushaltes" [Comparative investigations on metabolism of human milk and protein milk with special consideration of sulphur]. *Jahrb. f. Kinderh.* [Berlin], vol. 81 (1915), pp. 437–454.

Three infants, 3, 6, and 7 weeks old, apparently healthy, though two later developed rachitis, were tested on human milk and protein milk for the metabolism of nitrogen, ash, lime, phosphorus, and sulphuric acid. Methods and data of the experiments are explained in detail. Food elimination and retention of each child on each kind of milk are shown in tables on nitrogen, on ash, on carbon dioxide, on phosphorus pentoxide, sulphur trioxide, etc. There are eight tables and three curves. Protein milk is relatively harmless because the mineral acids are eliminated in the feces.

709 **Perret, M.:** "Quantités de lait que doivent prendre au sein de leur mère les nouveau-nés à terme" [The quantities of milk which infants born at term should receive at the mother's breast]. *Obstétrique* [Paris], vol. 8 (1903), pp. 435–441.

The author observed and recorded in tabular form the quantities of milk taken during the first 10 days of life by 45 normal infants weighing at birth about 3,000 grams. Because of differences in the nutritive value of milk and the assimilative powers of infants, he finds the resulting values suggestive only. References.

710 **Peters, H.:** "Über die Grösse der Einzelmahlzeiten der Säuglinge bei natürlicher Ernährung" [The food intake at a single meal of the breast-fed infant]. *Arch. f. Kinderh.* [Stuttgart], vol. 33 (1902), pp. 295–338.

In connection with a discussion of the value of mother's milk and the danger of overfeeding infants the author gives several pages of tables of the amount of milk taken at each meal by 30 infants.

711 **Pfersdorff, F., and K. Stolte:** "Über die Ausnutzung von Mehl- und Griessbreien beim Säugling" [Utilization of porridge and gruel by the infant.] *Monatschr. f. Kinderh.* Originalien [Leipzig and Vienna], vol. 11 (1912–13), pp. 476–480.

The author tested the utilization of porridge versus gruel, both made from wheat flour, upon two healthy infants of 5 and 6 months. Chemical analyses of nitrogen, carbohydrates, ash, and calories in the food and excretions are shown in tables. The assimilation of both foods was good, and the author concludes that the use of gruel is almost identical in effect with that of a concentrated preparation of flour.

712 **Philippson, Paula:** "Über die Entwicklung junger Säuglinge bei künstlicher Ernährung" [Development of young infants when fed artificially]. *Monatschr. f. Kinderh.* Originalien [Leipzig and Vienna], vol. 12 (1913–14), pp. 157–176.

This article treats the artificial feeding of infants brought to 1 of 11 "public consultation offices for infants and mothers" founded in Frankfort on the Main. Most of the infants were illegitimate, born in public lying-in institutions, nursed for 8 to 10 weeks, and brought to the consultation offices from about their third to about their twentieth week. The food consisted of cow's milk, 100 grams to 1 kilogram of weight, and five meals a day, with 1 teaspoonful of sugar to an 18-centimeter bottle dilution, according to stools. Twenty-three graphs with descriptions are given of 23 children treated in 1912, of whom 2 died before February, 1913, and a large table of 12 children treated in 1911. The percentage of infant mortality for the whole of Frankfort was 12.4 for 1911, 10.2 for 1912; for the children brought to the consulting offices 4.6 for 1911 and 2.48 for 1912.

713 **Pierra, L.:** "Les échanges chlorures chez le nouveau-né" [Chloride exchange in the newborn]. *Pédiatrie pratique* [Lille], vol. 3 (1905), pp. 114–118.

A résumé of the results of an investigation reported more in detail in the author's "Note sur l'absorption, l'élimination et l'utilisation du chlore chez des nouveau-nés sains" (Société d'obstétrique de Paris, 16 mars, 1905). From observations of six normal newborn infants, aged 6 to 23 days, the author estimated that during the first months an infant gaining 15 grams daily retains approximately 10 centigrams of sodium chlorid.

714 **von Pirquet, C.:** "Die einzelnen Nahrungsstoffe" [The various elements of diet]. *Ztschr. f. Kinderh.* [Berlin], vol. 14 (1916), pp. 449–472.

In connection with a description of the infant's diet the author describes experiments with four infants that seemed to prove that fat can be replaced with carbohydrates in the infant's diet without affecting his weight and development.

715 ——— "Über Nahrungsbedarf und Gewichtszunahme der Säuglinge" [Nutritional requirement and weight increase of infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 18 (1918), pp. 274–296.

In addition to a presentation of his own studies the author considers the work of Ahlfeld, Haehner, Laure, Feer, Czerny-Keller, Heubner, and Samelson. Topics treated are absolute amount of food in the first 40 weeks, amount of food versus body weight, and nutritional requirement. Tables and seven curves are included and mathematical formulas are given.

716 **Pritchard, Eric:** "The food requirements of infants." *British Journal of Children's Diseases* [London], vol. 11 (1914), pp. 49–62.

With the idea that standards of food requirement established by measuring the amount of food consumed by infants of the well-to-do classes are too high for infants of the slums, the author gave a test meal, or several test meals, to each breast-fed infant brought to his clinic during eight years. From the evidence thus collected he constructed tables which indicate that infants of the slums, because of environmental conditions, require less food than those more fortunately situated, and that this fact should be taken into account in artificial feeding.

717 **Pusch, Hans:** Über die Gärungsverhältnisse und den Eiweissgehalt der Faeces gesunder und kranker Kinder im ersten Lebensjahr [Fermentation and Protein Content of Feces of Healthy and Sick Children in the First year]. Bonn, 1898. 18 pp.

An inaugural dissertation (University of Bonn). The author studied utilization of carbohydrates and of albumin from 52 stools of healthy and sick children in the first year of life. Methods of analyzing feces are carefully given. Of the five detailed tables one gives data on 10 healthy, breast-fed infants between 6 and 11 days old; another, data on 10 healthy infants older and bottle fed; and a third, data on 10 healthy infants beginning to eat solids.

718 **Reiche, Adalbert:** "Calorienbedarf und Energiequotient bei Kindern von der Geburt bis zum 15. Lebensjahre berechnet nach dem Streckengewicht" (Caloric requirement and energy quotient in children from birth to the fifteenth year, reckoned according to length and weight). *Ztschr. f. Kinderh.* [Berlin], vol. 15 (1916–17), 313–317.

The author suggests calculating the energy requirement by multiplying $\frac{\text{weight}}{\text{height}}$ by 7 by 0.7. In one table he presents the following data he has obtained for 25 children, varying in ages from birth to 15 years: $\frac{\text{Weight}}{\text{height}}$, milk required by nurslings, total caloric requirement, and energy quotient. In another table he shows the caloric requirement as calculated by Camerer, Siegert, Uffelmann, and others, and comments on the agreement with his figures, calculated by the formula given. An addition of 30 per cent must be made for the working organism, also when the caloric requirement is calculated from the relation of weight and surface to carbon-dioxide production and oxygen consumption.

719 **Reusing, H.:** "Beiträge zur Physiologie des Neugeborenen" [Contributions to the physiology of the newborn infant]. *Zeitschrift für Geburtshülfe und Gynäkologie* [Stuttgart], vol. 34 (1896), pp. 40–50.

In tests on 42 pregnant women the author found that methylene-blue given in capsules appears in the urine one-half to one hour after administering and disappears two to four days after the last dose. In the case of infants it is not excreted so quickly. From analyses on 20 breast-fed infants the author found that both relatively and absolutely the amount of methylene-blue increased up to about the third day. The reason is that the breast-fed infant during the first few days of extrauterine life ingests very little liquid. As soon as the balance of water metabolism is established he eliminates foreign matters. Urea and uric acid at this time appear not only in larger quantity but also in stronger concentration.

720 **Reyher, Paul:** "Beitrag zur Frage nach dem Nahrungs- und Energiebedürfnis des natürlich ernährten Säuglings" [Contribution to the question of the breast-fed infant's requirements in nourishment and energy]. *Jahrb. f. Kinderh.* [Berlin], vol. 61 (1905), pp. 553–600.

A study was made by the author of his own healthy child, who weighed 3,290 grams and was 50 centimeters long at birth. She was breast fed for 183 days, then received a mixed diet and later only cow's milk. Three thousand five hundred weighings were made. The amounts of milk drunk at every meal for 268 days are given. Two curves give the child's growing weight and her energy quotient. A table shows the chemical analysis of the mother's milk. Tables present the daily and weekly amounts of food consumed, with calories, energy quotient, and body weights. Although the child drank less than the usual amount of milk the energy quotient corresponded to the figures established by Heubner. Where the breast glands are not very productive the milk seems to have a relatively high value in calories.

721 **Richet, C.:** "Observations calorimétriques sur des enfants" [Calorimetric observations on children]. *Comptes rendus hebdomadaires des séances de l'Académie des Sciences* [Paris], vol. 100 (1885), pp. 1602–1604.

The author studied the calorimetry of 15 girls, aged 2 to 4 years, in the calorimeter of his own invention (calorimètre à siphon). The duration of experiments was one hour. Results are tabulated.

722 ——— "Recherches de calorimétrie" [Researches in calorimetry]. *Archives de physiologie normale et pathologique* [Paris], ser. 3, vol. 17 (1885), pp. 237–291.

An article in five parts: (1) Historical; (2) description of the author's siphon calorimeter and of various experiments performed therewith; (3) influence on heat production of the size or weight of the animal; (4) influence of the external temperature; (5) influence of body covering. The author's calorimeter was adapted only to experiments with small animals, and most of the reported results are for guinea pigs, rabbits, birds, etc. His work, however, included several experiments with infants, for whom he constructed a special calorimeter, and results of these experiments are carefully recorded.

723 **Riebesell, P.:** Über die Wachstums- und Ernährungsgesetze des Menschen" [Laws of the growth and nutrition of man]. *Berliner Klinische Wochenschrift*, vol. 53, pt. 2 (1916), pp. 1338–1339.

The author evolves several equations for weight, height, body surface, and amount of nourishment required, and compiles a table according to age, of weight requirement in calories and albumin and relation between starch and albumin.

724 **Rietschel, Hans:** "Zur Kenntnis des Kreatininstoffwechsels beim Säugling" [The knowledge of creatinine metabolism in the infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 61 (1905), pp. 615–623.

After discussing the little that is known of creatinine, endogenous and exogenous, as affected by diet and muscular activity, and the identity of creatinine in muscle and in urine, the author describes his efforts to investigate creatinine in infant metabolism. He made 20 microscopic and Weyl

reaction tests on the urine of 15 children. Creatinine was detected in cases of fever or where it was given by mouth but could not be detected certainly at other times.

725 **Rietschel, Hans:** "Zur Technik der Ernährung der Brustkinder in den ersten Lebenswochen" [Technique of feeding children at the breast during the first weeks]. *Jahrb. f. Kinderh.* [Berlin], vol. 75 (1912), pp. 403–434, 601–617.

After recounting how Czerny and Keller and other writers have struggled to reduce the number of meals given daily to infants from 8 or 10 to 5 the author adduces cases in which the giving of only 5 or 6 meals daily has been injurious to young nurslings. For instance, Pies found that under this system only 11 per cent of 96 infants had attained birth weight by the tenth day; Fraugh, only 34 per cent of 1,000 children on seventh day; and Opitz only 20 per cent of 819 children on the ninth day. The author experimented on many children for short periods in the Infant Home at Dresden over a period of two years, having them fed eight times a day for a while and then five times. Data are presented for 73 cases. Graphs.

726 **Rissmann and Pritzsche:** "Über Säuglingsernährung" [Infant nutrition]. *Arch. f. Kinderh.* [Stuttgart], vol. 34 (1902), pp. 249–271.

The authors discuss artificial infant feeding in detail. Figures on weights of 19 infants fed on full cow's milk are given. Experiences of other authors are discussed and shown in tables. One infant's progress is followed up to the thirteenth month. Eight tables are given.

Roberts, Lydia: Children of Preschool Age in Gary, Indiana. Pt. II. Diet of the Children. *See* Children's Bureau.

——— The Nutrition and Care of Children in a Mountain County of Kentucky. *See* Children's Bureau.

727 **Röckemann, Wilhelm:** "Die Beeinflussung der Chorausscheidung durch Phosphorsäurezufuhr" [Effect on elimination of chlorine through administration of phosphoric acid]. *Arch. f. Kinderh.* [Stuttgart], vol. 72 (1922–23), pp. 161–171.

Four children, 5, 9, 10, and 12 years of age, were tested to determine effect of phosphates on elimination of chlorides. They were kept quiet in bed and given a plentiful diet. Phosphates and chlorides in food and feces were determined according to Neumann's method; in the urine chlorides were determined according to Volhard and the phosphates according to Embden (gravimetric method) or according to Volhard (uranyl process). A table and a graph for each subject give results. An intake of sodium hypophosphate causes decreased chloride elimination.

728 **Rommel, Otto:** "Über Buttermilch" [Buttermilk]. *Arch. f. Kinderh.* [Stuttgart], vol. 37 (1903), pp. 252–265.

After showing through chemical analysis that mother's milk and buttermilk are diametrically opposite, the author goes thoroughly into the composition of buttermilk and its digestibility, its calcium balance, etc. He describes two metabolism experiments for two days each, with fresh skimmed milk and with buttermilk on a 5½-months-old infant. Both milks were mixed with 15 grams of wheat meal and 60 grams of cane sugar to 1 liter of milk. The food and excretions were analyzed and the nitrogen balance and mineral metabolism are given in detail. With the skimmed milk the infant gained 70 grams a day, with the buttermilk 85 grams.

729 ——— "Über Dauerwägungen an Säuglingen" [On measurements of infants]. *Verhandlungen der Versammlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 23 (1906), pp. 175–176.

The author explains concretely and concisely the measures taken for the care of infants in the Munich Home for Infants. He also presents two elaborate graphs denoting nourishment, urine, feces, vomiting, perspiration, temperature of body and room, humidity, sleep or waking, restlessness, etc. From these studies on a breast-fed child and an artificially-fed child he concludes that insensible perspiration is dependent on (1) age and individuality of the child; (2) the condition of the child (it is greater when the child is restless and decreases when the child is quiet); (3) the nature of the food (breast feeding produces a decrease and artificial feeding an increase); (4) temperature and humidity, to both of which delicate children are particularly susceptible.

730 **Rosenbaum, S.:** "Über fettarme und fettreiche Säuglingsernährung" [Infant diet, poor in fats and abundant in fats]. *Monatschr. f. Kinderh.* [Leipzig], vol. 27 (1924), pp. 442–445.

An account of experiments made by the author with three sets of twins for the purpose of determining the effect of fatless diet on the infant. Each set of twins was several weeks old at the time of the beginning of the test which lasted in every case 2½ months. One of the infants of each set was given a normal amount of fat; the other was kept on a fatless diet. In one set only did the weight increase in the same way for both twins; in the second set the infant kept on the fatless diet died of pyelitis complicated by abscesses of the kidney; in the third set the infant kept on a fatless diet, who was underweight even before that, developed a serious form of atrophy which could not be cured even after a return to a diet abundant in fat. The author concludes that in cases of infants of low resistance withdrawal of fat from the diet for a considerable length of time brings about serious consequences.

731 **Rosenstern, Iwan:** "Zur Frage der zuckerarmen und Fettreichen Ernährung" [The question of diet poor in sugar and rich in fat]. *Ztschr. f. Kinderh.* [Berlin], vol. 2 (1911), pp. 481–490.

To investigate the function of sugar in the nourishment of infants the author conducted two series of experiments on healthy infants from 2 to 5 months old, wherein he reduced the sugar and increased the fat in their milk. In the first series he replaced a milk containing 5 per cent of sugar with a protein milk containing an isodynamic amount of unsalted melted butter. This milk contained only 1.5 per cent sugar, or 3 grams to the kilogram of weight instead of 14 grams, as is normal. In the second series of tests the author put infants that had been thriving on one-half milk with 5 per cent sugar on one-half milk with 2.2 per cent fat. In both series, excluding cases of dyspepsia, the weight curve flattened and could be improved only slightly by an increase of fat but very strikingly by an increase of sugar. The sugar minimum seemed to be higher with the one-half milk than with the protein milk. As reasons for this poor development of infants on a milk diet poor in sugar and rich in fat the author discusses poor fat absorption, nitrogen retention, water retention, and the osmotic qualities of sugar and accepts as explanation the high catalytic influence of sugar.

732 **Rothberg, O.:** "Über den Einfluss der organischen Nahrungskomponenten (Eiweiss, Fett, Kohlehydrate) auf den Kalkumsatz künstlich genährter Säuglinge" [The effect of organic food components (albumin, fat, carbohydrates) on the calcium exchange of artificially fed infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 66 (1907), pp. 69–92.

In the children's clinic of the University at Breslau the author investigated the effect of albumin, fat, and carbohydrates on the calcium exchange of five artificially fed infants. Each study covered five to six days. They are carefully described and the results embodied in 22 tables. The nitrogen was determined according to Kjeldahl; the fat in the food by Gerber's acid-butyrometric method and that in the feces with the help of the Soxhlet ether-extract apparatus; the carbohydrates by the Pfluger-Volhard method. Calcium oxide, not calcium, was always determined. The author concludes that in artificially-fed infants the calcium metabolism is decidedly affected by the kind of food. Nitrogen and calcium balance show no uniformity. A fat diet produces a negative calcium balance; so also does a carbohydrate diet, but to a lesser degree.

733 **Rubner, Max:** Beiträge zur Ernährung im Knabenalter mit besonderer Berücksichtigung der Fettsucht [Studies of Nutrition in Boyhood with Especial Reference to Abnormal Fat]. A. Hirschwald, Berlin, 1902. 80 pp.

The author discusses his elaborate metabolism experiments carried out on two brothers, one 10 years old and very fat and the other a normal boy of 11. The general findings are not very different from those concerning adults who are fat. The child has the highest relative food requirements during the period of muscular development; this period begins when the child weighs 9 kilograms and ends when the child reaches the weight of 35 to 38 kilograms.

734 ——— "Ernährungsvorgänge beim Wachstum des Kindes" [Nutrition processes in growth of the child]. *Archiv für Hygiene* [Munich and Berlin], vol. 66 (1908), pp. 81–126.

The author discusses work done on the metabolism of the child, especially the valuable work done since the eighties. He refers frequently to work done by Heubner and himself and to the experiments of Voit, Soxhlet, Camerer, Soldner, and others, notably to the momentous discovery that human milk instead of being rich in albumin is very poor in it. For a child of 4 kilograms he accepts 429.7 calories per day for total nourishment, 57.8 for growth, 325.5 for maintenance, etc., but the article for the most part is a theoretical and technical discussion of inferences to be drawn from the latest scientific speculation.

735 ——— **and Otto Heubner:** "Die künstliche Ernährung eines normalen und eines atrophischen Säuglings" [Artificial feeding of a normal and of an atrophic infant]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 38 (1899), pp. 315–398.

As a sequel to their article "The natural feeding of an infant" (*see* No. 736 this section), the authors experiment in the same way on artificial nutrition of a normal and of an atrophic infant. The healthy female infant was 7½ months old, weighed 7,570 grams, and received daily 1 liter of undiluted cow's milk which had been boiled 5 minutes with about 35 grams of sugar. The atrophic male infant, an illegitimate child, ill since birth, was 3½ months old, weighed 3,000 grams, and drank daily about 950 grams milk; in a second experiment he received also meal. Numerous tables give quantitative and qualitative analyses of intake in air and food and of eliminations. Among many results may be mentioned these: The assimilation of the breast-fed child was 91.6 per cent; of the infant fed on cow's milk and sugar, 92.2 per cent; of the atrophic infant, 87.1 per cent when fed on milk and 82.4 per cent when fed on meal. The number of calories to the square meter daily was 1,006 for the breast-fed infant, 1,143 for the normal infant fed on milk, and 1,090 for the atrophic child.

736 **Rubner, Max, and Otto Heubner:** "Die natürliche Ernährung eines Säuglings" [Natural feeding of an infant]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 36 (1898), pp. 1–56.

After a sketch of previous investigations on the metabolism of the infant the authors describe their own experiments on a healthy boy 9 weeks old, 5 kilograms in weight, who, with his mother, remained in the Hygienic Institute during the nine days of the experiment. He was bathed and nursed between 9 and 9.30 a. m., then he rested. At 1 o'clock he was inclosed in the respiratory chamber (which is carefully described) till 9 a. m. the next day, except for the short periods of his six or eight meals. A table of milk consumption is given, the average being 608.4 grams per day. Analyses of milk, urine, and feces are described, also the carbonic acid exhaled, which is somewhat less than that of the adult in proportion to surface area. (Saponification was noted.) Heat production was 1,006 calories to 1 square meter of surface per day. The adult gives off relatively more heat than a child. The physiological efficiency of the milk was found to be 91.6 per cent, 2.6 per cent being the loss in urine and 5.8 per cent in feces. The efficiency of cow's milk for the adult is from 84 per cent to 89 per cent.

737 ——— "Zur Kenntnis der natürlichen Ernährung des Säuglings" [On the study of the nutrition of the nursling]. *Zeitschrift für Experimentelle Pathologie und Therapie* [Berlin], vol. 1 (1905), pp. 1–25.

The authors give a very detailed and careful description of their experiments on the metabolism of a sturdy male infant 5½ months old. Full information is given regarding the infant's conditions, weights, etc., the respiratory chamber, the chemical analysis of the mother's milk, and excretions. Experiments on other children are mentioned. A section is devoted to water elimination. The conclusion is a brief discussion of the physiological efficiency of human milk.

738 **Rüdel, G.:** "Über die Resorption und Ausscheidung des Kalkes" [Absorption and elimination of calcium]. *Archiv für Experimentelle Pathologie und Pharmakologie* [Leipzig], vol. 33 (1893–94), pp. 78–87.

The author studied absorption and elimination of calcium at a polyclinic in Heidelberg in case of a girl 9 months old (four series of tests), and a boy and two girls about 3½ years old, a boy 13½, and a girl of 15. Various calcium salts were administered to the subjects. Calcium elimination by the urine was taken as a measure of absorption and the 24-hour urine analyzed by Neubauer's method. Results are tabulated.

739 **Salge, B.:** "Ein Beitrag zur Pathologie des Mehlnährschadens der Säuglinge" [A contribution to the pathology of nutritional disturbances in infants caused by meal]. *Jahrb. f. Kinderh.* [Berlin], vol. 76 (1912), pp. 125–142.

From a study of seven infants who were ill and a few tests with animals, the author concludes that carbohydrates are injurious for infants and states his reasons for his belief.

740 ——— "Einige calorimetrische Untersuchungen der Resorption des Säuglings" [Some calorimetric investigations into absorption in infants]. *Verhandlungen der Versammlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vol. 23 (1906), pp. 71–74.

The author tests absorption by the intestine in infancy by the calorimetric method. He follows the Breslau school in collecting the feces and urine. His subjects are the children of 12 nurses, some healthy, some suffering from effects of intestinal disturbances. The article contains a description of each case and a table giving amount of food, of feces, of calories, etc. The author concludes that the healthy breast-fed child loses 4 to 6 per cent of energy, that intestinal illness need not disturb absorption by the intestine, and that even in the atrophic child severe nutritional anomalies may have nothing to do with a defective utilization in the intestine.

741 **Samelson, S.:** "Beitrag zur Physiologie der Ernährung von frühgeborenen Kindern" [Contribution to the physiology of nutrition of premature children]. *Ztschr. f. Kinderh.* [Berlin], vol. 2 (1911), pp. 18–31.

The author discusses the work done by Camerer, Rubner, Heubner, et al., in ascertaining the amount of food required by infants, by calculating the number of calories in it and the energy quotient. He then describes his own work in this direction upon two prematurely born infants. They were fed upon human milk extracted from the breast and boiled. A table covering 67 days shows the specific gravity of this milk, the dry residue, ash, fat, lactose, nitrogen protein, and caloric content. Two other long tables give weight, amount of milk, number of calories, and energy quotient for one infant from his eighty-seventh to his one hundred and forty-eighth day and for the other from his sixtieth to his one hundred and seventeenth day. The author concludes that the energy quotients for premature children should be put within the wider limits of 115 to 150.

742 **Sandiford, Irene, and E. R. Harrington:** "Preliminary report on the basal metabolism of 157 normal school children between the ages of 5 and 17 years." *Journal of Biological Chemistry* [Baltimore], vol. 63 (1925), pp. xxxv–xxxvii.

At the time of writing 455 determinations had been made. No averages had been derived.

743 **Schelble:** "Untersuchungen über die Fettresorption des Säuglings" [Investigations of fat absorption in the infant]. *Münchener Medizinische Wochenschrift*, vol. 55, pt. 1 (1908), pp. 492–496.

Believing that fat is the cause when milk does not agree with children, the author examined the blood of infants 100 times, extracting it from the great toe. He gives case histories, curves, and tables with full data on 16 of the infants. The absorption was dependent on age and condition, amount of milk, and time of examination. There was no difference in time of absorption between healthy breast-fed children and ailing children fed on cow's milk, nor was any difference discernible between absorption of raw and absorption of boiled milk.

744 **Schick, B.:** "Ernährungsstudien beim Neugeborenen" [Nutritional studies in the newborn]. *Ztschr. f. Kinderh.* [Berlin], vol. 22 (1919), pp. 195–294.

This article presents a number of tables and case histories, 36 pages of tables, and 13 pages of curves. After deciding that sweetened tea is not a successful diet because it contains only water without salts the author discusses 167 cases of salty diet, on which more infants lost than gained weight. Next he considers diets almost devoid of fat but richer in albumin and sugar than human milk. Seventy-one received skim milk (containing one-half nutritional value) with 8.5 per cent cane sugar added; results were good. So were they in 98 cases fed on skim milk plus 17 per cent beet-sugar solution. The healthy newborn infant possesses an excellent tolerance for heterogeneous diet. Further tests were made on 291 infants with a concentrated food, tried first on older infants and then on newborn. The water limitation was not injurious, if the food contained the nutritional value. Sugar tolerance is also treated.

745 **Schittenhelm, Alfred, and Julius Schmid:** "Ablauf des Nucleinstoffwechsels in menschlichen Organen" [Course of nuclein metabolism in human organs]. *Zeitschrift für Experimentelle Pathologie und Therapie* [Berlin], vol. 4 (1907), pp. 424–431.

The authors dissected the bodies of five infants that died at birth, in order to study nuclein metabolism. Findings are given in detail. The presence of nuclease in liver and muscle is established. It can be assumed that this nuclease belongs to all organs. The deamidizing ferment is just as widespread as the nuclease and is established in these tests for kidneys, liver, muscles, lungs, intestine, spleen, and thymus. The authors judge the uricolytic ferment to be more common in the human organism than in animals but not to be abundant in blood.

746 **Schlesinger, Eugen:** "Der Einfluss der durch die Kriegslage veränderten Ernährung auf die schulpflichtige und die herangewachsene Jugend" [The effect on school children and youths of the change in nourishment caused by the war]. *Arch. f. Kinderh.* [Stuttgart], vol. 66 (1916), pp. 161–179.

After remarking that comparative measurements must be taken at the same hour and season with like environment, with allowance made for clothes, etc., the author describes examinations made by him at Strassburg in 1916, of weight, height, and constitution of 330 poor school boys of 6 to 14 years; of 280 school boys of 9 to 15 years, from more comfortable classes; and of many apprentices of 14 to 18 years, which he could compare, with like examinations made by him of similar subjects in 1913 and 1914. He believes that a subjective consideration of the constitution is very exact where only one experimenter is involved. Likewise the author employed the individualizing method on poor children and on 460 young men of 14 to 17 years, comparing his results with similar investigations at the same schools in 1906–9. The war was found to have caused a slight inferiority in growth.

747 **Schloss, Ernst:** "Untersuchungen über den Einfluss der Salze auf den Säuglingsorganismus" [Investigations into the effect of salts on the infant organism]. *Jahrb. f. Kinderh.* [Berlin], vol. 71 (1910), pp. 296–346.

The author tested the influence of salts upon the organisms of 10 normal infants in the first three months of existence. He determines nitrogen according to Kjeldahl and halogens according to Volhard. The results of his 12 experiments he shows in curves of temperature and weight and in 67 tables covering 18 pages, of the water, nitrogen, and chlorin exchange and the urine elimination. He also discusses at length the effect of the salts on metabolism. He concludes that a certain minimum of salts is necessary for growth. An excess produces variations in temperature, weight, etc., but no permanent result unless very large doses injure the cell function.

748 **Schloss, O. M., and J. L. Crawford:** "The metabolism of nitrogen, phosphorus, and the purin substances in the newborn, with special reference to the causation of the uric-acid infarcts of the kidney." *Am. J. Dis. Child.* [Chicago], vol. 1 (1911), pp. 203–229.

This study was done with special reference to the occurrence of uric-acid infarcts. "Uric-acid infarcts elements" were present in all the nine cases studied. The uric-acid and phosphorus excretion was high in all cases as compared with adult standards. The cause of this was not determined. The urine record for each case is reported in full. The leucocyte count for the first eight days of life is tabulated in eight cases.

749 Schlossmann, Arthur: "Über das Verhalten des Säuglings im Hunger" [Behavior of the infant in hunger]. *Verhandlungen der Versammlungen der Gesellschaft für Kinderheilkunde, 1912—13* [Wiesbaden], vol. 30 (1914), pp. 143–153.

To test the effect of hunger in infancy the author had infants fed on water containing saccharin and a 3 per cent solution of sodium chlorid identical in amount and temperature with ordinary diet. Even when this diet was prolonged for three days no ill effects manifested themselves. One child on a hunger diet of 60 hours gained 50 grams in weight. Temperature during the test fell and remained unchanged on the skin. The nitrogen curve in artificially-fed infants falls, but in breast-fed infants rises. The lactivorous infant in fasting becomes carnivorous and consumes its own tissue, but even so the nitrogen elimination in the hungry breast-fed child is less than in a hungry one artificially fed. In other experiments 7 per cent lactose solution was given. Nitrogen fell and acetone and B-oxybutyric acid did not rise, but these latter did rise when salt-saccharin solution was given. A table gives total metabolism of child.

750 ——— "Über den Einfluss der Ernährung auf den respiratorischen Stoffwechsel" [The effect of nutrition on respiratory exchange]. *Verhandlungen des Kongresses für Innere Medizin* [Wiesbaden], 26th Congress (1909), pp. 290–295.

The lecturer has conducted studies of respiratory metabolism of infants to determine the exchange of carbonic acid and oxygen in the sleeping normal child and the influence of nutrition on such metabolism. He is particularly interested in the question of the relation between respiratory metabolism and surface areas. If that is a constant, then laws governing it in children will aiso prevail in adults. The lecturer mentions various other studies on guinea pigs and infants, all of which confirm Rubner's theory in regard to surface area.

751 ——— "Über den respiratorischen Stoffwechsel des Säuglings" [The respiratory exchange of the infant]. *Deutsche Med. Wchnschr.* [Berlin], vol. 37, pt. 2, no. 36 (1911), pp. 1633–35.

To prove the significance of investigations on the respiratory exchange of infants the author mentions the work done on metabolism by Camerer, Rubner and Heubner, Birk and Edelstein, Niemann, himself, and others; compares the apparatus of Pettenkofer and Regnault and Reiset; and describes the effect of digestion and motion. Ordinary variations of temperature have no effect. The respiratory exchange is proportional to the square meter of body surface in infancy as at other stages.

752 ——— "Über Menge, Art und Bedeutung des Phosphors in der Milch und über einige Schicksale desselben im Säuglingsorganismus" [Amount, nature, and significance of phosphorus in milk and some instances of its effect upon the infant organism]. *Arch. f. Kinderh.* [Stuttgart], vol. 40 (1904–5), pp. 1–39.

The interesting study of phosphorus in the human system is especially significant in childhood on account of its importance in brain and bone. A normal infant during the first year probably adds 55 to 60 grams of phosphorus to its body, three-fourths gram entering into the brain. The author describes four methods he has used for determining phosphorus in milk. Almen's tannic-acid method for separating organic and inorganic phosphates does not bring dependable results. In phosphorus tests upon the milk of 39 different women Schlossmann finds per liter 0.45 gram of phosphorus pentoxide, 0.195 gram of phosphorus, and 43 grams of nitrogen. He compares human milk with that of animals and his own work with that of other investigators. The phosphorus content is affected by casein, but not materially by race, by duration of lactation, fever, or menstruation. In eight very comprehensive metabolic experiments on four young children the amount of phosphorus pentoxide absorbed from the human or cow's milk is determined.

753 ——— "Zur Frage der natürlichen Säuglingsernährung" [Question of breast feeding of infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 30 (1900), pp. 288–382.

This article illustrates the value of human milk for the infant, showing its composition in at least 250 analyses and the growth and development of breast-fed children of all conditions and ages. Observations covering 2½ years fill many pages of tables. One series of tables, arranged according to age of infant, presents 218 entries on sex, age, weight of child, analysis of milk, condition of mother, etc. Another series gives weights and food amounts of 13 healthy, 7 weak, and 12 sick infants, with case histories. The author discusses various phases of infant feeding, such as overfeeding and proportion of milk drunk to body weight.

754 ——— "Zur Frage des respiratorischen Stoffwechsels beim Säugling" [The question of respiratory exchange in the infant]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Weisbaden], vols. 25–26 (1908–9), pp. 52–65.

The author tests the respiratory exchange of an infant with the Regnault-Reiset apparatus as modified by Zuntz, of which he gives a detailed description. One series of experiments concerned a healthy, breast-fed boy of placid disposi-

tion, 4½ months old. He was put into the apparatus immediately after his supper at 6 p. m. and slept for hours. The average respiratory quotient was 0.911. In one experiment where he cried and tugged at his jacket to remove it it was 0.896. To show effect of digestion, the quotient in the first three hours after the meal was 0.944 and in the last five hours 0.889. For three sick infants fasting for 24 hours the quotients were 0.690, 0.730, and 0.765. When calculated on body surface the carbon-dioxide elimination of the resting infant the author believes to be similar to that of the adult.

755 **Schlossmann, Arthur, and H. Murschhauser:** "Der Grundumsatz und Nahrungsbedarf des Säuglings gemäss Untersuchungen des Gasstoffwechsels" [Basal metabolism and food requirements of the infant according to investigations of respiratory exchange]. *Biochemische Zeitschrift* [Berlin], vol. 26 (1910), pp. 14–41.

In studying basal metabolism the authors made nine experiments on four infants in Regnault-Reiset's apparatus. The child being tested was fed for the last time in the evening and the next day was given only weak tea. The experiment began at 3 p. m. and lasted three hours. Every motion was noted. Very full data are given for age, weight, surface area, carbonic acid, and oxygen per kilogram and per square meter, respiratory quotient, etc. Figures ascertained for the infant are compared with Atwater's figures for the adult, and no essential difference is found between adult and child when surface is taken as a measure. Carbonic-dioxide output and oxygen intake, so far as they are connected with the combustion of carbohydrates and fat, are directly proportional to surface. Fat and carbohydrate metabolism in like circumstances is the same for all approximately normal people when reckoned according to surface.

756 ——— ——— "Der Stoffwechsel des Säuglings im Hunger" [The infant's metabolism in hunger]. *Biochemische Zeitschrift* [Berlin], vol. 56 (1913), pp. 355–415.

After a survey of literature on the metabolism of the child in hunger the authors describe their experiments on healthy breast-fed and artificially fed infants. From 19 experiments on the nitrogen exchange and 11 on acetone and B-oxybutyric acid in the urine, they find that the effect of hunger on the breast-fed children is to increase excretion of both acetone and nitrogen and on the bottle-fed children is to increase acetone and decrease nitrogen. The B-oxybutyric acid elimination is parallel to that of acetone. A breast-fed child can suffer hunger with far less danger than can the artificially fed child. These authors also tested the gaseous exchange of hungry children, finding respiratory quotients of 0.779, 0.778, 0.790, etc. Numerous tables are given.

757 ——— ——— "Der Stoffwechsel des Säuglings im Hunger" [Metabolism of the infant in hunger]. *Biochemische Zeitschrift* [Berlin], vol. 58 (1913–14), pp. 483–502.

A description of experiments carried out with a 6-months-old child. The amount and kind of food given at different periods are described. The author gives his findings on the elimination of water, nitrogen, acetone, and B-oxybutyric acid, respiratory exchange, energy, sugar in the blood, temperature, etc. After hunger of 24 hours and 72 hours the exchange per kilogram and hour in protein amounted to 0.099 gram and 0.072 gram; in fat to 0.168 gram and 0.200 gram, and in glycogen to 0.125 gram and 0.00224 gram. The calories sank from 891 to 782.

758 ——— ——— "The influence of activity on the metabolism of the child. Together with remarks on the article "Some fundamental principles in studying infant metabolism" by F. T. Benedict and Fritz Talbot." *Am. J. Dis. Child.* [Chicago], vol. 6 (1913), pp. 15–22.

An argument on the importance of mechanical work done by children during metabolic observation. "Exact observation of the activity in experiments with respiration apparatus must be insured, and included in the publication of these researches if the observation is to have real value." This contention is illustrated by citing examples of mechanical work done by various children while being studied and its effect on the results.

759 ——— ——— "Über den Einfluss des Alters und der Grösse auf den Gasstoffwechsel des Säuglings" [Effect of age and size on the gaseous exchange of the infant]. *Biochemische Zeitschrift* [Berlin], vol. 18 (1909), pp. 499–505.

Questioning the correctness of other students' assertion that the respiratory exchange of the infant differs in degree from that of the adult, the authors compare three sets of results obtained in August, 1908, January, 1909, and April, 1909. In August, 1908, the age of the infant boy, the subject of the study, was 144 days, his weight 5 790 grams, his surface 38.4 square centimeters, his production of carbon dioxide while asleep per hour and square meter was 13.78 grams, and his consumption of oxygen 11.05 grams. For January, 1909, the corresponding figures were 28.4 days, 8,450 grams, 49.63 square centimeters, carbon dioxide 13.99, and oxygen 11.05. For April, 1909, they were 380 days, 8,930 grams, 51.50 square centimeters, 13.49 carbon dioxide, and oxygen 11.41. These results being almost identical, the authors accept Rubner's theory that metabolic processes are proportional to body area at all ages.

760 **Schlossmann, Arthur, and H. Murschhauser:** "Über den Einfluss mässiger Temperaturschwankungen der umgebenden Luft auf den respiratorischen Stoffwechsel des Säuglings" [Influence on the infant's respiratory exchange of moderate variations in the temperature of the surrounding air]. *Biochemische Zeitschrift* [Berlin], vol. 37 (1911), pp. 1–22.

The authors conducted five experiments each on two subnormal infants of 3 and 4 months to observe how a variation of temperature within 16.4° C. and 23.5° C. would affect respiratory exchange. The infants after 18 hours of fasting were kept quiet two or three hours for the experimentation. The change in temperature was produced by placing hot or cold water in the respiratory apparatus. The authors conclude that moderate variations of temperature have no effect on the respiratory exchange of infants, which is influenced only by food and motion, and that even the infant organism can protect itself from its environment. With an electrical thermometer automatically registering the temperature every 30 seconds, Schlossmann ascertained that infants show no change of temperature when lying in bed or even after taking nourishment. The article contains 2 tables and 12 graphs.

761 ——— **C. Oppenheimer, and H. Murschhauser:** Über den Gasstoffwechsel des Säuglings nach einigen einleitenden Versuchen mit Hilfe des von Zuntz und Oppenheimer modifizierten Respirationsapparats nach Regnault und Reiset" [The gaseous exchange of the infant according to some preliminary experiments with the respiratory apparatus of Regnault and Reiset as modified by Zuntz and Oppenheimer]. *Biochemische Zeitschrift* [Berlin], vol. 14 (1908), pp. 385–406.

In 1908 in the Academic Clinic for Child Therapeutics at Dusseldorf the authors conducted careful studies on the gaseous exchange of a healthy, breast-fed, male infant of placid disposition, 4½ to 5 months old and 5,790 grams in weight. After being nursed in the evening he slept eight hours during each of the six experiments in the respiratory apparatus. During the first three hours and last five hours the oxygen consumption was per hour and kilogram, 0.556 liter and 0.485 liter, respectively; and the carbon-dioxide production was 0.525 liter and 0.431 liter, the respiratory quotient being 0.944 and 0.889. Not only digestion but crying, too, as shown in a day experiment, increased the oxygen and carbon dioxide, especially the former. A table shows that the above metabolic processes were proportional to the body surface of the child, as in the case of adults. Eleven additional investigatfons deal with the respiratory metabolism of ailing infants on a hunger diet.

762 ——— **and Paul Sommerfeld:** "Ernährung und Stoffwechsel des Kindes jenseits des ersten Lebensjahres" [Nutrition and metabolism of the child after the first year]. Pfaundler und Schlossmann, Handbuch der Kinderheilkunde, Leipzig, 1910, vol. 1, 2d ed. F. C. W. Vogel, pp. 247–308.

A comprehensive article like a textbook summarizing investigations of others on nutritional requirements of children and describing the authors' own extensive experiments on metabolism. Many tables and graphs are included.

763 **Schmid–Monnard:** "Über die Nahrungsmengen normaler Flaschenkinder" [Food intake of normal bottle-fed infants]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 49 (1899), pp. 67–76.

This article with its six tables concerns observation—covering, in seven cases, 16 to 40 weeks; in four cases, 4 to 12 weeks—on the amounts of milk consumed by 11 bottle-fed infants. Such infants require one-third more calories than do breast-fed infants. The assimilation varies; one girl with 97 calories per kilogram and 620 calories in all gained 32.3 grams, whereas a boy of like age on 111 calories gained only 11 grams. Though cow's milk contains much more protein than human milk it does not produce normal increase during the first six months. The number of calories obtained from fat or carbohydrates may not fall below a certain number without injury to the infant.

764 **Schütz, Aldar:** "Untersuchungen über die entgiftende Tätigkeit des Magensaftes nebst einigen Bemerkungen über ihre Bedeutung bei der Säuglingsernährung und Immunität" [Tests on antitoxic activity of gastric secretion with some remarks on its significance in infant nutrition and immunity]. *Zeitschrift für Hygiene und Infections-Krankheiten* [Leipzig], vol. 61 (1908), pp. 115–147.

The author first describes 27 tests he made in 1903–4 on 17 children in the Breslau Children's Clinic, by which he established that the gastric secretion of infants destroys diphtheria toxin. A table on these experiments gives age, weight, general condition, diet, stomach content removed, reaction, free hydrochloric acid, total acidity, degree of toxin destruction, etc. Later tests on animals are described and these conclusions noted: Diphtheria toxin is annihilated by a hydrochloric-acid solution, the content of which corresponds to the free hydrochloric acid of an infant. Cow's milk and boiled human milk have no effect.

765 **Schwartz, Ph., R. Baer, and J. Weiser:** "Histologische Untersuchungen über den Eisenstoffwechsel im frühen Säuglingsalter" [Histological studies of iron metabolism in early infancy]. *Ztschr. f. Kinderh.* [Berlin], vol. 37 (1924), pp. 167–191.

The author studied the iron metabolism in the liver and spleen of 115 infanjts of different degrees of development. Some of the infants were born dead; others died at ages varying from a few days to 20 weeks. He found that in the great majority of children, whether premature or born at term, signs of activation of iron in the spleen and liver appear very early in life. The first signs are evident in either stillborn children or those who died in the first three days. From that time on the signs of activated iron metabolism become gradually more pronounced and reach their maximum when the child is from 1 to 2 months old. After the third month the signs decrease, and at the age of 5 months the liver and spleen are again free from iron. The cause of this change in the amount of iron the author attributes to the disintegration of the blood at birth.

766 **Schwarz, H.:** "Protein metabolism in infants and children." *Am. J. Dis. Child.* [Chicago], vol. 2 (1911), pp. 189–209.

A general discussion in which little personal work by the author is cited. The uses of nitrogen made by the body are described. The protein intake and output are quoted from Michel, Keller, Rubner, and Heubner and recorded in three cases of the author's. The latter part of the article is devoted to the results of a nitrogen partition of the urine.

767 **Schwenkenbecher:** "Über die Ausscheidung des Wassers durch die Haut von Gesunden und Kranken" [Elimination of water through the skin of healthy and sick persons]. *Deutsches Archiv für Klinische Medizin* [Leipzig], vol. 79 (1903–4), pp. 29–62.

In studying perspiration the author used an apparatus suggested by Rubner's ideas. Apparatus and method are described; subjects were tested; fasting and control tests were conducted. Twenty-one tables of results are given on persons of various ages, of whom eight are below 21 years.

768 **Sedgwick, J. P.:** "Creatinin and creatin metabolism in children." *J. A. M. A.* [Chicago], vol. 55 (1910), pp. 1178–1180.

The author examined the urine of seven normal infants during the first nine days of life, recording, in one series of three subjects, the daily creatinine excretion, and in a second series, four subjects, both creatinine and creatine excretion. He found that creatinine is always present in the urine of the first week in a concentration approximating that of adult urine. Creatine is also excreted during infancy. In later infancy creatinine is present in the urine uniformly, but in much more dilute condition than with adults.

769 **Seham, Max:** "The acidotic state of normal newborns, with special reference to the alveolar carbon-dioxide tension, alkali tolerance and acetonuria." *Am. J. Dis. Child.* [Chicago], vol. 18 (1919), pp. 42–50.

With the purpose of testing acidosis by means of carbon-dioxide alveolar tension the author made 151 determinations on 50 infants, from 1 hour to 32 weeks of age. A pulmotor mask with two brass tubes was used, so arranged that it necessitated the rebreathing of a certain amount of air until it was in equilibrium with the air in the alveolæ. Tables show the results of the experiments from which the author concludes that he has not been able to establish a lower carbon-dioxide tension, indicative of an "acidotic state." The author also made an alkali-tolerance test to determine acidity of the urine by administering orally with the stomach tube sodium bicarbonate. He found the lowest amount necessary to change urine to alkaline 0.1 gram, the highest 4 grams, the average 1.7 grams, which does not indicate acidosis. In examination of a 24-hour specimen of the urine of 10 newborn infants he found practically no acetone.

770 **Selter, Paul:** "Nahrungsmengen und Stoffwechsel des normalen Brustkindes" [Food intake and metabolism of the normal breast-fed child]. *Arch. f. Kinderh.* [Stuttgart], vol. 37 (1903), pp. 91–103.

This article contains tables on the food intake and excretions of feces, urine, perspiration, and breathing, of two male infants nursed by their mother until the nineteenth and twenty-first weeks after birth.

771 ——— "Nahrungsreste in den Säuglingsfäces" [Remains of food in infant feces]. *Zentralblatt für die Gesammte Physiologie und Pathologie des Stoffwechsels* [Berlin and Vienna], new ser. vol. 2 (1907), pp. 609–617.

Without tables or graphs the author discusses the remains in feces of infants, of fat in their food, of carbohydrates including sugar and flour, of albumin, and of inorganic matter. He concludes that the stool of the healthy infant from a physical, microscopic, and chemical standpoint shows qualities dependent on the kind of food given. Fat is found in every infant stool; also carbohydrates in small quantities.

772 **Shaw, T. P., and A. L. C. Gilday:** "A study of the absorption of fats in infants." *Brit. M. J.* [London], vol. 2 (1906), pp. 932–936.

Report of experiments by chemical examination of feces of seven male infants from 17 to 108 days of age. Processes both mechanical and chemical are described in great detail and each experiment recorded in tabular form, with descriptive notes. A table is also derived showing the total intake of fat, percentage of fat in feces, percentage of fatty acid in feces, and percentage of fatty acid as soap in feces. The authors conclude that about 4 per cent in breast-fed infants and 5 per cent in bottle-fed infants of the fat ingested appears in the feces; that this is to a great extent fat that has escaped digestion; that the fatty compounds in the feces exist as neutral fat, fatty acids, and soaps; that the soaps are relatively increased in artificially-fed infants, in infants with a low percentage of fat in the food, and in infants with diarrhea. References.

773 **Sherman, H. C., and E. Hawley:** "Calcium and phosphorus metabolism in childhood." *Journal of Biological Chemistry* [Baltimore], vol. 53 (1922), pp. 375–399.

Four series of experiments were undertaken, designed to determine the rate of assimilation of calcium in normal children of different ages and the nature and amount of the intake required to support optimum calcium storage in the growing child. In the first series 12 normal children 3 to 13 years old, receiving a mixed diet that included 760 grams of milk per child per day, were studied for calcium and phosphorus retention. In the second series 3 of these children were observed in eight experiments of six days each, with varying amounts of milk in the diet, to determine what amount would induce optimum storage of calcium. In the third series the same 3 children were observed in three experiments of nine days each, during the first and third of which each child received 500 grams of milk per day as the only calcium-rich food of a mixed diet, while during the second carrots and spinach were added in such quantity as would furnish the amount of calcium provided by 500 grams of milk. In the fourth series 3 other children were supplied with milk and vegetables in different proportions. The data of each experiment are reproduced in tables. It was found that the children did not utilize the calcium of vegetables so efficiently as they did that of milk; that children from 3 to 13 years of age required 1 gram of calcium per day to induce optimum storage of this element. In general, the conditions influencing the storage of calcium tended to influence that of phosphorus in the same direction. Bibliography.

774 **Siegert, F.:** "Der Eiweissbedarf des Kindes nach dem ersten Lebensjahre" [The protein requirement of the child after the first year of life]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vols. 23–24 (1906–7), pp. 442–453.

The author believes that ordinarily diet is too rich in protein. From long experimentation on protein metabolism he selects for discussion protein tests of two to three weeks' duration on six healthy children from 4½ to 14 years old. They were allowed to drink and play as much as they liked. Diets are presented, and the nitrogen intake and output, growth, etc., are recorded. The author believes that his experience and that of Camerer and others proved that the protein requirement of the growing child amounts to only 9 or 10 per cent of the total caloric requirement.

775 ——— "Der Nahrungsbedarf des Brustkindes im ersten Vierteljahr" [Nutritional requirement of the breast-fed child in the first three months of his life]. *Verhandlungen der Gesellschaft für Kinderheilkunde* [Wiesbaden], vols. 23–24 (1906–7), pp. 24–45.

Tables of weights and amounts of milk consumed at each meal are given for a healthy female infant from the fifteenth to ninety-fifth day and for a healthy male infant from the thirteenth to ninety-second day.

776 ——— "Über das Verhalten der festen und flüssigen Fettsäuren im Fett des Neugeborenen und des Säuglings" [Behavior of stable and volatile fatty acids in the fat of the newborn infant and nursling]. *Beiträge zur Chemischen Physiologie und Pathologie* [Braunschweig], vol. 1 (1901–2), pp. 183–188.

The author determines the iodin number of the higher fatty acids in the subcutaneous fat of 1 adult and of 28 children, 4 prematurely born, 5 newborn, and 19 less than 1 year old. After describing his method of analysis he presents a table of iodine numbers of 1 adult and 57 children, including besides his subjects those of Knöpfelmacher and Thiemich. Another table gives the average iodine number for each of the first 12 months of life, from 42.5 for the first month to 62.35 for the twelfth month. By the end of the first year the fatty tissue of the infant seems definitely to change and resemble that of the adult.

777 **Soldin, Max:** "Zur Kenntnis der Darmfäulnis im Säuglingsalter bei verschiedenartiger Ernährung" [Knowledge of intestinal putrefaction in infancy, on varied diet]. *Jahrb. f. Kinderh.* [Berlin], vol. 65 (1907), pp. 292–298.

This article contains a table giving age, weight, diet, nitrogen, total sulphuric acid, sulphuric-acid ether, phenol, indican, urobilinogen, and organic acids, from 16 tests on 10 infants, and a table of total sulphuric acid, sulphuric-acid ether, and phenol.

778 Sommerfeld, Paul: "Zur Kenntnis der chemischen Zusammensetzung des kindlichen Körpers im ersten Lebensjahre" [Chemical composition of the child's body in the first year]. *Arch. f. Kinderh.* [Stuttgart], vol. 30 (1900), pp. 253–263.

For three years in the Children's Hospital of the Emperor and Empress Frederick the author studied the composition of the child's body. He gives details on tests made upon muscles of 10 infants from 19 days to 1 year old and on complete dissections of two cadavers, of 4 weeks and 3 months, the first atrophic, the second fairly well developed. In both studies he has a summarizing table of age, weight, diagnosis, water, dry residue, ash, and nitrogen. He compares the findings of Camerer with his own work.

779 ——— "Zur Kenntnis der Magensaftsecretion nebst einigen Bemerkungen über Speichelsecretion" [Science of gastric secretion with some remarks on salivary secretion]. *Arch. f. Kinderh.* [Stuttgart], vol. 49 (1908–9), pp. 1–15. See also *Biochemische Zeitschrift* [Berlin], vol. 9 (1908), pp. 352–356.

In the winter of 1904–5 the author studied the gastric secretion through a fistula of a healthy girl, 9 years old (still very well four years after the gastrotomia and œsophagotomia). His usual method was to wash out her stomach after some hours of fasting and then test the secretion obtained by sham feeding. After a discussion, with tables, of general properties, specific gravity, freezing point, electrical conductivity, acidity, hydrochloric acid, and peptic ferment of the gastric juice the author describes in detail nine tests giving time intervals, amounts of secretion, total acidity, digestive action, etc. The flow of secretion came usually 3 to 5 minutes after chewing. It would not respond to mechanical stimulus but would to sham drinking and the sight, even the mention, of food. Extraordinarily large amounts of saliva were often secreted, but the author could not, like Pawlow, ascertain a relation between saliva and kind of food.

780 ——— and Wilhelm Caro: "Zur Kenntnis der Ausnützung von Phosphor und Stickstoff bei reiner Milchernährung älterer Kinder" [The assimilation of phosphorus and nitrogen in older children on a pure milk diet]. *Arch. f. Kinderh.* [Stuttgart], vol. 33 (1902), pp. 161–166.

The authors ascertained the assimilation of phosphorus and nitrogen for three children, 5½, 6, and 7 years, respectively, on a diet of milk. Tables show the amount of nitrogen and phosphorus in their food, urine, and feces. The relation of nitrogen to phosphorus was 1 : 5 in the food and 1 : 4.75 in the excretions. If one takes into account only the urine nitrogen, as opposed to the total excreted phosphorus, then the proportion is P : N 1 : 4.56.

781 Sonden, Klas, and Robert Tigerstedt: "Untersuchungen über die Respiration und den Gesammtstoffwechsel des Menschen" [Investigations into the respiration and total metabolism of man]. *Skandinavisches Archiv für Physiologie* [Leipzig], vol. 6 (1895), pp. 1–225.

This article includes, besides a long discussion, numerous tables and four large plates to illustrate the apparatus employed. At the conclusion of the second section on the amount of carbonic acid eliminated according to age and sex, the authors state that this elimination is relatively much greater in the young than in adults, children having livelier metabolism. It is relatively greater in boys than girls in about the ratio of 140 : 100. In another section on the elimination of carbonic acid and nitrogen according to time of day, they add that the minimum elimination of carbonic-acid gas in sleep reckoned per square meter of surface is in children 11 to 12 years of age 52 per cent and in young people 18 to 20 years old 17 per cent greater than in adults.

782 Stargardter, Julius: "Beiträge zum Nahrungsbedarf und Eiweissbedarf des Kindes jenseits des Säuglingsalters" [Food and albumin required by children after nursing period]. *Arch. f. Kinderh.* [Stuttgart], vol. 57 (1912), pp. 305–49.

The author gives results of tests with his three boys in determining the amount of nourishment, especially albumin, required. Tables give the caloric requirements for ages 2 to 14. The caloric requirements for growth and for energy are discussed, as well as the nitrogen intake and elimination.

783 Steinitz, Franz: "Über den alimentären Einfluss des Fettes auf die renale Ammoniakausscheidung" [Influence of fat intake on ammonia in the urine]. *Centralblatt für Innere Medicin* [Leipzig], vol. 25 (1904), pp. 81–95.

The author made six tests of elimination of ammonia upon five healthy boys about 12 years old, for whom he compiles case histories and tables of findings. There is a great difference in the effect of fat on the metabolism of the infant and of the older child or adult. In the older child the elimination of ammonia in the urine stands in close connection with fixed alkalis in the general circulation. Action may take place in the intestine or in intermediary metabolism. Loss of alkali through the intestine caused by fat is not important in the case of the healthy older child.

784 **Steinitz, Franz, and Richard Weigert:** "Erfahrungen mit Molkensuppe bei Säuglingen" [Experiences with whey soup for infants]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 12 (1913–14), pp. 242–260.

The authors recount their successful experience with whey soup as an infant food. They add to it 4 per cent of mondamin or maismon and 2.5 grams of peguin to the liter. The article gives the case history and graph of increase in weight for each of 14 infants.

785 **Stolte, K.:** "Klinische Erfahrungen und Stoffwechselversuche bei Verwendung der Buttermehlnahrung nach Czerny-Kleinschmidt" [Clinical experiences and metabolic tests in connection with the use of butter-flour diet according to Czerny-Kleinschmidt]. *Jahrb. f. Kinderh.* [Berlin], vol. 89 (1919), pp. 161–176.

The author employed a butter-flour diet with great success on a large number of newborn and prematurely born infants in clinic and private practice. After a detailed description of a few cases he gives tables of chemical analyses of (1) nitrogen, fat, ash in food, feces, urine, total loss, and balance for three healthy infants fed on butter flour; (2) nitrogen, fat, carbohydrates, ash, kalium, natrium, calcium, magnesium, phosphorus, chlorin in human milk, butter-flour food, and cow's milk; and (3) the various kinds of ash in food excretions of two normal infants. "The tests presented," says the author in conclusion, "correspond altogether to the expectations that one might have on the basis of success obtained in the clinic with the butter-flour diet."

786 **Szontagh, Felix:** "Beiträge zur künstlichen Säuglingsernährung" [Contributions on the artificial feeding of infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 56 (1902), pp. 341–349.

From observations and records by the author and the mother of a child weighing 2,500 grams at birth tables are compiled giving an analysis of the food intake, the weight, the nutrition quotient, and the results of metabolic experiments conducted for several months, beginning at 1 month of age.

787 **Takeno, J.:** "Beiträge zur Kenntnis des Stoffwechsels besonders der Mineralien im Säuglingsalter" [Contributions to knowledge of infant metabolism, especially of minerals]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 77 (1913), pp. 640–678.

The author describes his studies in the elimination of the most important organic and inorganic elements in the feces of infants according to diet. His main work consists of 18 studies of composition of feces of 9 normal infants, fed on nurses' milk, buttermilk, mixed fare, whey milk modified with such substances as lactose, maltose, flour, and albumin. Some of the infants were also given cream, lipanin, and cod-liver oil. His methods of analysis are specified. The results are presented in 38 tables accompanied by discussion.

788 **Talbot, Fritz B.:** "Basal metabolism in children." *Physiological Reviews* [Baltimore], vol. 5 (1925), pp. 477–517.

A review of studies made since 1843, with bibliography of 169 titles.

789 ——— "Physiology of the new-born infant." *Am. J. Dis. Child.* [Chicago], vol. 13 (1917), pp. 495–500.

A study of the respiratory metabolism of newborn infants from which energy metabolism may be calculated. Tables are given of average respiratory quotients of 105 infants during the first eight days and of body surface, computed by Lissauer's formula, for 61 body weights. A formula is derived for computing the total calories of the basal metabolism of a newborn infant from length and body surface. The author finds that the respiratory quotients indicate body fat as the infant's source of energy until breast milk "comes in"; that energy requirements of the newborn are smaller per unit of body weight than those of older infants; that a water bath depresses the metabolism; and that weak or premature infants should be fed shortly after birth.

790 ——— "Standards of basal metabolism in normal infants and children." *Am. J. Dis Child.* [Chicago], vol. 21 (1921), pp. 519–528.

A presentation in concise form of the basal metabolism curves for infancy and childhood, to be used as standards for comparison. Fourteen charts are given, derived from the investigations of Benedict and Talbot on 258 normal infants (Carnegie Institution of Washington Publication No. 302, 1921), and suggestions are made as to the variations from the average which may be expected because of irregularities in physical development.

791 ——— "The caloric requirements of normal infants and children from birth to puberty." *Am. J. Dis. Child.* [Chicago], vol. 18 (1919), pp. 229–237.

A series of charts derived from the investigations of Francis G. Benedict and the author at the nutrition laboratory of the Carnegie Institution of Washington on 108 boys and 70 girls from the Boston Directory for Wet-Nurses and the New England Home for Little Wanderers. The charts show comparison of basal metabolism of boys and girls; measured total metabolism from birth to one year; hypothetical effect of diminished food supply, diarrhea, fever, and excessive muscular activity.

792 **Talbot, Fritz B.:** "Twenty-four hour metabolism of two normal infants with special reference to the total energy requirements of infants." *Am. J. Dis. Child.* [Chicago], vol. 14 (1917), pp. 25–33.

Two normal infants in the Directory for Wet-Nurses of the Boston Infants' Hospital were selected for this study, each being kept inside the respiratory chamber as many hours of the 24 as possible. Complete records were made of the activities (moving, playing with hands, crying, etc.), and an exact account is given of periods outside the chamber. The amount of milk received at each nursing is also recorded, and results of the measurements of gaseous metabolism are tabulated by periods of from 8 to 96 minutes. Averages of the "basal" and maximum metabolism of the two infants are computed. The total number of calories used while in the chamber are corrected by estimates of requirements for the remaining time. The author found the 24-hour requirement of one infant about 74, of the other about 100 calories per kilogram of body weight.

793 ——— **and J. L. Gamble:** "The protein metabolism of an infant." *Am. J. Dis. Child.* [Chicago], vol. 12 (1916), pp. 333–344.

Report of a metabolism study with a poorly developed and poorly nourished infant observed for five 3-day periods, between the ages of 5¼ to 6¾ months, the amount of protein being increased in each successive period so that during the last period he was offered over three times as much as he had during the first period. Results of observations are reported in several tables. The authors found that metabolism went on in a normal manner, and that the child gained rapidly in weight after he received sufficient calories to satisfy his appetite.

794 ——— **and Lewis W. Hill:** "The influence of lactose on the metabolism of an infant with special reference to fat, nitrogen and ash." *Am. J. Dis. Child.* [Chicago], vol. 8 (1914), pp. 218–227.

A study of the metabolism of one infant, seven observations having been made within a period of about six weeks, during which time the percentage of lactose in the food was increased from 5.63 to 14 and again decreased to 4.38. Since the child did not digest the 14 per cent lactose well, this amount was decreased in a brief time to 9.16 per cent, no metabolism study having been conducted with the higher percentage. The authors found that increasing amounts of sugar up to a certain limit increase the retention of nitrogen and beyond that point may diminish the absorption and possibly the retention of nitrogen; they do not affect the absorption of fat up to a certain point, beyond which there may be a diminished absorption of fat. Sugar beyond certain limits may result in a greatly increased acidity of stool and diarrhea. The retention of ash seems to depend on the amount of sugar in the food. Where this is increased beyond a certain point a negative balance may result and the ash may be lost from the body. References.

795 ——— **Warren R. Sisson, Margaret E. Moriarty, and Alice J. Dalrymple:** "The basal metabolism of prematurity." *Am. J. Dis. Child.* [Chicago], vol. 24 (1922), pp. 95–101. See also *Transactions of the American Pediatric Society* [Albany], vol. 34 (1922), pp. 91–99.

These investigations in basal metabolism were made on seven prematurely born infants at the Boston Lying-in Hospital and children's department of the Massachusetts General Hospital in 1922 by the technique described by Benedict and Talbot in the Carnegie Institution of Washington Publication No. 201. Charts show weight, caloric intake, and basal metabolism. The caloric intake tended to reach two and one-half times the basal findings before satisfactory gain in weight was obtained. There was no gain until 150–200 calories were digested in a day. The only food completely assimilated to accomplish this was human milk. A relatively large proportion of food intake went to form new body tissue. The basal metabolism was strikingly low.

796 **Tanaka, M.:** "Der Einfluss von Eiweissanreicherung der Nahrung beim Säugling auf den Stoffwechsel" [Effect upon an infant's metabolism of increasing protein in its diet]. *Jahrb. f. Kinderh.* [Berlin], vol. 88 (1918), pp. 161–175.

Two prematurely born infants were studied at ages 5 months and 11 weeks. Case histories are given. Both had perfect health throughout the observations. They were examined for five days under physiological conditions, then, after a pause, were tested with doses of 10, 20, and 30 grams of cow casein in four and three tests, respectively. Tables show for each test amount of food, number of calories, amount and specific gravity of urine, weight of feces, body weight, nitrogen exchange, utilization, retention, phosphorus, calcium, magnesium, etc. With increasing intake of protein occurred an increased nitrogen absorption but faulty retention, evidently caused by an intermediary metabolic disturbance.

797 **Tangl, Franz:** "Der Stoff- und Energieumsatz eines künstlich ernährten Säuglings" [Metabolism and energy exchange of an artificially fed infant]. *Archiv für die Gesammte Physiologie des Menschen und der Thiere* [Bonn], vol. 104 (1904), pp. 453–513.

Tangl describes the development of his third child, a son, born September 2, 1900, with a weight of 2,500 grams and a length of 48 centimeters; a delicate but entirely healthy infant, who doubled his weight in the seventeenth week, cut his first tooth at the end of 9 months, and started walking before 1 year of

age. On account of the mother's mastitis the boy was artificially fed. His food was all weighed and its weight carefully noted. The metabolism was tested for four days in the thirteenth week and in the twentieth with Bendix and Finkelstein's apparatus. No respiratory experiment was conducted. Tables give the results in full. They are compared with those obtained by Cronheim and Müller, Rubner and Heubner, and others. The author concludes that his sound but frail infant showed the same utilization of milk and of its chemical energy, the same growth in weight, etc., as any robust infant fed on cow's milk.

798 **de Tannenberg, *Mme.*: Contribution à l'étude de la ration alimentaire des enfants de 2 à 15 ans [A Study of the Food Requirements of Children from 2 to 15 Years of Age].** Paris, no. 451, 1920. 64 pp.

A thesis (University of Paris) including investigation of the food of two groups of children, one at the Écoles Lailler, the other at a hospital, the study having been made when the food supply was limited. Individual observations of food ingested during periods of time varying from eight days to four months, with daily variations (averages) in weight, are recorded for about 80 children, and the findings are compared with those of other investigators. Menus are given and food values discussed. Children are divided into large, average, and light eaters, and the needs of each group are considered. Bibliography.

799 **Teixeira de Mattos, Jhr. Ed.: "Die Buttermilch als Säuglingsnahrung" [Buttermilk as an infant food].** *Jahrb. f. Kinderh.* [Berlin], vol. 55 (1902), pp. 1–61.

In connection with a discussion of the value of buttermilk for infants the author gives 15 case histories with weights of infants fed in a polyclinic from 1879 to 1901.

800 **Tobler, L., and F. Noll: "Zur Kenntnis des Mineralstoffwechsels beim gesunden Brustkind" [Mineral metabolism of the healthy breast-fed child].** *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 9 (1910–11), pp. 210–217.

Article contains data on mineral metabolism of a healthy infant 2½ months old, weighing 4,000 grams, fed on mixed milk obtained from two nurses. The test covered six days. Intake was 713.2 grams a day. Increase in weight was 24 to 25 grams daily. Intake, excretion, and utilization of potassium, sodium, calcium, magnesium, chlorin, sulphur, phosphorus, etc., are shown in tables and compared with findings of Camerer and Soldner, Keller, Rubner and Heubner, Michel and Peret, and Blauberg.

801 **Torres, Calixto: "The relation of the reaction of the urine to the diet in infants and children."** *Am. J. Dis. Child.* [Chicago], vol. 14 (1917), pp. 365–378.

In studying the relation of diet to urinary reaction the author evolved two theories: (1) The more protein in the food, the more acid the urine; (2) a diet of vegetables, especially of those poor in proteins, diminishes the acidity of the urine. To test these theories, he conducted two series of observations—one on three bottle-fed infants, in whose diet the percentages of fat, carbohydrate, and protein were changed at will; the other on two children, 5 and 5½ years of age, fed with four types of diet: (1) Vegetable; (2) mixed; (3) milk; (4) meat. The influence on the urine of the dietary changes is shown by graphs. He found that diminishing the amount of protein in the diet to 2 grams or 3 grams per kilogram would often render the urine alkaline. In cases where it still remained acid the addition of vegetables to the diet further decreased the acidity.

802 **Tumpovski, M.: Asotisti metamorfoz na pervom miesiatze zhizni pri kormlenii grudiu [Nitrogen Metabolism in the First Month of Life of Breast-Fed Infants].** St. Petersburg, 1890. 30 pp.

For this dissertation (St. Petersburg University) the author studied eight normal breast-fed infants from 1 to 17 days old for the purpose of determining the metabolism of nitrogen. The study lasted from 4 to 16 days. The author obtained the weight of the infants before and after feeding and the weight of the milk taken by them and analyzed their urine and feces. He found (1) a constant increase in the quantity of milk taken during the first month and a proportionate gain in weight; (2) an increase during the first month in the quantity of urine and feces per unit of infant's weight, but a decrease per unit of milk taken; (3) that 21 to 58 per cent of albumin of the breast milk taken by the child was retained.

803 **Tunnicliffe, F. W., and Otto Rosenheim: "Contribution to our knowledge of proteid metabolism in children."** *Brit. M. J.* [London], vol. 2 (1900), pp. 1083–1088.

To determine whether milk proteid can replace meat in the diet of children from 3 to 6 years of age, the authors studied three children, aged 2½, 4, and 5 years. Plasmin, the milk proteid used, is fully described and an analysis is given. The experiment was carried on in April and May and lasted about three weeks. Tables show the exact amount and proportions of food given and a complete analysis of the excreta, and charts show the assimilation and body weight. The authors conclude that milk proteid is capable of replacing meat as a nitrogenous food in the mixed diet of children according to its nitrogen per-

centage; that a greater gain in body weight took place with milk than with meat; that the phosphorus of milk proteid can be assimilated and retained in the body.

804 **Ulmann, Georges:** Étude de la nutrition chez le nourrisson [A Study of the Nutrition of the Nursling]. Paris, no. 223, 1900. 128 pp.

The original work in this thesis (University of Paris) consists of observation of one normal breast-fed infant for six days and one fed with sterilized milk for five days as to weight, quantity of milk taken, analyses of urine and feces, and assimilation. A comparative study of the work of other investigators is made. Bibliography.

805 **U. S. Public Health Service, U. S. Treasury Department:** Dried Milk Powder in Infant Feeding, by Taliaferro Clark and Selwyn D. Collins. Reprint No. 789, Public Health Reports. Washington, 1922. 20 pp.

A continuation of the study first reported by W. H. Price, Reprint No. 588, Public Health Reports, April 2, 1920, carrying it over a full year, and including a classification of intestinal flora of a selected group and data obtained by weighing 241 infants regularly for at least four weeks. An analysis was made of age distribution, seasonal distribution (of weighing), and physical condition of the infants. Tables show mean weights and indexes of weights for each week under observation by diet groups. Curves are derived. Bacteriological studies were made of 110 specimens of stools from 24 infants through a period of 10 weeks, showing the lowest count of microorganisms in the stools of breast-fed infants, followed in order by the count in the stools of infants fed on whole-milk powder, grade A milk, and emulsified milk. Bibliography.

806 ——— Dried Milk Powder in Infant Feeding. Safety, Usefulness, and Comparative Value, by W. H. Price. Reprint No. 588, Public Health Reports. Washington, 1920. 22 pp.

A preliminary report of a three-month study of the results of feeding three small groups of infants (287 in all) as follows: Group I, "Grade A" milk, Pasteurized by the holding process, 145° F. for 30 minutes, containing fat, 4 per cent; sugar, 4.8 per cent; protein, 3.18 per cent. Group II, modifications prepared from whole-milk powder, reconstructed in the homes, the process of preparation of the powder, and its analysis being given in the report. This food gave approximately fat, 4 per cent; sugar, 5.7 per cent; protein, 3.71 per cent. Group III, modifications prepared from milk reconstructed from unsalted butter and skimmed-milk powder of the same brand as the whole-milk powder used for Group II. All infants were less than 6 months old. Not all were in normal health. Tabulation and analysis of the results seemed to show that dried-milk powders of the brand investigated have a useful place in infant feeding. References.

807 ——— The Basal Metabolism of Infants Fed on Dry Milk Powder, by Fritz B. Talbot, and Margaret E. Moriarty. Reprint No. 724, Public Health Reports. Washington, 1922. 10 pp.

A report of the basal metabolism of 13 normal infants fed on dry-milk powder prepared as described in the report of W. H. Price. "Dried-Milk Powder in Infant Feeding." Reprint No. 588, Public Health Reports, April 2, 1920. Case histories of the 13 infants are summarized, and metabolism findings are tabulated under sex, age, height, weight, average weight for age, total calories, calories per kilogram of body weight, calories per square meter of body surface, and pulse. The basal metabolism was found to be slightly higher than that of average, normal infants but within normal limits. Deviations were not great enough to permit any striking conclusions. Curves are included.

808 **Vogt, Hans:** "Die Bedeutung der Eier als Bestandteil der Säuglingsernährung" [Significance of eggs as an ingredient of infant feeding]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 8 (1909–10), pp. 585–602.

The author gives case histories for six infants to whom he fed yolk of egg. He found such diet satisfactory for about four weeks, after which the infants' condition became unsatisfactory. Most of the article treats of the theory of nutrition and the work of others on animals, adults, and infants.

809 ——— "Zur Kenntnis der Stickstoffverteilung im Säuglingsharn" [Nitrogen distribution in infant urine]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 8 (1909–10), p. 121–133.

The author studied nitrogen distribution in infant urine after a diet of mother's milk, hunger diet of tea, and various kinds of artificial food. Six tables of tests on from two to eight infants give age, diet, amount of urine per 24 hours, total nitrogen, urea nitrogen, ammonia nitrogen, etc.

810 **Wacker, L., and Karl F. Beck:** "Untersuchungen über den Fett- und Cholesterinstoffwechsel beim Säugling" [Investigations of fat and cholesterin metabolism in the infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 29 (1921), pp. 331–351.

The authors studied cholesterin metabolism and its relation to fat metabolism in four infants. Methods of work are described in detail and data are shown in tables.

811 Wallich, V.: "Influence de l'allaitement sur le développement définitif de la taille" [The influence of method of nourishment on adult physical development]. *Annales de gynécologie et d'obstétrique* [Paris], ser. 2, vol. 7 (1910), pp. 129–136.

By study of one family of 3 and one of 5 adults and of 167 women the author found that in a family where children had been differently nurtured the child having sufficient breast feeding reached the best physical development. Among adults from different environments the same fact held true. Breast feeding beyond one year was not favorable to perfect development. Delayed menstruation often occurred among girls who had been artificially fed in infancy.

812 Wang, Chi Che, David B. Witt, and Augusta R. Felcher: "A comparison of the metabolism of some mineral constituents of cow's milk and of breast milk in the same infant." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 352–368.

A series of metabolic studies was undertaken with five apparently normal male infants between the ages of 11 days and 6 months. The infants were fed alternately with breast milk and modified cow's milk, 6 days on each diet, and analysis made of the calcium, magnesium, phosphorus, and chlorid content of both urine and feces. The actual quantity of calcium excreted in the feces was always greater on a diet of cow's milk; the amount in the urine showed slight variation. Calcium absorption and retention ran closely parallel. The actual quantity of calcium absorbed and retained was greater for cow's milk than for breast milk, but the percentage of utilization and retention was greater for breast milk except in the older children. The calcium metabolism of breast milk was independent of the age of the child, but that of cow's milk showed a distinct increase with increase in age. References.

813 Watson, C.: "Food requirements of children." *Brit. M. J.* [London], vol. 1 (1917), p. 408.

The author made a detailed study of the actual amount of food consumed by healthy children (number not given) 4 to 6 years of age, in several physicians' families, and found the daily average to be: Protein, 71 grams; fat, 67 grams; carbodydrates, 198 grams; total calories, 1,725.

814 ——— "Remarks on the food requirements of children." *Brit. M. J.* [London], vol. 1 (1913), pp. 603–605.

As a member of a committee to suggest nutritive meals at small cost for children fed by the school authorities the author made an analysis of the diet of eight children, aged 4 to 7, one his own, the others children of other physicians interested in the work. Tabulated results showed a daily average consumption of 1,751 calories in proportions of 72.1 grams protein, 69.1 fat, 198.4 carbohydrates. Various food combinations are analyzed with reference to nutritive elements and cost.

815 Widmer, Robert: "Über den Wasserbedarf des Kindes im 1. und 2. Lebensjahre" [The child's water requirement in the first and second year]. *Jahrb. f. Kinderh.* [Berlin], vol. 83 (1916), pp. 177–205.

The author treats of the water requirement during the first and second years of life and its great importance, considering it in connection with certain infants famous in the literature of pediatrics and also in connection with eight almost normal children in the second year of life whom he himself carefully studied. He gives case histories, tables of weights, food and water consumption, and curves. He concludes that for children of this age the minimum requirement of water is 65 cubic centimeters, the maximum is 110, and the mean 85 cubic centimeters per kilogram of weight.

816 von Willebrand, H.: "Studier öfver ämnesomsättningen hos gossar i åldern 9–14 år" [Study of metabolism in boys 9–14 years]. *Finska Läkaresällskapets Handlingar* [Helsingfors], vol. 49 (1907), pp. 417–470.

The works of other authors are discussed. Repeated studies were carried out with four schoolboys. Detailed results are given in 39 tables. Bibliography.

817 Wolff, Georg: "Über den Kalk- und Phosphorsäurestoffwechsel des Säuglings bei knapper und reichlicher Ernährung mit Kuhmilch" [The lime and phosphoric acid metabolism of the infant on a scanty and on a rich diet of cow's milk]. *Jahrb. f. Kinderh.* [Berlin], vol. 76 (1912), pp. 180–204.

The author studied the metabolism of lime, phosphoric acid, nitrogen, and fat in a healthy female infant of 8 months on a scanty diet of three-fourths liters and an excessive diet of 1¼ liters daily of cow's milk. The experiments were conducted in the Charité, Berlin, in 1911, and each one lasted four days. Heubner's energy quotient for this age being 80–83, the author gave the infant 64 calories and 107 calories during the two tests in question. She had been breast fed during the first six weeks. At this time she weighed 6,900 grams, had a temperature of 36.8 and a pulse of 120. At the end of the first test she weighed 6,725 grams and at the end of the second 6,800 grams.

The methods of testing urine and feces are described. Chemical analyses of intake and excretions are presented in tables. The nitrogen exchange was

little influenced and soon adapted itself on scanty and rich diet to circumstances. Fat absorption was not favorable, but better in the second period (86.1 per cent) than first (75.6 per cent). The elimination of calcium in the urine was almost as great in first as in second period; i. e., the balance was negative in the first and positive in the second. Most of the phosphorus was eliminated in the feces and taken from the bony system. The phosphoric acid in the urine came probably from disintegrating albumin. In the above case of an 8 months' infant, undernourishment with cow's milk threatened to be injurious, overfeeding by no means so.

818 **Wright, F. C.:** "Observations upon the metabolism of adolescents by indirect calorimetry." *Journal of the Royal Naval Medical Service* [London], vol. 6 (1920), pp. 277–287.

To aid in establishing a standard of food requirements of boys between 15 and 17 on training ships, the author made observations of 15 boys of a newly joined class, recording the caloric output per minute in occupations requiring 12 different degrees of activity (from sleep to boat pulling). Estimation of the caloric output in a day's routine on the ship gave a total of 3,362.05. The last of the article concerns the food value of the average daily rations.

D. TEMPERATURE

819 **Abt, Isaac A.:** "Temperature variations in infancy and early childhood." *Illinois Medical Journal* [Chicago], vol. 36 (1919), pp. 5–10.

A general discussion. From personal observation of children followed through infancy and childhood the author found temperatures of 99° F., 99.5° F., and even 100.5° F. not inconsistent with health.

820 **Apert, E.:** "La température centrale chez le nouveau-né et le prématuré" [Body temperature of the newborn and the premature child]. *Nourrisson* [Paris], vol. 1 (1913), pp. 29–33.

A brief résumé of the literature of 1912 dealing with this subject, with comments by the author.

821 **Armbruster:** "Über die Eigenwärme des Kindes in ihren Beziehungen zu jener des Embryos" [Temperature of children as related to that of the embryo]. *Der Kinder-Arzt* [Leipzig], vols. 26–30 (1915–1919), pp. 119–121.

Temperature of the embryo is 0.5° C. higher than that of the mother. After birth the newborn loses body warmth and has a temperature of only 35° C. two hours after birth. Normally the temperature is 37° C. after the first day. Children have higher temperature than adults.

822 **Babák, Edward:** "Über die Wärmeregulation bei Neugeborenen" [Heat regulation in the newborn]. *Archiv für die Gesammte Physiologie des Menschen und der Thiere* [Bonn], vol. 89 (1902), pp. 154–177.

In studying the regulation of heat in the newborn the author used Regnault's respiratory apparatus for gaseous exchange and D'Arsonval's compensation calorimeter for radiated heat. Body temperature was taken by rectum. Subjects were healthy infants under 1 week old. Tables show age, weight, temperature, oxygen consumption, carbon-dioxide output, calories, respiratory quotient, and wrappings of child. Each test lasted 2½ to 3 hours, and many tests were made on each child. One series covered seven days of first week; another had to do with effect of heavy and light covering; another with effect of room temperature and season. The article includes a review of relevant literature.

823 **von Baerensprung, Felix:** "Untersuchungen über die Temperaturverhältnisse des Foetus und des erwachsenen Menschen im gesunden und kranken Zustande" [Investigations on temperature of fetus and adult in health and sickness]. *Müller's Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin* [Berlin], 1851, pp. 126–175.

The author found by testing that the average temperature of infants immediately after birth is 30.25° R.; after a lukewarm bath, 29.56° R.; and during first 10 days, 30.04° R. Subjects were from 20 to 39 in number. The average temperature of a few children up to puberty was 30.1° R. Temperature under the arm was 0.4° less than in anus or mouth. Eleven males ranging from 15 years to 20 years of age had a temperature of 29.98° R. Von Baerensprung recalls Bergmann's theory that small bodies having relatively large surfaces give up and produce relatively more heat than large bodies. Réaumur scale, while not indicated, is evidently used.

824 **Bernard, Arthur:** De la température des nouveau-nés [The Temperature of the Newborn]. Paris, no. 503, 1897. 58 pp.

Thesis for medical degree (University of Paris). Temperature observations (rectal) on more than 300 newborn infants for a period of 10 days or longer formed the basis of the original work, temperatures having been taken at least twice a day, sometimes after every nursing. The author found temperature immediately before birth a little higher than that of the mother, falling abruptly just after birth, recovering slowly during several days, then remaining practically constant. Robust infants have a comparatively stable temperature.

Temperature exhibits daily irregularities, being more variable in the afternoon than in the morning. Sleep lowers the temperature; nursing and muscular movement raise it. Bibliography.

825 **Bonnal:** "Chaleur animale. Recherches expérimentales sur la température qu'on observe chez la femme au moment de l'accouchement, et sur celle de l'enfant au moment de la naissance" [Animal heat. Experimental researches on the temperature of the woman at the time of delivery and of the infant at the moment of birth]. *Comptes rendus hebdomadaires des séances de l'Académie des sciences* [Paris], vol. 101 (1885), pp. 861–863.

From about 30 observations the author found the rectal temperature of infants at birth and before severance of the cord to be between 37.6° C. and 38.3° C., with lower or higher figures in exceptional cases. This temperature, almost always higher than that of the mother, decreases during the first hour of life, often to 36° C. or even lower.

826 **Cassels, Jas. P.:** "On the normal temperature of the body in infancy and childhood." *Glasgow Medical Journal*, ser. 3, vol. 1 (1866–67), pp. 380–386.

Observations on the temperature, taken in the groin, of 17 healthy infants 1 to 11 days old. Diurnal variation and correlation of pulse and respiration are given. The author thinks the temperature of children is lower than that of adults.

827 **Davis, Carolina:** Beiträge zur Kenntnis der Körpertemperatur im Kindesalter [Contributions to the Knowledge of Body Temperature in Childhood]. Bern, 1879. 25 pp.

Inaugural dissertation (University of Bern). Tests with a thermogalvanometer on various parts of the body in the case of eight healthy children, where two corresponding spots on the body were compared, gave a deviation of the needles 28 times to the left, 22 times to the right. Twenty more cases were tested in armpit and rectum with an ordinary thermometer and on the surface of the body with Doctor Granville's insulated surface thermometer. The surface has a temperature far less constant, but shows highest values where the great blood vessels lie nearest the surface. Temperature of extremities decreases with distance from torso.

828 **Devilliers, Alfred:** Recherches de thermométrie chez le nouveau-né [Thermometric Researches on the Newborn]. Paris, no. 239, 1912. 82 pp.

In two chapters, the first concerned with temperature in health. Original observations are given on (1) the temperature of 21 infants immediately after birth; (2) duration in these of the period of lowering temperature; (3) duration of the period of regaining temperature; (4) hourly temperature (36 hours) of four infants born at term to determine curve of regaining of temperature. Three curves show regain of temperature of premature infants (method of derivation indefinite). The influences of food, external temperature, bathing, and muscular activity on temperature are considered. Bibliography.

829 **Donald, W. M.:** "Some observations upon the temperatures of apparently healthy children. An experimental study." *Arch. Pediat.* [New York], vol. 18 (1901), pp. 189–192.

A narrative report of diurnal observation of the temperature in normal children. Twenty subjects aged 3 to 12 years were observed for 14 days.

830 **Eröss, Julius:** "Über den Einfluss der äusseren Temperatur (der künstlichen Erwärmung und Abkühlung) auf die Körperwärme, Puls, und Respiration junger Säuglinge und über die praktische Anwendung der künstlichen Wärme" [Effect of external temperature (artificial heating and cooling) on body heat, pulse, and respiration of young infants and on practical use of artificial warmth]. *Zeitschrift für Heilkunde* [Prague and Leipzig], vol. 5 (1884), pp. 317–382.

Twelve hundred and twenty temperature observations were made by the author himself by rectum, with Leyser's thermometer, as well as many observations of pulse and respiration, on 297 infants in Breisky's obstetrical clinic; 251 temperature observations were also contributed by Epstein. About 20 tables give full date on effect of hot-water bottles for varying length of time on robust infants and on weak, premature, marantic, and newborn infants; also, of padding, of incubator, and of bath. Three tables show effect of early and late cutting of umbilical cord. In general, infant temperature is marked by inability of organism to adapt itelf to and protect itself from external conditions.

831 ——— "Untersuchungen bezüglich der Temperaturverhältnisse und der Indicationen der künstlichen Erwärmung frühzeitig geborener Kinder" [Investigations on temperature and indications for artificial warming of premature children]. *Archiv für Gynaekologie* [Berlin], vol 27 (1885–86), pp. 350–378.

Between November, 1884, and May, 1885, in the University Clinic of Budapest the author made 1,150 observations of temperature of 50 infants during

their first 8 days of life. They were all prematurely born in the thirty-first to thirty-eighth week of pregnancy and weighed between 1,300 to 2,700 grams. Body weight and food intake were often observed. The author discusses the temperatures of the 50 infants in detail and presents five curves. Thirteen showed subnormal temperature, the others a normal or elevated temperature. The premature infant is compared with the normal newborn, and the vegetative life of the former is described. No artificial warming was employed.

832 **Eröss, Julius:** "Untersuchungen über die normalen Temperaturverhältnisse der Neugeborenen in den ersten 8 Lebenstagen" [Investigations on normal temperature conditions of newborn infants during the first 8 days of life]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 24 (1886), pp. 189–224.

To ascertain the normal temperature of infants during their first eight days of life, the author made 3,200 rectal tests of 100 normal newborn infants in the gynecologic clinic of the Budapest University, using a Leyser maximal thermometer with a cylindrical end. The temperature of the room was 17° to 20° C. The tests were made every six hours by the author himself at 6 to 7 a. m., 12 to 1 p. m., 6 to 7 p. m., and 12 to 1 a. m. Only the first temperature, one-half hour after birth, was taken by another physician. The conclusions from his abundant data the author discusses at length and tabulates. At birth the average temperature is 37.6° C. By the fourth day it has fallen to 37.1° C. By the fifth and to the eighth day it has risen again to 37.29° C. The highest temperature is found in the morning and the lowest at noon.

833 **Fehling, H.:** "Über Temperaturen bei Neugeborenen" [Temperature in newborn]. *Archiv für Gynaekologie* [Berlin], vol. 6 (1873–74), pp. 385–391.

The author took 1,200 rectal temperatures of 90 infants in the first 12 days of life. Twenty-five observations immediately after birth gave a temperature of 38.32° C. for boys and 37.99° C. for girls. With small daily variations the normal temperature of the young infant is 37° or 38°, 0.8° to 1° lower than in intrauterine life. The dependence of infant's temperature on that of the mother is small. There are five curves.

834 **Feis, Oswald:** "Die Temperaturverhältnisse in der ersten Lebenswoche" [Temperature in first week]. *Archiv für Gynaekologie* [Berlin], vol. 43 (1892–93), pp. 463–502.

The author here presents a mass of detailed information on rectal temperatures of young infants. The 2,921 observations on 25 infants, including some that were prematurely born, began immediately after birth. At that time temperature of normal infants is 37.69° C. In 17.7 hours they attain an average temperature of 37.05° C, whereas premature children take 24.5 hours to reach 36.76° C. Many data are given on effect of time of day, weight, amount of food, etc.

835 **Finlayson, J.:** "On the normal temperature in children." *Glasgow Medical Journal*, ser. 4, vol. 1 (1869), pp. 186–202.

A study of daily variation of normal temperature in children. Two hundred and eighty-three observations were made on temperature of 18 healthy children, aged from 20 months to 10½ years. All temperatures were taken in the rectum, and results were tabulated for half-hour intervals for 24 hours. For comparison, corresponding tables by Roget on axillary temperature and by Cassell on temperature taken in groin are given. The author deduces a greater range of temperature in the child than in the adult; fall in evening, greatest between 7 and 9 p. m., lowest about 2 a. m., rise between 2 and 4 a. m. No obvious relationship between frequency of pulse and respirations and normal temperature was established.

836 **Forster, R.:** "Über Thermometermessung bei Kindern" [Thermometry in children]. *Journal für Kinderkrankheiten* [Erlangen], vol. 39 (1862), pp. 1–22.

The author discusses the work of other investigators, especially von Baerensprung, and defends thermometry in the armpit of children. His own findings are shown in five tables and three curves. Of 291 observations on healthy infants between the second and the ninth day the mean temperature was 37.24° C. It is usually higher in robust than in weak subjects. In the first two hours after birth the temperature falls to 36.25° C. The curve rises in 24 to 36 hours after birth and also between the fifth and the eighth day. During the first nine days of life the temperature rises 0.14° C. through the day.

837 **Fraenkel, Dora:** "Über die normale Körpertemperatur der Kinder und ihr Verhalten bei Bewegung und Ruhe" [The normal temperature of children at rest and exercising]. *Deutsche Med. Wchnschr.* [Leipz'g and Berlin], vol. 39, pt. 1 (1913), pp. 267–268.

The author systematically for two or three weeks tested the temperature of 137 children between 5½ and 13 years and 26 children between 14 and 16½ years at a children's sanatorium in Borgsdorf. Temperature was taken at 7 to 7:30 a. m. in bed, at 8 p. m. in bed, and at 4.30 to 5 p. m. after play. The thermometer was inserted 4½ centimeters into the rectum. In rest the temperature was seldom above 37.2° C.; after muscular activity 74 per cent of the children showed over 38° C. Age had no effect. Outside temperature affected only neuropathic children. The article contains one graph and three tables.

838 **Gofferjé, Fritz:** "Die Tagesschwankungen der Körpertemperatur beim gesunden und beim kranken Säugling" [Daily variations of temperature in the healthy and sick infant]. *Jahrb. f. Kinderh.* [Berlin], vol. 68 (1908), pp. 131–190.

A comprehensive treatment of the 24-hour variations in infants' temperature. Their temperature curve is different from that of adults in that it seems to lack the morning remission and shows less fluctuation. The author gives measurements and curves of temperature taken every two hours in the rectum of healthy infants in the Dresden Nursery from November, 1906, to February, 1907. The low night temperature is from 10 p. m. to 4 a. m. and the high day temperature from 10 a. m. to 6 p. m. Jundell's infant temperatures for a different climate and season present the same peculiarities. Infants fed on cow's milk show a curve like that of adults in irregularity and extent of oscillation. Sections of the article concern the relation between skin temperature and room temperature.

839 ——— "Über die tägliche Temperaturschwankung des Säuglings" [Daily variation of temperature of the infant]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 6 (1907–8), p. 54.

This résumé of Gofferjé's lecture at the pediatric conference in Dresden, March 23, 1907, states that in the third to the fourth week of the infant's life a typical variation of temperature marks the 24-hour day—minimum from 10 p. m. to 4 a. m. and maximum from 10 a. m. to 4 p. m.

840 **Heim, P., and M. K. John:** "Die Thermoregulation des gesunden und ernährungsgestörten Säuglings" [Thermoregulation in healthy and ill-nourished infants]. *Jahrb. f. Kinderh.* [Berlin], vol. 73 (1911), pp. 266–272.

The authors tested healthy and dyspeptic infants for their temperature reactions. The dyspeptic infant shows great variations in temperature; the normal infant can adapt himself to changing external conditions. Hunger and thirst produce fever. Infants kept too warm in summer are liable to diarrhea. Water retention is significant in the regulation of temperature.

841 **Heller, Fritz:** "Fieberhafte Temperaturen bei neugeborenen Kindern in den ersten Lebenstagen" [Febrile temperatures in newborn infants during the first days of life]. *Ztschr. f. Kinderh.* [Berlin], vol. 4 (1912), pp. 55–62.

The author herein discusses the fever that frequently attends initial loss of weight during the second to the seventh day of an infant's life. After mentioning literature on this subject, he describes his observations on 191 normal infants. Seventeen per cent—mostly, the heaviest and healthiest—had this fever; 70 per cent were boys and 30 per cent girls. The fever apparently had nothing to do with any pathological state since it soon disappeared and the children developed well. The author does not believe it is a "thirst fever," since loss of water and weight often are unattended by fever. He concludes the fever in question is caused by defective nitrogen metabolism and possibly in addition by defective thermolability and says that relief can be afforded by a little water or tea.

842 **Homburger, Theodor:** "Über Mastdarmtemperatur beim Kinde" [Rectal temperature in the child]. *Arch. f. Kinderh.* [Stuttgart], vol. 25 (1898), pp. 224–240.

Tests were made with 108 children. A depth of at least 10 centimeters was necessary to get accurate results. A study was made of the effects of nutrition, restlessness, sex, age, and feces in the intestine upon temperature, and simultaneous temperatures in the armpit and rectum were compared.

843 **Kerley, Charles G.:** "Observations on temperature in children." *Pediatrics* [New York], vol. 19 (1907), pp. 521–529.

Result of a study of the temperature of 59 healthy children, aged from birth to 1 year, the observations having been made by Dr. H. G. Myers, resident physician at the New York Infant Asylum. Temperatures were taken by rectum, for 4 minutes. Results are also given of a similar study, made by the author at the country branch of the New York Infant Asylum, of the temperature of 25 healthy children, observations having been made four times a day, for one week. He concludes that a daily rise above 99.5° F. may be considered abnormal.

844 **Lachs, Johann:** "Die Temperaturverhältnisse bei den Neugeborenen in ihrer ersten Lebenswoche" [Temperature conditions in newborn infants during the first week]. *Sammlung Klinischer Vorträge, Gynaekologie* [Leipzig], new ser. nos. 99–133 (1900–3), pp. 323–342.

The author made 3,000 temperature observations on 100 newborn infants, each infant having its own maximal thermometer. The temperature was taken always at same hours, 8 a. m., 12.30, 5, and 10.30 p. m., in rectum. The article contains 5 tables and a bibliography of 25 titles.

845 **Lépine, R.:** "Sur la température des nouveau-nés" [On the temperature of the newborn]. *Comptes rendus hebdomadaires des séances et mémoires de la Société de biologie* [Paris], ser. 5, vol. 1 (1870), pp. 207–210. (Also *Gazette médicale de Paris*, vol. 25 (1870), pp. 368–369.)

The author studied the temperature of more than 100 infants during the first 8 days of life, by readings taken at least twice a day by rectum. Grouping the infants by weight, he found the temperature of the heavier group higher than that of the lighter; grouping those who were gaining in weight on the fifth to eighth days and those who were not, he found the temperature in the former group a little higher than that in the latter.

846 **McClure, W. B., and L. W. Sauer:** "The influence of clothing on the surface temperature of infants." *Am. J. Dis. Child.* [Chicago], vol. 10 (1915), pp. 425–435.

A report of observations on the surface temperature of infants at moderate and high room temperatures. The surface temperature was determined by the thermoelectric method. At a room temperature of about 31° C. an infant clothed in cotton gown, diaper, shirt, and hose approaches closely to the point where a heat loss by conduction and radiation is no longer possible.

847 **Mendelssohn, A.:** "Beobachtungen über Hauttemperaturen der Säuglinge [Observations on the temperature of infants' skin]. *Ztschr. f. Kinderh.* [Berlin], vol. 3 (1911–12), pp. 292–308.

After discussing aseptic fevers and those caused by bacteria, heterogeneous albumin, salts, etc., the author takes up the matter of skin temperature in infants. Ten graphs show body temperature and skin temperature of 10 infants, as well as temperature and humidity of air, with window open and shut, covers on or off, hot-water bottle used or not. From these observations it appears that infants have very inferior ability to regulate their temperature. Such capacity is slowly acquired and is easily lost through illness.

848 ——— "Über das Wärmeregulationsvermögen des Säuglings" [Infant's capacity to regulate temperature]. *Ztschr. f. Kinderh.* [Berlin], vol. 5 (1912–13), pp. 269–293.

Author comments on investigations by Eröss, Rietschel, and Kleinschmidt and describes his own repeated tests on 19 infants with an electrical warming pad or with an electric-light bath. The experiments lasted from two to three hours and involved temperatures between 40° and 50° C. Breathing was registered by Marey's capsule with a kymographion, and humidity was considered. Results are discussed and embodied in 19 curves. Mendelssohn declares that the infant's mechanism for regulating temperature is better developed for heat than for cold.

849 **Moro, E.:** "Über rektale Hyperthermie im Kindesalter" [The rectal hyperthermia in childhood]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 11 (1912–13), pp. 430–438.

The author raises the question why the rectal temperature should usually exceed the axillary temperature. He cites a number of instances, in one of which the difference amounted to 2°. From a series of experiments on small groups of children he shows that in bed temperatures differ little in different parts of the body and that exercise quickly influences temperature. Exercise of the legs influences the rectal temperature; that of the arms the axillary temperature. He shows secondly that individuals weak muscularly or ill are more liable than others to changing and diverging temperatures.

850 **Mühlmann, M.:** "Die Temperatur der Neugeborenen." [The temperature of newborn infants]. *Arch. f. Kinderh.* [Stuttgart], vol. 23 (1897), pp. 291–304.

The author studied temperature variations during the day in the case of 21 infants from 2 to 5 days old in the Charité, Berlin, during the spring of 1896. For each subject he shows results in a table and curve. He found there was no essential difference between the temperature of newborn infants and that of adults. There was great variation in the variability owing to effort of nursing and digesting, to bath, change of season, etc. The average temperature was 36.3°, with no marked difference owing to sex.

851 **Neff, Frank C.:** "Temperature variability in certain apparently normal children." *Southern Medical Journal* [Birmingham], vol. 15 (1922), pp. 268–272.

An investigation of the effect on temperature of emotional instability in children. The temperature of a large number of children was taken before and after a period of crying or excitement. In 39 per cent of 158 crying children the temperature was found to be elevated from 0.2° to 1° F.; in 10 per cent of 88 children similarly examined under excitement but not crying there was a like elevation of temperature.

852 **Nobécourt, P., and Prosper Merklen:** "Sur la température des nourrissons" [The temperature of nurslings]. *Revue mensuelle des maladies de l'enfance* [Paris], vol. 25 (1907), pp. 341–349.

The author observed the temperature of seven normal breast-fed infants from 3 to 26 days of age, testing it every three hours for two consecutive days and finding the greatest variation 0.4°. Observation of six bottle-fed infants, aged 5, 7, 9, and 11 months, showed a much greater variation in temperature. Curves are presented.

853 **Peters, Franz:** "Einige Beobachtungen zur Diätetik des Säuglingsalters" [Some observations on dietetics in infancy]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 10 (1876), pp. 314–333.

In addition to discussing the feeding of seven healthy infants, the author gives a table of the temperatures in 37 tests carried out after baths in fresh and salt water.

854 **Pilz, C.:** "Die normale Temperatur im Kindesalter" [Normal temperature in childhood]. *Jahrb. f. Kinderh.* [Leipzig], new ser. vol. 4 (1870–71), pp. 414–423.

This article, after mentioning the investigations of others, describes tests made by rectum, hourly during the night and every five minutes during many hours of the day, which led to the conclusions that in general children have higher temperatures and more rapidly changing temperatures than adults, that in children the maximum temperature is usually at 5 p. m., with another high point at 11 a. m., but that sometimes the maximum is reached at 10 to 11 a. m. and at 4 to 6 p. m.

855 **Prouff:** "Variations de la température chez le nouveau-né dans le cours des premières heures de la vie" [Variations of the temperature of the newborn during the first hours of life]. *Bulletins et mémoires de la Société de chirurgie de Paris*, vol. 5 (1879), pp. 299–300.

A brief note on 30 observations, 4 of which are reproduced in detail. The author found that temperature decreases at the rate of about 1° each quarter hour from 38° or 37° at birth to 33° or less, from that point remounting to normal.

856 **Raudnitz, Robert W.:** "Die Wärmeregelung beim Neugeborenen" [Thermal regulation in the newborn infant]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 24 (1887), pp. 423–552.

An exhaustive study, in which the author describes his experiments in 63 cases, mostly newborn infants. Part of the body where temperature is taken, effect of baths and various conditions upon temperature and permeability of infant's as compared with adult's skin are discussed in detail.

857 **von Reuss, A.:** "Über transitorisches Fieber bei Neugeborenen" [Transitory fever in newborn infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 4 (1912), pp. 32–54.

The author discusses the "transitory" fever that often comes upon newborn infants between the second and the fifth day, lasting only a few hours or two to three days. The temperature is usually 38° C. or 39° C. He gives case histories and curves for 24 cases observed in the Women's Clinic at Vienna and discusses the causes of the fever.

858 **Roesing:** "Beobachtungen an 100 Neugeborenen über Temperaturverhältnisse und Nabelerkrankungen" [Observations on 100 newborn infants as to temperature and umbilical affections]. *Zeitschrift für Geburtshülfe und Gynaekologie* [Stuttgart], vol. 30 (1894), pp. 176–198.

Between October, 1893, and February, 1894, the author took 3,000 temperatures of 100 newborn infants. None were over 39° and only 21 per cent over 37.9°. The temperature of the newborn infant is higher than that of its mother by 0.1° to 1° C. Usually no difference was apparent between first-born children and others. Cord came off in 45 per cent of cases on the third to the fifth day; in 29 per cent on the eighth to the tenth day. Daily variations of temperature, even in healthy infants, are very great. Thirteen curves and a table are presented.

859 **Roger, Henri:** De la température chez les enfants à l'état physiologique et pathologique [The Temperature of Infants, Physiological and Pathological]. Rignoux, Paris, 1844. 190 pp. Also *Archives générales de médecine* [Paris], ser. 4, vols. 5 and 6 (1844); ser. 4, vols. 7, 8, and 9 (1845).

In the first three chapters, pages 1 to 34, the author discusses normal temperature and gives a table of nine observations of the normal temperature, respiration and pulse of infants, aged 1 to 30 minutes; of 33 infants, aged 1 to 7 days; of 25 infants, aged 4 months to 14 years. Chapter 4 contains a discussion of comparative temperatures in different parts of the body, with a table of observations of 15 children, aged 8 to 13 years.

860 **Rudolf, R. D.:** "The normal temperature of the body." *International Clinics* [Philadelphia], ser. 18, vol. 1 (1908), pp. 82–88.

A comprehensive discussion reviewing past literature and reporting the average morning temperature as 97.637° F. and the average evening temperature as

97.677° F. These figures are derived from 1,000 observations by third-year medical students. A table is printed showing by months the percentage of temperatures below 98.4°, the data for this having been derived from afebrile cases at the Toronto General and Children's Hospitals. The author advocates on charts a zone of normal variation rather than a line for normal.

861 **Schelble, H.:** "Über Stamm- und Hauttemperaturen bei Säuglingen" [Trunk and skin temperature in infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 2 (1911), pp. 62–76.

Author gives six graphs of weight curve and diet of healthy infants, which showed range of 0.8° in temperature, perhaps because the subjects were not very carefully dressed. He suggests that monothermia is the artificial product of clinical care, and calls attention to service rendered by Jundell in showing how temperature variation can be reduced to minimum by protection from mental and physical disturbance. Other graphs give temperature curves of healthy infants for body temperature and skin temperature as found by galvanometer and smoke drum.

862 **Shufeldt, R. W.:** "Thirty-five hundred comparative observations on the pulse, respiration, and temperature of children." *New York M. J.*, vol. 54 (1891), pp. 258–263.

Observations were made on six children in wards of the Children's Hospital of St. John's Episcopal Church, Washington, D. C., for about three months. Charts are shown for each child.

863 **Solis-Cohen, Myer:** "Temperature, pulse, and respiration relationships in infancy and childhood." *Arch. Pediat.* [New York], vol. 22 (1905), pp. 909–919.

The normal pulse-respiration rates for different ages are quoted from 12 earlier writers, and literature of the subject is reviewed. The author then gives a summary of the pulse and respiratory rate (tabulated) of 1,013 observations on 129 children with normal temperature, ages birth to 12 years. Tables of pulse and of respiration for temperatures from 98 to 105 are given and a table of febrile pulse-respiration ratios. Data were collected from hospital charts. No effort was made to take records when children were asleep or quiet.

864 **Sommer, Carl:** "Über die Körpertemperatur des Neugeborenen" [The body temperature of the newborn]. *Deutsche Med. Wchnschr.* [Berlin], vol. 6, no. 43 (1880), pp. 569–573, 581–586, 595–599, 605–608.

Many data collected by the author from his observations of rectal temperature in 101 newborn infants at the Royal Saxon Lying-in Institute at Dresden, and also data compiled by other investigators of temperature in infants. The article also sketches the history of thermometry, especially as regards children, and mentions such injurious customs as cold baths for the newborn and visits to registrars' offices. Tables are full and numerous. The author found 37.72° C. to be average temperature directly after birth; that of boys was 0.05° C. higher than that of girls. The better developed a child, the more likely was its temperature to be higher than its mother's. Several phases of initial cooling are discussed. The average loss of heat during the first bath was ascertained by the author to be 1.87° C. The temperature tends to fall between the second and sixth days and to be high on the eighth and ninth days. It also fluctuates according to time of day, being higher at noon than in morning and evening. Nursing raises it, but the difference between natural and artificial feeding in effect on temperature is negligible.

865 **Squire, William:** "Infantile temperatures in health and disease." *Transactions of the Obstetrical Society of London* [London], vol. 10 (1869), pp. 274–298.

Discussion illustrated by several special cases, not compiled in tabular form.

866 **von den Steinen, Paul:** "Untertemperaturen bei gesunden Neugeborenen" [Subnormal temperature in healthy newborn infants]. *Zentralblatt für Gynäkologie* [Leipzig], vol. 48 (1924), pp. 1254–1256.

A study of the temperature of 79 newborn infants weighing 3,000 to 4,500 grams and of 21 weighing 2,000 to 3,000 grams. The temperature was taken daily during the first eight days of life, every time between 4 and 5 p. m., after the infants had been fed and bathed. The temperature of the room was 20 to 23° C.; the infants were covered with feather blankets; in spite of this, in almost every case, the temperature of the infants was below normal, and there was no case of so-called transitory fever. For the purpose of checking up the data so obtained, the temperature was also taken before the children were bathed; in those cases the temperature was found to be not more than one degree higher than in the preceding cases.

867 **Stoltz (le Doyen):** "Exposé de quelques recherches sur la température axillaire et sur la température rectale chez les enfants" [A report of some investigations of the axillary and rectal temperatures of infants]. *Revue médicale de l'est* [Nancy], vol. 7 (1877), pp. 146–152.

Seven observations of normal infants, of whom the axillary and rectal temperatures were taken from 9 to 32 times, morning and evening, and recorded in tabular form; also axillary and rectal temperatures of five premature infants and of seven infants born at term taken within the first 24 hours. The author found no satisfactory explanation of the difference between rectal and axillary temperature.

868 **Sturges, Octavius:** "The temperature of young children in health and disease." *Westminster Hospital Reports* [London], vol. 2 (1886), pp. 1–22.

The author studied the temperatures of 20 children under 6 years of age belonging to 3 categories: (1) Those recovered from an acute illness but only at the beginning of convalescence; (2) convalescents who had been sent to the country to recover health and strength; (3) entirely healthy children. Hourly axillary temperatures are recorded for the first class, with charts of 2 cases; mouth temperatures 4 times daily for 7 consecutive days, with charts of 3 cases, for the second class; 40 observations, taken in the axilla 10 minutes each time, at various hours from 10 a. m. to midnight, for the third class. The author's conclusion is that the normal temperature of young children is less stable than that of adults, and when disturbed returns to normal less quickly.

869 **Tibérius, Périclès:** La température dans les différentes formes d'allaitement chez les nourrissons sains [The Temperature of Healthy Nurslings with Different Kinds of Feeding]. Lyon, no. 6, 1902. 45 pp.

Thesis (University of Lyon). The original work in this thesis consists of studies of the temperature curve, for about a month, of two breast-fed infants, four infants fed with cow's milk variously prepared, one infant fed with ass's milk, three infants fed with cow's milk followed by breast feeding, one infant fed with sterilized cow's milk followed by ass's milk, one infant fed with sterilized ass's milk followed by breast feeding. Curves are given. The author concludes that different kinds of food produce different temperature curves, oscillating above and below a normal 37° C; that the oscillations are least with breast feeding and greatest with cow's milk; that regularity of weight gain accompanies a regular temperature curve. Bibliography.

870 **Weill:** "Note sur la thermométrie chez les nourrissons" [Note on the temperature of nurslings]. *Lyon médical*, vol. 99 (1902), pp. 629–632.

Records from La Clinique de la Charité, of rectal temperature (twice daily) of all the infants there under care for about 10 years. The author found an almost constant temperature of about 37° C. in breast-fed infants, a less constant temperature in infants fed with ass's milk, and still less constant in those fed with cow's milk.

871 **Williams, Mary H.:** "A note on the temperatures of one thousand children." *Lancet* [London], vol. 1 (1912), pp. 1192–1194.

A report of observations made for the "Medical Inspection of Children Act." Many of the children were diagnosed as suspicious cases of tuberculosis or rheumatism. The data are tabulated to show number of cases, sex, temperature, and percentage of cases with each temperature. Methods of taking temperature and deriving diagnosis are described.

872 **Winckel, F.:** "Über Anwendung permanenter Bäder bei Neugeborenen" [Use of permanent baths for newborn infants]. *Centralblatt für Gynäkologie* [Leipzig], vol. 6 (1882), pp. 1–5, 19–24, 38–40.

Case histories and tables of temperatures, etc., are presented for six newborn infants for whom permanent baths were used.

873 **Wolff, Alexander:** "Zur Beurteilung der Temperaturschwankungen beim Kinde" [A critical examination into variations of temperature in the child]. *Ztschr. f. Kinderh.* [Berlin], vol. 3 (1911–12), pp. 128–154.

The author studies temperature in childhood, especially as affected by exercise, in thin, pale children. He describes change of temperature before and after exercise in 50 cases and gives curves and a table. He concludes that a characteristic of childhood is lability of temperature and that only a temperature over 38° C. is pathological. Fluctuations up to 1.5° C. after exertion are normal. Children seem to grow accustomed to certain kinds of exercise and do not react after them with raised temperature. Walking seems less beneficial to the child than games.

874 **Wurster, Georg:** "Aus der geburtshülflichen Klinik des Professor Gusserow in Zürich" [Obstetrical clinic of Professor Gusserow in Zurich]. *Berliner Klinische Wochenschrift*, 6th year, 1869, pp. 393–395.

Author investigated temperatures of 55 newborn infants, 49 of whom were normally born. In the case of the 49 mothers, 200 estimations showed an average of 37.31° C. during parturition, minimum and maximum being 36.3° C. and 38.2° C. The average temperature of infants is 37.41° C., ranging from 36.5° C. to 38.2° C. In 24 cases the infant's temperature was higher than the mother's; in 9 cases lower; in 16 cases relation changed during birth.

SECTION IV. ADOLESCENCE AND PUBERTY

1 **Aran, F. A.:** Leçons cliniques sur les maladies de l'utérus et de ses annèxes [Clinical Lectures on Diseases of the Uterus and Its Appendages]. Labé, Paris, 1858. 1,106 pp.

The age of first menstruation is given for 100 women in Paris. In four-fifths of the number it was between 12 and 18 years. The most frequent age was 15 to 16 years.

2 **Baelz, E.:** "Das Wachsthum der Geschlechter zur Pubertätszeit" [Growth of the sexes at time of puberty]. *Verhandlungen der Berliner Gesellschaft für Anthropologie*, 1901, published in *Zeitschrift für Ethnologie* [Berlin], 1901, vol. 33, p. 211.

In study of the growth of both sexes the author finds that growth stops sooner in Japan than in Europe. At the time of puberty girls are larger and heavier than boys. Japanese girls reach puberty later than European girls brought up in Japan.

3 ——— Die körperlichen Eigenschaften der Japaner. Eine anthropologische Studie [Physical Characteristics of the Japanese]. Pt. 2, Yokohama, 1883, Buchdruckerei des "Écho du Japon." 69 pp.

Brief statement on beginning of menstruation in 240 cases. The earliest age is 11 years, latest 19 years, and most frequent 15 years. Puberty does not take place in Japan so early as it is thought to do in Europe.

4 **Baldwin, B. T.:** "Stages of physiological maturation or physiological age." *The Fifteenth Yearbook of the National Society for the Study of Education*, University of Chicago Press, 1916, pp. 12–22.

A study of 3,600 boys of the athletic type in Baltimore and 1,317 boys from 14 counties of Maryland, made by Doctors Burdick and Brown to determine the ages at which these boys showed characteristics of puberty, was checked and reported by the author; also a study of 1,241 prepubescent, pubescent, and postpubescent girls of the Baltimore Athletic League. These findings are included in a paper discussing norms to be used as standards in measuring physical development.

5 **Barbaud, C., and C. Lefèvre:** La femme aux trois grandes périodes de sa vie: puberté, union sexuelle, ménopause. La puberté chez la femme: étude physiologique, clinique et thérapeutique [Woman at the Three Great Periods of Her Life: Puberty, Sexual Union, Menopause. Puberty in Woman: A Physiological, Clinical, and Therapeutic Study]. A. Maloine, Paris, 1897, vol. 7. 234 pp.

A comprehensive study of the subject of puberty among women. Anatomical and physiological changes at puberty are considered, and data are given from various authors on the age of puberty, the influence of climate, race, heredity, and social position.

6 **Basset, T.:** Étude sur la puberté chez la femme [Study of Puberty in Woman]. Montpellier, no. 68, 1867. 136 pp.

In this thesis [University of Montpellier] the physiology, pathology, and hygiene of puberty are discussed. The age of the beginning of menstruation is considered and the influence of climate, race, heredity, constitution, etc. Three tables give the age of menstruation in cold, warm, and temperate climates in 10,338 cases. Various authors are quoted. No original data. Bibliography.

7 **Benoist, A.:** Considérations sur la puberté chez la femme. L'aménorrhée et la ménorrhagie [Considerations on Puberty of Woman, Amenorrhea, and Menorrhagia]. Paris, no. 101, 1852. 42 pp.

Thesis (University of Paris). A description of the changes taking place at the age of puberty with special reference to amenorrhea and menorrhagia.

8 **Bierent, L. H.:** Étude sur la puberté chez l'homme et chez la femme. La puberté à l'état physiologique [A Study of Puberty in Man and Woman. The Physiology of Puberty]. Lille, no. 160, 1896. 200 pp.

Thesis (University of Lille). A careful review of the literature relating to the subject of puberty. Part I considers the age of puberty in man and woman in the different countries and its variations due to climate and race. The average ages found by different writers are given. Part II discusses anatomical and physiological changes. All the various organs are considered as to growth and weight in both man and woman. Part III deals with psychological changes. There are no tables. Averages only are given.

9 **Bouchacourt:** "Menstruation." Dictionnaire de Médecine, Paris, vol. 19, 1839, pp. 440–480.

A general discussion, among 160 original observations, communicated by Bouchacourt, most of them from the maternity hospital at Lyon, the earliest age was 10 years, the latest 24 years, and the most frequent 15 to 16 years.

10 **Bowditch, H.:** "The growth of children." Report of the Board of Health, Mass. vol. 8, pp. 283–284. Boston, 1877.

Data from the manuscript tables of Dr. J. R. Chadwick, containing records of observations on 575 American-born women at the Boston Dispensary and the Boston City Hospital, are tabulated to show the age at which menstruation began. The average age was found to be 14 years 5½ months.

11 **Brierre de Boismont, A.:** "De la menstruation; faire connaître l'influence que cette fonction exercise sur les maladies et celle qu'elle en reçoit" [Concerning menstruation; a study of its influence on diseases and of the effect of disease on menstruation]. *Mémoires de l'Académie royale de médicine* [Paris], 1841, vol. 9, pp. 104–233. Also: Germer-Baillière, Paris, 1842. 560 pp.

Twelve hundred women in the rich, middle, and poor classes were observed for a period of 10 years. The age of the beginning of menstruation was considered, the influence of country and city life, temperament, constitution, color of hair, height, length and duration of the flow, and the age at menopause. Many original data and many tables are included.

12 **Campbell, J.:** "On the age at which menstruation begins in Siam." *Edinburgh Medical Journal*, vol. 8, pt. 2 (1862), pp. 233–236.

A study of the average age for the occurrence of puberty among the Siamese. In the small number of cases studied it was found to be between the fifteenth and sixteenth year. (Data obtained through correspondence with doctors and missionaries.)

13 **Clow, A. E. Sanderson:** "Menstruation during school life." *Brit. M. J.* [London], vol. 2 (1920), pp. 511–513.

An article largely concerned with hygiene, giving age of onset of menstruation and details concerning the menstrual function, for about 1,200 cases.

14 **Committee of the Association of Collegiate Alumnae:** Health Statistics of Women College Graduates. Wright & Potter, Boston, 1885. 78 pp.

A table gives the age of first menstruation for 705 college women. The earliest age is 9 years, the latest 20 years, and the most frequent 13 to 14 years. Another table gives the conditions attending the menstrual periods and the number suffering from pain and irregularity at the different periods.

15 **Courty, A:** Traité pratique des maladies de l'utérus, des ovaires et des trompes considérées principalement au point de vue de diagnostic et du traitement, contenant un appendice sur les maladies du vagin et de la vulve [A Practical Treatise on the Diseases of the Uterus, Ovaries, and Tubes, Considered Principally from the Point of View of Diagnosis and Treatment] Asselin & Cie., Paris, 1881. 1437 pp.

The author reviews the literature on the age of first menstruation and includes several tables giving the number of observations, locality and source, and average age in all classes. He also made 600 observations on the women of all classes of Montpellier, finding an average age of 14 years 2 months 1 day.

16 **Crampton, C. W.:** "Anatomical or physiological age versus chronological age." *Pedagogical Seminary* [Worcester], vol. 15 (1908), pp. 230–237.

A short article illustrating the differences in the degree of maturity among boys of the same chronological age. It is found from 4,800 records of New York City high-school boys that mature boys are 33 per cent heavier, 10 per cent taller, and 33 per cent stronger than immature boys of the same chronological age.

17 ——— "The influence of physiological age upon scholarship." *Psychological Clinic* [Philadelphia], vol. 1 (1908), pp. 115–20.

A study of prepubescent, pubescent, and postpubescent development, chiefly of the male. Tables based upon 4,800 records compare the ages, weight, height, and strength of individuals in each of the three stages of development. Relation of pubescence to scholarship is discussed; also teeth as an evidence of physiological age, data having been obtained from a study of 1,000 boys from 10 to 15 years of age, who were examined as to weight, height, and presence or absence of permanent canines and second molars. A preliminary study of weight, height, and strength in relation to menstruation is reported.

18 **Curjel, Dagmar F.:** "The reproductive life of Indian women." *Indian Journal of Medical Research* [Calcutta], vol. 8 (1920–21), pp. 366–371.

A study of 489 Indian women showed the average age of onset of puberty to be 13.63 years.

19 **De Blasio, A.:** "La pubertà dei napoletani normali e delinquenti" [Puberty in normal and delinquent inhabitants of Naples]. *Medicina italiana* [Naples], 1907, pp. 632–634.

A study was made of 1,000 normal and 1,000 delinquent boys and girls in Naples. The author draws the following conclusions: Puberty appears earlier in woman than in man; it develops earlier in delinquents of both sexes than in normal persons; in the delinquents precocity is the direct cause of the abnormalities.

20 **Delpeuch, Armand:** "La période prépubère" [The prepubertal age]. *La Presse médicale* [Paris], pt. 2, no. 68 (1898), pp. 89–93.

Discussion of the work of many investigators to show (1) the acceleration of growth which precedes puberty, consisting largely in a lengthening of the lower extremities and (2) that this is the period of life when the trunk is relatively shortest and chest narrowest. Bibliography.

21 **d'Espine, Marc:** "Recherches sur quelques-unes des causes qui hâtent ou retardent la puberté" [Researches concerning some of the causes which hasten or retard puberty]. *Archives générales de médecine* [Paris], ser. 2, vol. 9 (1835), pp. 5–18, 303–318.

Data for this study were obtained by questioning 85 women of Paris, 25 of Marseilles, and 43 of Toulon and by consulting records of 137 women of Göttingen and 450 of Manchester. The Parisian data only were secured by the author. Analyses are made of the influence of latitude and climate; environment (city or country); temperament and constitution. The author found that puberty develops earlier in warm climates than in cold; in cities than in the country. Tables are given.

22 **Diaz, E. R.:** Breves observaciónes sobre la aparición de la pubertad en la mujer chilena i de las predisposiciónes patolójicas propias del sexo" [Brief observations on the appearance of puberty in the Chilean woman and the pathological predispositions peculiar to the sex]. *Revista Médica de Chile* [Santiago], vol. 16 (1887–88), pp. 289–298.

The author gives the ages at which he found the beginning of menstruation among about 4,600 women living in the different parts of Chile where climate and occupations vary.

23 **Doktor:** "Über die Menstruation" [On menstruation]. *Centralblatt für Gynäkologie* [Leipzig], vol. 16 (1892), p. 800.

This is a brief review of an article by Doktor containing a report on 9,600 obstetrical and gynecological cases in Budapest with statistics on the first appearance of the menses, duration of each period, and age of menopause. Average age was 15 years 4⅓ months; limits, 8 and 38 years. Jewesses began to menstruate one year earlier than others, inhabitants of the capital earlier than girls in the Provinces, and educated women earlier than uneducated.

24 **Dubois, P. A., and C. Pajot:** Traité complet de l'art des accouchements [Complete Treatise on the Science of Obstetrics]. Béchet jeune, Paris, 1860, pt. 2, pp. 269–534.

The authors discuss the physiology of menstruation and the influence of race, climate, physical development, city life, etc. A table contains 600 observations made in cold, temperate, and warm climates. The average age of first menstruation in warm climates is 12 years 11 months 21 days; in temperate climates, 15 years 3 months 17 days; and in cold climates, 16 years 7 months 21 days.

25 **Elgood, Mrs. B. Sheldon:** "The age of onset of menstruation in Egyptian girls." *Journal of Obstetrics and Gynaecology of the British Empire* [London], vol. 16 (1909), pp. 242–244.

The author investigated in 1906 and 1907 the menstrual history of 275 girls, between 6 and 16 years old, attending a school for native Egyptian girls in Cairo and of over 400 girls in three other boarding and day schools for Egyptian girls. In a large majority of cases menstruation was established at 13 or 14 years of age.

26 **Emmet, T. A.:** Principles and Practice of Gynaecology. H. C. Lea's Son & Co., Philadelphia, 1884. 876 pp.

The author in chapter 9 gives the result of 2,330 observations made on women in his private practice. He found the average age of the beginning of menstruation to be 14.23 years; the earliest age, 10 years; the latest age, 23 years. Tables give the proportion of sterile, fruitful, and unmarried women for each age of menstruation; also the duration of the flow and amount of pain.

27 **Engelmann, G. J.:** "Age of first menstruation on the North American continent." *New York M. J.*, vol. 75 (1902), pp. 221, 270.

An extensive study of the age of menstruation in the American girl. Twelve thousand four hundred and two observations were made by the author, or at his request, on all classes of society in the United States and Canada, and the evidence thus obtained was compared with the results of more than 6,000 observations of other investigators previously recorded. The following conclusions were drawn: American women are more precocious (average age, 13.9 years) than women of other temperate climates (average age, 15.5 years). They are more precocious than the races from which they have sprung. Cli-

mate has little influence; education and mentality have more. The American Indian and American Negro reach puberty between 12 and 13 years.

28 Engelmann, G. J.: "Das Alter bei der ersten Menstruation am Pol und am Äquator" [Age of first menstruation at the pole and at the equator]. *Centralblatt für Gynäkologie* [Berlin], vol. 26, pt. 2 (1902), pp. 1225–1227. Also: *American Gynecology* [New York], vol. 2 (1903), pp. 238–261.

Author does not believe puberty begins early in the Tropics and late in cold climates. He bases his arguments on 60,000 cases obtained from the writings of various investigators and classified by residence in cold, temperate, and warm climates. Puberty may take place at the pole as early as it does at the equator. Race and food are important factors to be considered in the age of development.

29 ——— "Rapport du développement mental au développement fonctionel chez la jeune fille américaine; analyse de 12,000 cas de première menstruation" [The relation of mental development to functional development of the American girl. An analysis of the first menstruation of 12,000 cases]. *Annales de gynécologie et d'obstétrique* [Paris], vol. 55 (1901), pp. 30–43.

A study giving data on the influence of mental development on the age of puberty. Twelve thousand and forty-seven cases from the various classes in the United States were studied. College girls show an average age of 13.52 years for the beginning of menstruation, and the laboring classes an age of 14.27 years. The author compared his figures with those of European writers. There is less difference in age between the two classes in the United States because the social conditions of the laboring classes are better than in Europe.

30 ——— "The American girl of to-day." *Transactions of the American Gynecological Society* [Philadelphia], vol. 25 (1900), pp. 8–45.

A study of the influence of modern education and mental development on functional development. From 6,549 observations it is found that college girls have reached the age of puberty about a year earlier than working girls. The period of greatest growth and physiological activity is just before the pubertal period. At puberty there is a retardation and a return to normal. Functional disturbances tend to increase with the intensity and seriousness of the mental work.

31 ——— "What is normal menstruation?" *New York M. J.* [New York], vol. 72 (1900), pp. 986–988.

A résumé of the author's conclusions, drawn from a study of the records of 5,000 women between 15 and 26 years of age from high and normal schools, colleges, and department stores.

32 Engström, O.: "Till menstruationens statistik" [On the statistics of menstruation]. *Finska Läkaresällskapets Handlingar* [Helsingfors], vol. 36 (1894), pp. 222–224.

A study of 3,500 private patients. All were born in Finland and were of Finnish or Swedish origin. In 42.66 per cent of the cases menstruation began in the fourteenth to the fifteenth year, in 13.08 per cent in the thirteenth year, in 17.54 per cent in the sixteenth, and in 10.54 per cent in the seventeenth year. The author compares his figures with those obtained by Heinricius, which apply only to the poorer classes, and finds that girls of the poorer classes begin to menstruate later than those of the well to do.

33 Faye, F. C.: "De la menstruation en Norvège" [Menstruation in Norway]. *Congrès médical International de Paris*, 1867 [Paris], 1868, pp. 191–195.

A study of the age of menstruation in Christiania. For 2,691 cases of servant girls entering the maternity hospital the average age was 16.375 years. The duration and interval between periods were also studied. According to data collected by Vogt the average age for first menstruation in Norway is 16.12 years. The average age for the Laplander is 16.7 years. Original data and many tables are included.

34 ——— "Menstruation of females in Norway." *Monthly Journal of the Medical Sciences* [Edinburgh and London], vol. 14 (1852), pp. 83–84.

A report from the Lying-in Hospital of Christiania. In 122 cases the earliest age of first menstruation was 13 years, the latest 24 years, and the most frequent 16 years. The average age was 17.7 years. Data are given for recurrence of the periods and duration of the flow.

35 Fayrer, J.: "European child life in Bengal." *Medical Times and Gazette* [London], vol. 1 (1873), pp. 515–517, 544–548.

Data are given concerning the age of menstruation of 27 girls. The earliest was 12 years 2 months, the latest 16 years 4 months. Average age was 14 to 15 years. This age of puberty is much later than that of the natives of India and about the same as in England.

36 Fehlinger, H.: "Die Geschlechtsreife bei den farbigen Menschenrassen" [Sexual maturity among colored races]. *Naturwissenschaften* [Berlin], vol. 2 (1914), pp. 1003–1004.

The author compares data from many authorities. In reviewing the work done on the age of puberty in the colored races the author finds that develop-

ment is late. Menstruation does not begin until the sixteenth or seventeenth year, and the final growth is reached several years sooner than in the white race. Secondary sexual characteristics do not appear before 16 years. Writers attribute this late development to underfeeding.

37 **Féré, Ch.:** "Les proportions des membres et les caractères sexuels" [The proportions of the limbs and the sexual characters]. *Journal de l'anatomie et de la physiologie* [Paris], vol. 33 (1897), pp. 586–591.

Investigations of about 200 adult subjects, sexually undeveloped, and of an underdeveloped boy 19 years of age led to the conclusion that excessive length of limb is correlated with defective sexual characteristics.

38 **Foster, W. L.:** "Physiological age as a basis for the classification of pupils entering high schools: relation of pubescence to height." *Psychological Clinics* [Philadelphia], vol. 4 (1910–11), pp. 83–88.

A short discussion concerning the benefits derived from classifying high-school boys according to their physiological age. A study was made of the degree of pubescence of the entering class of a New York City high school, and it was found that there is a close relationship between height and pubescence. The more mature boys are taller.

39 **Francillon, M.:** Essai sur la puberté chez la femme. Étude de psycho-physiologie féminine" [An Essay on the Puberty of Woman. A Psycho-physiological Study of Woman]. F. Alcan, Paris, 1906. 305 pp.

An extensive study of the changes occurring in the body from birth to maturity with special reference to the period of puberty. The changes in the bones, muscles, blood, excretions, respiration, circulation, internal secretions, genital organs, and organs of sense are considered. The age of first menstruation in various countries and races is discussed. Numerous tables from various authors, original data, and an extensive bibliography are included.

40 **Giles, A. E.:** "Primary amenorrhoea" [Delayed menstruation and permanent amenorrhea]. *Clinical Journal* [London] vol. 17 (1901), pp. 225–233.

A discussion of delayed and permanent amenorrhea, with definitions. The occurrence of menstruation in 1,000 cases was studied. The earliest was 9 years, latest 27 years, and most frequent 14 years. All cases starting at over 18 years constitute "late menstruation," 52 cases of which are considered. In late menstruation the flow is scanty, irregular, and painful. The later it is the greater the liability to sterility.

41 ——— "The factors which lead to variations in the age of puberty and the clinical characters of menstruation" *Medical Chronicle* [Manchester], ser. 4, vol. 1 (1901), pp. 161–179.

A comprehensive summary of the works of various authors on the age of puberty, with some original data. The factors leading to variations are climate, race, heredity, town and country life, racial conditions, mental status, constitution, pigmentation, and height. Numerous tables, several graphs, and a bibliography are included.

42 **Glogner, Max:** "Über den Eintritt der Menstruation bei Europäerinnen in den Tropen" [Beginning of menstruation in European women in the Tropics]. *Archiv für Schiffs- und Tropenhygiene* [Leipzig], vol. 9, no. 8 (1905), pp. 337–340.

After discussing the theory of Virchow, Donder, and Humboldt that physique of Europeans is transformed in tropical climates and opposing the theory of Stokvis, the author gives statistics on beginning of menstruation in 25 girls of pure European stock, born between 1890 and 1900 in the Dutch Indies, and 50 girls of mixed stock. In 18 of the 25 cases menstruation began earlier than in Europe. The author believes that this substantiates Virchow's theory.

43 **Godin, P.:** "De la puberté à la nubilité chez l'adolescent moyen au point de vue de la croissance [Concerning puberty and nubility in the average adolescent from the point of view of growth]. *Bulletins et mémoires de la Société d'anthropologie de Paris*, ser. 5, vol. 10 (1909), pp. 497–501.

The author studied the body growth from the end of puberty to nubility. He found the percentage increase varied from 11.1 per cent for height to 29.6 per cent for weight. The average age for the beginning of puberty in boys is 15.5 years.

44 ——— "Quelques conclusions de mes recherches sur la croissance chez l'homme, relatives à la puberté" [Some conclusions from my researches on the growth of man, relative to puberty]. *Comptes rendus hebdomadaires des séances de l'Académie des sciences* [Paris], vol. 153 (1911), pp. 967–968.

A summary of conclusions with regard to the phases of life in relation to the function of reproduction, with statement of the author's method of determining the beginning and the duration of puberty.

45 Grapow, M.: "Die postfötale Entwicklung der weiblichen Zeugungsorgane und deren Beziehungen zur Pathologie derselben" [The post-fetal development of the female genital organs and its relation to the pathology of the same]. *Deutsche Med. Wchnschr.* [Leipzig and Berlin], vol. 16 (1890), pp. 788–790.

The author describes the genital organs of the newborn girl and their later development to maturity and childbirth. During this growth the length of the cervix, relatively very large at birth, is surpassed by the length of the fundus.

46 Gruzdeff, V. S.: "K voprosu o nachalie polovoi zrielosti u zhenshchin S. Peterburga" [On the beginning of sexual maturity among the women of St. Petersburg]. *Trudi V syezda obshchestva russkikh vracheii v pamyat Pirogova* [St. Petersburg], vol. 1 (1894), pp. 534–542.

An investigation with original data of 10,000 women in St. Petersburg of the following races: Russians, Finns, Poles, Germans, Jews, Esthonians, and Lithuanians. The ages of beginning menstruation were as follows: Germans (15–16), Poles (15.33), Jews (15.40), Russians (15.75), Esthonians and Lithuanians (16), and Finns (16.27). Better living and mental work caused early puberty.

47 Guttmann, Max: "Einige Beispiele individueller körperlicher Entwicklung" [Some examples of individual physical development]. *Ztschr. f. Kinderh.* [Berlin], vol. 13 (1915–16), pp. 248–256.

The author employed the individualizing method in measuring the same 11 boys, whose family and life he describes. Development is shown graphically in curves and in tables giving age, weight, height, and chest girth. Methods of taking the measurements are explained.

48 Guy, W.: "On the first and last appearance of the menses and the relation existing between the two periods." *Medical Times* [London], vol. 12 (1845), pp. 363–364.

A short article giving in tabular form the ages for the beginning and end of menstruation in woman. For 1,500 girls observed by the writer the earliest age was 8 years, the latest 25 years, and the most frequent 15 years. From the data it appears that the earlier menstruation begins the longer it functions.

49 Hall, G. S.: Adolescence, Its Psychology, and Its Relation to Physiology, Anthropology, Sociology, Sex, Crime, Religion, and Education. D. Appleton & Co., New York, 1911. Vol. 1, 589 pp.; vol. 2, 784 pp.

A very comprehensive discussion including many tables of the findings of noted authorities on height and weight increases, the growth and development of the body in general and of the skeletal and muscular systems from birth to adolescence. The relation of adolescence to changes in the nervous system and to the mental and moral development is given special attention.

50 Hecker, C., and Buhl, L.: Klinik der Geburtskunde. Beobachtungen und Untersuchungen aus der Gebäranstalt zu München [Observations and Investigations at the Maternity Hospital in Munich]. W. Engelmann, Leipzig, 1861–4. Vol. 1, 342 pp.; vol. 2, 252 pp.

One chapter in each volume deals with the age of beginning of menstruation of 3,114 patients at a maternity hospital in Munich, most of them peasants. The author gives a separate table for the city dwellers and finds that for both groups, the inhabitants of Munich and the total of 3,114 women, the most frequent ages of beginning of menstruation are 16, 17, and 18 years.

51 Helms, O.: "I hvilken Alder indtraeder Menstruationen hos Kvinder her i Landet?" [At what age does menstruation of women begin in this country?] *Ugeskrift for Laeger* [Copenhagen], vol. 76, no. 44 (1914), pp. 1893–97.

One thousand one hundred and twenty-eight women were questioned as to the beginning of menstruation. The data gathered are arranged in six groups according to the age of the women at the time the material was gathered. The author found that menstruation begins earlier in the city than in the country and that menstruation generally occurs later among modern women than among those of 50 years ago.

52 Holder, A. B.: "Gynecic notes taken among the American Indians." *Am. J. Obst.* [New York], vol. 25 (1892), pp. 752–768; vol. 26, pp. 41–60.

With much irrelevant material, this article includes (pp. 753–758), notes on the age of puberty in Indian girls and measurements in weight, height, chest, waist, and hips of 33 girls, ages 12 to 25. Methods of measurement are not definitely given. The average age of the 33 was 17$\frac{1}{12}$ years; weight, 132½ pounds; height, 5 feet 3½ inches; chest, 32½ inches; waist, 29$\frac{11}{12}$ inches; hips, 34$\frac{11}{12}$ inches.

53 Hrdlička, A.: Physiological and Medical Observations among the Indians. Government Printing Office, Washington, 1908. 460 pp.

In the study of the beginning of puberty among the Indian girls it was found that development of the breasts commences in the Apache and Pima during the twelfth year. Menstruation commences earlier in the Indian than in the New England white girl (fourteenth to fifteenth year), and retardation is less frequent.

54 **Husemann, T.:** "Normales Verhalten der Menstruation in Norwegen" [Normal conditions of menstruation in Norway]. *Monatsblatt für Medizinische Statistik und Öffentliche Gesundheitspflege* [Berlin], vol. 20, no. 4 (1868), pp. 24–28.

Summary of a report by Vogt, chiefly from observations of other writers, published in a Norwegian magazine, on an investigation of 1,821 women in Norway. Average age of beginning of menstruation was 16.12 years. Danish writers found that development of the breasts commences in the Apache and Pima tics are also given on duration of the menstrual period, amount of discharge, length of intervals between periods, age of menopause, and rate of fertility.

55 **Joubert:** "The supposed influence of tropical climate on menstruation." *Transactions Indian Medical Congress*, Dec., 1894 [Calcutta], 1895, pp. 428–430.

A discussion of the effects of a warm climate on the age of puberty and other causes which might lead to early puberty in India. Data were collected from 3,194 cases from the different classes in India. The author believes climate has little influence. He concludes the causes of early menstruation are precocious knowledge and too early sexual excitement from child marriages.

56 **Joulin:** "Mémoire sur la menstruation" [Memoir on menstruation]. *Congrès médical international de Paris*, 1868, pp. 178–185.

The author reviews the literature on this subject and presents tables on the influence on menstruation of climate, race, and manner of life, giving data relating to cold, warm, and temperate climates. The common age for cold climates, from 4,713 observations, is 16 years. The common age for warm climates, from 1,724 observations, is 12 years, and for temperate climates, from 16,080 observations, is 15 years. The author decides that data are insufficient to determine influence of race.

57 **Key, Axel:** "Die Pubertätsentwickelung und das Verhältniss zu den Krankheitserscheinungen der Schuljugend" [Development of puberty and its relation to symptoms of illness in school children]. *Verhandlungen des X. Internationalen Medicinischen Congresses*, 1890 [Berlin], vol. 1 (1891), pp. 66–130.

An account of a study of 15,000 schoolboys and over 3,000 schoolgirls in Sweden, mostly belonging to well-to-do families and ranging in age from 6 to 19 years. For comparison, 4,000 school children from the poorer classes were also studied. Heavy school work was found to have an undesirable effect on the growth and health of children. A large number of charts and statistical tables from works of other students are included.

58 ——— "Om pubertetsutvecklingen och dess förhållande till sjukligheten hos skolungdomen" [Development of puberty and its relation to disease among school children]. *Nordiskt Medicinskt Arkiv* [Stockholm], new ser. vol. 1 (1891), pp. 1–73.

The effect of school attendance on development and on the incidence of disease in children is studied in detail. Twenty-two tables and 28 graphs show growth in height and weight and incidence of disease of nearly 15,000 boys and 3,000 girls 6 to 21 years of age.

59 **Krieger, E.:** Die Menstruation [Menstruation]. A. Hirschwald, Berlin, 1869. 169 pp.

A theoretical discussion including data on about 6,000 cases recorded by other investigators and 550 studied by the author.

60 **Lagneau, G.:** "Recherches comparatives sur menstruation dans les diverses contrées sous le rapport ethnologique" [Comparative researches on menstruation in the different countries from the point of view of ethnology]. *Congrès médical international de Paris*, 1867 [Paris], 1868, pp. 170–178.

This article consists of a general review of work by various authors on the age of first menstruation and the factors which influence this age. The author has compiled a long table giving the age of first menstruation, the country, latitude, average temperature, authority, and number of observations. Many examples are given of the influence of race. Bibliography.

61 ——— "Recherches comparatives sur la menstruation en France" [Comparative researches on menstruation in France]. *Bulletins de la Société d'anthropologie de Paris*, vol. 6 (1865), pp. 724–751.

A review of the literature on the age of the beginning of puberty. The factors considered are climate, race, mode of living, constitution, and stature.

62 **Leudet:** "Étude sur la menstruation des femmes de la ville de Rouen et du département de la Seine-Inférieure" [Study of menstruation of women of the city of Rouen and of the department of the lower Seine]. *Congrès médical international de Paris*, 1867 [Paris], 1868, pp. 162–170.

A study of menstruation in the leisure class, the working class, and in country women. The average ages for the appearance of the menses are, for the leisure class, 13.7 years; for country women, 14.5 years; and for the working class, 14.9 years.

63 **Lievin:** "Statistique de la menstruation de mille habitants de Saint Petersbourg" [Statistics on menstruation in 1,000 inhabitants of St. Petersburg]. *Congrès médical international de Paris*, 1867 [Paris], 1868, pp. 205–206.

Contains four tables on the subject of menstruation in St. Petersburg and original data on 1,000 observations of the Russian, German, Jewish, and Finnish races. The points considered are age of beginning of menstruation, duration, and interval between periods.

64 **Lintz, W., and H. Markow:** "Relation of onset of menstruation to environment." *Endocrinology* [Los Angeles], vol. 7 (1923), pp. 57–60.

An analysis of the menstrual histories of 800 women seen consecutively in private practice, showing in tabular form the age of onset of menstruation with relation to environment; i. e., residence on farms, in towns up to 4,000, towns from 5,000 to 25,000 and large cities. The authors found no proof that environment has any influence upon menstrual history.

65 **Lowsley, O. S.:** "The human prostate gland at birth, with a brief reference to its fetal development." *J. A. M. A.* [Chicago], vol. 60 (1913), pp. 110–114.

This discussion is based on the study of serial cross-sections of the prostate of a newborn infant and of a reconstruction in wax of the various groups of tubules composing the gland, the prostatic urethra, the ejaculatory ducts and the prostatic utricle enlarged 20 times. Five figures.

66 ——— "The human prostate gland in youth." *Medical Record* [New York], vol. 88 (1915), pp. 383–391.

A lengthy and technical descriptive article embodying the results of studies of cross-sections of glands of two 4-year-old boys, and of one 17-year-old boy. (Six plates.) These special studies, which are described in detail, were supplemented by a large number of investigations not so described, and the results compared with the work of other investigators. Bibliography.

67 **McLeod, K.:** "On the nubile age of females in India." *Indian Medical Gazette* [Calcutta], vol. 25 (1890), pp. 278, 305, 377.

A small number of data are given relating to the age when native girls of India and English girls living there begin to menstruate.

68 **Marro, A.:** La puberté chez l'homme et chez la femme, étudiée dans ses rapports avec l'anthropologie, la psychiatrie, la pédagogie et la sociologie [The Puberty of Man and Woman, Studied in Its Relations to Anthropology, Psychiatry, Pedagogy, and Sociology]. Schleicher Frères, Paris, 1902. 539 pp.

An extended study including original material on anatomical and physiological changes at puberty. Height, weight, strength, tactile and olfactory sensibility, the relation of puberty to psychology, anthropology, sociology, education, and hygiene are considered. The age of puberty among several hundred women was studied by the author, and causes of acceleration or retardation of the beginning of puberty are discussed.

69 ——— "La puberté; ses rapports avec l'anthropologie, la physiologie et la psychiatrie" [Puberty, its relation to anthropology, physiology, and psychology]. *Bulletin de la Société de médecine mentale de Belgique* [Ghent and Leipzig], vols. 72–75 (1894), pp. 413–439, 574–603.

A discussion, with data based upon a few original observations, of the changes occurring in the body at the age of puberty. The modifications of sensibility to touch and smell are studied and tables given. Psychological changes are considered with special reference to degenerates and criminals.

70 **Mathé, L.:** "L'âge nubile à Cuba" [The marriageable age in Cuba]. *Médecine scolaire* [Paris], vol. 4 (1911), pp. 115–118.

By compilation of the work of others the author found that Cuban women have an average stature of 150 centimeters; that menstruation begins at about 13 years. Bibliography.

71 **Mayer, C. E. L.:** "Exposé statistique de la menstruation dans l'Allemagne septentrionale et centrale" [A statistical account of menstruation in northern and central Germany]. *Congrès médical international de Paris*, 1867 [Paris], 1868, pp. 206–219.

For this article 6,000 observations were made covering a period of over 13 years. The age of the beginning of menstruation is considered in the upper and lower classes, the influence of social position, latitude, longitude, altitude, temperature, constitution, color of hair, and height. Other points considered are age of menopause, duration, interval between periods, quantity and quality of flow. Article contains a wealth of original data. Tables are not given.

72 **Meyer, H.:** "Über die Entwickelung der menschlichen Eierstöcke" [The development of the human ovaries]. *Archiv für Gynaekologie* [Berlin], vol. 23 (1884), pp. 226–275.

This is a comprehensive description, based on the author's own observations and the work of other students, of the ovary and its stroma; follicles, ova, and other parts, their origin, development, and purpose, their structure, length,

weight, color, and the relative sizes of the two ovaries and of the ovaries and uterus. Three plates show the ovary in various stages of the fetus, in infants at birth and at ages of 3 days, and in children of 13 years. There are several small drawings, and tables.

73 **Mondière, A. T.:** "Monographie de la femme de la Cochinchine. Femmes annamite, chinoise, mink-huong, cambodgienne. Anthropométrie, physiologie, position sociale" [A monograph on the women of Cochin-China. Women of Anam, China, Mekong and Cambodia. Anthropometry, physiology, social position]. *Mémoires de la Société d'anthropologie*, ser. 2, vol. 2 [1875–1882], pp. 437–516. *See also* G. Masson, Paris, 1882. 40 pp.

Nine hundred and twenty observations were made by the author on the age of first menstruation of the women of Cochin-China. The earliest age was found to be 12 years, the latest 25 years, and the average age 16 years and 4 months.

74 **Moon, S. B.:** "The question of growth at puberty." *American Physical Education Review* [Boston], vol. 4 (1899), pp. 294–298.

Measurements were made on 18 boys to test Bowditch's law in regard to a retardation before pubescent acceleration. Successive measurements, 12 to 13 months apart, were taken three times before and twice after the beginning of puberty, for each boy. Figures are given for weight, total and sitting height, and knee height increases. The law was not satisfactorily confirmed. Four tables are given. The author believes pubertal attainment has little if any effect upon rate of growth.

75 **Murphy, E. W:** "A report of the obstetric practice of University College Hospital, London." *Dublin Medical Journal*, vol. 26 (1844–45), pp. 177–229.

An article on menstruation, pregnancy, and parturition. From data collected from 2,169 cases (559 the author's, 450 Roberton's, and 1,160 Lee's), the age of first menstruation was found to range from 9 to 23 years. The most frequent age was 15 years. One table is given.

76 **Neurath, Rudolf:** "Geschlechtsreife und Körperwachstum" [Puberty and growth]. *Ztschr. f. Kinderh.* [Berlin], vol. 19 (1919), pp. 209–224.

Many theories of the author and other students are discussed. One case of premature puberty in a girl and two cases of retarded puberty in boys are given in great detail, with tables of physical measurements. Puberty affects growth in both physiological and pathological cases. Premature puberty prematurely ends function of epiphyses and body growth: belated puberty keeps said epiphyses unossified for an abnormally long time and causes a prolonged growth of the long bones of the extremities. Bibliography.

77 **Osiander, F. B.:** Denkwürdigkeiten für die Heilkunde und Geburtshülfe aus den Tagebüchern der königlichen practischen Anstalten zu Erlernung dieser Wissenschaften in Göttingen [Memoirs on Therapeutics and Midwifery from the Daily Records of the Royal Practical Institutions for the Study of These Sciences in Göttingen]. Vandenhoeck-Ruprecht, Göttingen, 1794–5. 2 vols., 987 pp.

The book is a collection of cases from the daily records of 2 hospitals, mostly on gynecology and obstetrics. Pages 380–388 of volume 2 contain an account of the beginning of menstruation of 137 patients; also an enumeration of circumstances accelerating and retarding menstruation.

78 **Pagliani, L.:** "Die Entwicklung des Menschen in den der Geschlechtsreife vorangehenden späteren Kindesjahren und im Jünglingsalter (von 7 bis 20 Jahren) im Verhältnisse zum Geschlecht, zur Ethnographie und zu den Nahrungs- und Lebensbedingungen [Development of the human being in the later years of childhood preceding puberty and in adolescence (from the age of 7 until 20) in relation to sex, ethnography, and conditions of nutrition and living]. *Untersuchungen zur Naturlehre des Menschen und der Thiere*, vol. 12, 1881, pp. 89–99.

The author gives his conclusions, drawn from his previous work, regarding the periods of accelerated growth, and the relation of such factors as age, puberty, sex, race, nourishment, living conditions, etc. to height and weight increases. A table gives the average height, weight, lung capacity, and muscular strength for 250 boys in an agricultural colony and 400 girls in a boarding school.

79 **Petiteau, M.:** "Études sur la menstruation des femmes des Sables D'Oblonne" [A study of the menstruation of the women of Sables D'Oblonne]. *Gazette hebdomadaire de médecine et de chirurgie* [Paris], vol. 4 (1857), p. 567.

The age of first menstruation in 500 cases is considered, the duration of the degree of dysmenorrhea. The influence of temperament and constitution on the beginning of menstruation is discussed, and also the age of the cessation of menstruation. The most frequent age for the beginning is 15 years and for the end 45 to 50 years. The author finds no correlation between the beginning and cessation of menstruation.

80 **Pétrequin, T. J. E.:** Recherches sur la menstruation [Researches on Menstruation]. Paris, no. 311, 1835. 23 pp.

A thesis (University of Paris) based on a study of 272 women in Lyon, over half of whom first menstruated between 13 and 15 years of age. The physiology of the menstrual flow is considered.

81 **Postma, H.:** "De lengtegroei van het meisje in de puberteitsjaren" [The growth in height of girls at the age of puberty]. *Nederlandsch Maandschrift voor Verloskunde en Vrouwenziekten en voor Kindergeneeskunde* [Leyden], vol. 5 (1916), pp. 463–472.

The author studied the growth in height from 11 to 20 years of age in 370 girls of the reformatory of Montfort. The average heights for each year are about the same as those given by other writers. Girls of the North Sea Province are taller than those of any other Province. Girls who menstruate late are on an average smaller in stature. Tables give heights for American, German, Belgian, and Italian girls quoted from other authors.

82 ——— "Menstruatie en lichaamsgewicht in verband met onmaatschappelijk gedrag" [Menstruation and body weight in relation to asocial conduct]. *Nederlandsch Maandschrift voor Verloskunde en Vrouwenziekten en voor Kindergeneeskunde* [Leyden], vol. 5 (1916), pp. 272–281.

The author studied the weight of girls from 13 to 20 years in 355 cases in the reformatory of Montfort. He found the yearly increase came almost to a standstill at 17 years. Girls who have not yet menstruated are lighter in weight than menstruating girls of the same age. Girls who menstruate early are heavier than girls of the same age who menstruate late. Original data and tables are given.

83 ——— "Uit den puberteitsleeftijd van het meisje" [The period of puberty in girls]. *Nederlandsch Maandschrift voor Verloskunde en Vrouwenziekten en voor Kindergeneeskunde* [Leyden], vol. 5 (1916), pp. 146–153.

The author studied the age of first menstruation of 342 girls of the reformatory of Montfort. Girls of the lower classes menstruate between 13 and 15 years. Menstruation is earlier in large cities than in villages.

84 **Queirel, A., and J. Rouvier:** "Recherches statistiques sur la menstruation à Marseille et dans les Bouches-du-Rhône" [Statistical research on menstruation in Marseille and in the Bouches-du-Rhone]. *Annales de gynécologie* [Paris], vol. 12 (1879), pp. 401–410.

A study of menstruation in all classes in the Bouches-du-Rhone district. The average age given for the beginning of menstruation is 13 years, 8 months, 4 days. For the leisure class (41 cases) it was 13 years, 4 months, 7 days; for the laboring class (206 cases) it was 14 years, 1 month, 15 days; for the laboring class in the country (41 cases) it was 13 years, 9 months, 24 days; for the laboring class in the city (165 cases) 14 years, 1 month, 23 days.

85 **Raciborski, A.:** De la puberté et de l'âge critique chez la femme, au point de vue physiologique, hygiénique et médical et de la ponte périodique chez la femme et les mammifères [Puberty and the Critical Age in Woman from the Point of View of Physiology, Hygiene, and Medicine, and Periodic Ovulation in Woman and Animals]. J. B. Baillière, Paris, 1844. 520 pp.

The author finds that age of puberty is influenced by climate, race, social conditions, temperament, and stature, and bears a close correlation to latitude. Various authors are cited. Some original data are given.

86 ——— "De l'époque de la puberté chez la femme en général et dans ses rapports avec la latitude geographique, le climat, la race et les différentes conditions individuelles" [On the epoch of puberty in woman in general and on its relation to geographic latitude, climate, race, and different individual factors]. *Expérience* [Paris], vol. 12 (1843), pp. 65, 81, 100, 118, 131.

The material in this article is included in the author's two later books. Some original data and tables are here given, and a review of the literature on the subject of the age of puberty and the influences which cause variations in the age. Some of the factors considered are latitude, climate, race, education, and constitution.

87 ——— Traité de la menstruation, ses rapports avec l'ovulation, la fécondation, l'hygiène de la puberté et de l'âge critique, son rôle dans les différentes maladies, ses troubles et leur traitement [A Treatise on Menstruation; its relation to ovulation, fertilization, the hygiene of puberty and of the critical age; its rôle in the different diseases; its disorders and their treatment]. J. B. Baillière et fils, Paris, 1868. 631 pp.

A comprehensive study of the subject of menstruation. Two long tables give the average age for the beginning of puberty from different authors and for various countries. The higher the latitude the later the beginning of menstruation. Puberty is influenced by race, heredity, social position, and education.

88 **Ravn:** "Menstruationens physiologi, statistisk behandlet" [Physiology of menstruation handled statistically]. *Bibliothek for Laeger* [Copenhagen], ser. 3, vol. 7 (1850), pp. 2–17.

An extensive study of menstruation in Denmark. The age of beginning of menstruation was studied in 3,433 cases. Other factors considered are country and city life, social position, place of birth, temperament, and color of hair.

89 **Reche:** "Untersuchungen über Wachstum und Geschlechtsreife bei Melanesischen Kindern" [Investigations on the growth and sexual maturity of Melanese children]. *Correspondenzblatt der Deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* [Berlin], vol. 41 (1910), pp. 49–55.

The author examined 58 children of both sexes from 4 to 17 years of age. He found that puberty takes place in the Melanese women at about 17 years. The secondary sex characteristics develop very late, at about the seventeenth year, after menstruation begins.

90 **Rigden, W.:** "On the age at which menstruation commences." *Transactions of the Obstetrical Society of London*, vol. 11 (1870), p. 243.

A table showing the occurrence of menstruation in 2,696 young women in England. Earliest age was 9 years, latest 26 years, and average 14.96 years.

91 **Roberton, John:** "An inquiry into the natural history of the menstrual function." *Edinburgh Medical and Surgical Journal*, pt. 1 (1832), pp. 227–254.

A compilation from the records of many travelers and explorers. Contains one table on page 231, giving the ages at which 450 women began to menstruate; the information was obtained by the author from pregnant women at the Manchester Lying-in Hospital. References.

92 ——— "On the age of puberty in the Island of Madeira." *Edinburgh Medical and Surgical Journal*, vol. 66 (1846), pp. 281–285.

The average age for the occurrence of puberty in the Island of Madeira in 228 cases was 15 years and 5 months. This is six or seven months later than the average for England. Data were obtained through correspondence with physicians and missionaries.

93 ——— "On the alleged influence of climate on female puberty in Greece." *Edinburgh Medical and Surgical Journal*, vol. 62 (1844), pp. 1–11.

The climate has little or no influence on puberty among Greek girls. The average age of 33 cases observed was between 14 and 15 years, as in England. Data were obtained through correspondence with physicians and missionaries.

94 ——— "On the period of puberty in Esquimaux women." *Edinburgh Medical and Surgical Journal*, vol. 63 (1845), pp. 57–65.

The average age for 16 cases studied for the occurrence of puberty among the Eskimos is 15⅛ years. Data were obtained through correspondence with missionaries.

95 ——— "On the period of puberty in Hindu women." *Edinburgh Medical and Surgical Journal*, vol. 64 (1845), pp. 156, 257, 423.

From 239 observations reported by missionaries and doctors, the average age for the beginning of puberty among the Hindu women appears to be 12 years and 8 months.

96 ——— "On the period of puberty of Hindu women." *Edinburgh Medical and Surgical Journal*, vol. 66 (1846), pp. 56–64.

A study based on 310 observations from Calcutta and Bengalore of the occurrence of puberty among Hindu women. The average age is about 13 years and 2 months. Infantile marriage, which exists in India, may be a cause for this age. Data were obtained through correspondence with missionaries and doctors.

97 ——— "On the period of puberty in negro women." *London Medical Gazette*, vol. 30 (1842), pp. 677–682. See also *Edinburgh Medical and Surgical Journal*, vol. 58 (1842), pp. 112–120.

From data obtained through correspondence with missionaries the average age for the occurrence of puberty in the negro women was found to be about the same as in the white races.

98 **Rodzevich, G. J.:** "Antropologuicheskaya ekskursiya po Volguie" [Anthropological study in the Volga District]. *Vrachebniia Viedomosti* [St. Petersburg], vol. 7 (1882), pp. 3376–3379.

Very brief account of beginning of menstruation of 268 women patients at the free maternity hospital in the city of Astrakhan. Average age is 15.21 years for all races, but northerners begin to menstruate later than southerners. For instance, Armenians usually begin in their thirteenth or fourteenth year.

99 **Schaeffer, R.:** "Über Beginn, Dauer und Erlöschen der Menstruation" [On the beginning, duration, and end of menstruation]. *Monatsschrift für Geburtshülfe und Gynaekologie* [Berlin], vol. 23 (1906), pp. 169–191.

Investigation of 10,500 cases in Berlin; 90 to 95 per cent of Germanic race; 5 to 10 per cent Slavs (Poles); one-half to 1 per cent Jewesses. Average age for all cases was 15¾ years. The author disagrees with accepted theory that country girls menstruate later than city girls. He also thinks that effect of complexion, physical condition, size, and social status may be nonexistent. Food, however, may have some effect upon the age of first menstruation.

100 ——— "Über das Alter des Menstruationsbeginns" [On the age of beginning of menstruation]. *Archiv für Gynaekologie* [Berlin], vol. 84 (1907–8), pp. 657–686.

An article dealing with 1,050 cases of clinic patients and 1,801 cases from the higher classes. The author criticizes inaccuracy of statistics of other authors. He found that girls born in the country begin to menstruate late but growing up in the country has no such effect; and that girls born in the country but moving to the city in childhood show late menstruation. Author concludes that menstruation is early in: (1) Strong individuals, (2) large-city dwellers, (3) the well to do; and that, contrary to the belief of other investigators, complexion and color of hair have no effect. Abundant food and mental work are factors of importance.

101 **Schlichting, X.:** "Statistisches über den Eintritt der ersten Menstruation und über Schwangerschaftsdauer" [Statistics on the first menstruation and the duration of pregnancy]. *Archiv für Gynaekologie* [Berlin], vol. 16 (1880), pp. 203–232.

Account of ages of beginning of menstruation in 4,186 cases collected by Hecker, in 6,550 cases reported on by Krieger and 8,881 of author's own cases. The only conclusion presented by the author is that climate is an important factor.

102 **Sen, B. C.:** "Menstruation in warm climates." *Transactions of the Indian Medical Congress* [Calcutta], December, 1894, pp. 431–433.

A study of menstruation in warm climates. In addition to data from other authorities, the author gives a table of his own data on the ages at which 146 girls, Brahmin, native Christian, and Eurasian, began to menstruate. He finds that the native Indian girls menstruate earlier than European girls but attributes this fact to social customs and not to climate.

103 **Sokolov, N. D.:** "K charakteristike polovoj dieatelnosti jenshchin krestjanok severovostochnago ugla Moskovskago uyezda" [Characteristics of sex life of women peasants of the northeastern part of the Moscow district]. *Vrachebniia Vedomosti* [St. Petersburg], vol. 5 (1880), pp. 1367–1369.

A study of 200 observations of Russian peasant women ranging in age from 16 to 70 years. The average age for the beginning of menstruation is 15.77 years. The first child was born during the first year after marriage in two-thirds of the cases.

104 **de Soyre:** "De la primiparité à terme" [Concerning primiparity at term]. *Gazette des hôpitaux civils et militaires* [Paris], vol. 36, no. 111 (1863), pp. 441–442.

A short article giving data gathered from 1,000 women entering the hospital for the delivery of their first child. The earliest age for the beginning of menstruation among these women was 8 years, the latest 24 years, and the most frequent 15 years. The youngest woman giving birth to her first child was 14 years old, the oldest 45 years; the most frequent age of first delivery was 22 years.

105 **Stefansson, Vilhjalmur:** "Temperature factor in determining the age of maturity among the Eskimos." *J. A. M. A.* [Chicago], vol. 75 (1920), pp. 669–670.

Finding the age of maturity unusually early among Eskimo women the author discusses the possible effect of temperature in producing this condition. The usual clothing, a double layer of skin, and the very high temperature of the Eskimo hut, make the conditions among them similar to those in a tropical country. Among certain Indian tribes whose mode of living is not so well adapted to the rigors of the climate, the age of puberty is as high as, or higher than, that of north European whites.

106 **Steinach E., and P. Kammerer:** "Klima und Mannbarkeit" [Climate and puberty]. *Archiv für Entwicklungsmechanik der Organismen* [Berlin], vol. 46 (1920), pp. 391–458.

This comprehensive article on climate and puberty first discusses individual variations, normal and abnormal, of the sex glands, then describes tests on white rats conducted by comparing those subjected to an artificial temperature with control animals, and (this being the largest section of the article) lastly considers young men and women of different races in different climates from every point of view related to sex. No original studies are reported. There are six tables, a plate of five figures, and a long bibliography.

107 **Symington, J.:** "On the position of the uterus and ovaries in the child, with remarks on the growth of the female genitals." *Transactions of the Edinburgh Obstetrical Society* [Edinburgh], vol. 11 (1885–86), pp. 31–44.

The author summarizes, with references, the literature on this subject to the date of his own observations and presents five drawings from frozen sections at 6 weeks, 2 months, 15 months, and 13 years. From study of these and several other sections not shown, he makes numerous statements as to the position and growth of the genitals and devises a table showing length of uterus from birth to 18 years of age.

108 **Szukits, Ferdinand:** "Über die Menstruation in Österreich" [On menstruation in Austria]. *Zeitschrift der Kaiserlich-Königlichen Gesellschaft der Aerzte zu Wien*, vol. 13 (1857), pp. 509–544.

An account of the beginning of menstruation in 2,275 cases from Vienna and other parts of Austria. The average age of beginning was 15 years 7½ months. The author divided his cases according to place of origin, social condition, and occupation and found that a lower latitude and a comfortable living accelerate menstruation. He enumerates other factors found by various writers to effect the beginning of menstruation and discusses in detail the nature of menstruation, its pathology and duration, and the age of menopause.

109 **Tilt, E. J.:** "De l'influence du climat et de la race sur la menstruation" [On the influence of climate and race on menstruation]. *Congrès médical international de Paris*, 1867 [Paris], 1868, pp. 187–190.

A general article discussing chiefly the findings of others but giving observations of the author on about 300 cases as to season of the year when menstruation began.

110 ——— On Uterine and Ovarian Inflammation and on the Physiology and Diseases of Menstruation. J. Churchill, London, 1862. 470 pp.

The author reviews the literature on the age of the beginning of menstruation, discussing the influences of heredity, race, national customs, temperature, habitation, and civilization. A long table gives the average age of first menstruation in warm climates (13.19 years), temperate (14.91 years), and cold (16.41 years), with the number of observations (12,321) and the source of information. The author also gives his own data on age at which menstruation began for about 800 women of the well-to-do classes in London.

111 ——— "Reflections on the causes which advance or retard the appearance of first menstruation in women, with a synoptical table showing the mean age of first menstruation in women in hot, temperate, and cold climates." *Monthly Journal of Medical Science* [Edinburgh and London], vol. 11 (1850), pp. 289–296.

A valuable study of the causes which retard or advance menstruation. The intrinsic causes are considered such as race, heredity, and national customs; and also the extrinsic, as temperature, habitation, and civilization. A long table is included which gives the age of first menstruation of 10,422 women in different parts of the world with the source of the information and number of observations.

112 **Tyrchowski, W.:** "Przeciętne oznaczenie dojrzałości płciowej u kobiet w Krolestwie Polskiem" [Statistics on the puberty of women in the Kingdom of Poland]. *Pamiętnik Towarzystwa Lekarskiego Warszawskiego* [Warsaw], vol. 72 (1876), pp. 592–601.

Data are given on the ages of beginning of menstruation based on 2,368 cases from various parts of Poland. The author gives separate tables for Christian Polish women (1,544 cases) and for Polish Jewesses (826 cases). Data are divided according to constitution, color of hair, social condition, economic condition, and degree of education. In both groups good social conditions, wealth, and education have an accelerating effect on menstruation.

113 **Vogt, H.:** "Sur la menstruation normale en Norvège" [On normal menstruation in Norway]. *Congrès médical international de Paris*, 1867 [Paris], 1868, pp. 196–204.

This article consists of a study of menstruation in the six prefectures of Norway. The age of the beginning of menstruation, the duration, the interval between periods, the age of menopause, and the duration of the menstrual period are studied in the leisure class, the working class, and peasants. In 4,731 observations the average age is 16.27 years, duration in 3,821 cases is 3.89 days, interval in 4,178 is 3.89 weeks. Tables and original data are given.

114 **Warén, Erkki:** "Till kännedomen om menstruationen i Finland" [Menstruation in Finland]. *Finska Läkaresällskapets Handlingar* [Helsingfors], vol. 57 (1915), pp. 433–447.

Several thousand observations of other investigators and of the author are put in tables to show the most frequent age at which menstruation begins in Finland, duration of flow, and most frequent age of menopause. The author and Henreicus found that the greater number of women began menstruating at 15; Engstrom found 16 years to be the most frequent age.

115 **Webb, A.:** Pathologica Indica, or the Anatomy of Indian Diseases. Allen & Co., London, 1848. 340 pp.

The author gives data from 37 observations made on the age of first menstruation among Hindu women. The ages are 11, 12, and 13 years and the average age is 12.41 years.

116 **Weber, F.:** "Über die Menstrualverhältnisse der Frauen in St. Petersburg" [On the phenomena of menstruation of the women in St. Petersburg]. *St. Petersburger Medizinische Wochenschrift*, vol. 8 (1883), pp. 329, 337, 345.

An account of investigation of the menses of 2,371 women of St. Petersburg. Average age of beginning was 14½ years. Menstruation was earlier among the well to do; those staying at home in good circumstances began earlier than women engaged in hard work; also brunettes were earlier than blondes and those with a robust constitution earlier than delicate girls. Many tables on the above subject, also on duration of menstruation, intervals between the periods, the menopause, and many citations are included.

117 **West, C.:** Lectures on the Diseases of Women. J. Churchill & Sons, London, 1864. 687 pp.

A table gives the age of first menstruation for 566 women in London. The majority of them had the catamenia first appear between 14 and 17 years.

118 **Whitehead, J.:** On the Causes and Treatment of Abortion and Sterility; being the result of an extended practical inquiry into the physiological and morbid conditions of the uterus, with reference especially to leucorrhoeal affections and the diseases of menstruation. John Churchill, London, 1847. 426 pp.

The author considers the influence of climate and temperament on the beginning of menstruation, presenting a table of 4,000 observations from all classes of society. The earliest age is 10 years, latest 26 years, most frequent 16 years, and average 15 years 7 months. Menstruation is early in sanguine and bilious temperaments, later in lymphatic, and latest in melancholic temperaments.

119 **Yamasaki, M.:** "Über den Beginn der Menstruation bei den Japanerinnen, mit einem Anhang über die Menarche bei den Chinesinnen, den Ruikiu- und Ainofrauen in Japan" [Beginning of menstruation in Japanese women, with an appendix on menarche in Chinese, Riukiu, and Aino women in Japan]. *Zentralblatt für Gynäkologie* [Leipzig], vol. 33, no. 2 (1909), pp. 1296–1305.

The article gives full data on the age at which menstruation begins with Japanese women. In 1904 the author found the average age in 1,585 women to be 14 years 11 months. A few years later, among 4,861 women, he found it to be 14 years 10 months. Observations included four races in Japan—Japanese, Ainos, Kriri, and Chinese—many social classes, and varying conditions of life. With the author's results are compared those of 12 other investigators. Yamasaki discusses how the beginning of puberty varies in four races, in different climates, etc., and believes that the manner of living has a decided effect on the menarche.

SECTION V. STANDARDS AND METHODS OF JUDGING PHYSICAL FITNESS IN CHILDREN

1 **Academy of Medicine, Public Health Committee:** "Malnutrition among school children." *Journal of Sociologic Medicine* [Easton, Pa.], vol. 19 (1918), pp. 176–187.

A general discussion of malnutrition, including a table in which 2,169 English children are graded by the Dunfermline scale and a similar table for New York City school children from 1909 to 1917.

2 **Anonymous:** "Pignet's standard and Chinese students." *Bost. M. & S. J.*, vol. 174 (1916), pp. 329–330.

Pignet's formula modified to apply to pounds and inches ($F=(W+C)-H$), where W is weight in pounds, C chest girth in inches at full inspiration, and H the height in inches, gives a standard of physical fitness by which a value of over 120 indicates great strength, under 80, physical unfitness. Applied to 181 students in the college of Yale-in-China it was found that 86 per cent were physically below the standard required for military service.

3 **Ascher, L.:** "Körpermessungen und ihre Verwertung" [Body measurements and their practical application]. *Verhandlungen der Gesellschaft Deutscher Naturforscher und Ärzte* [Munster], 1912 [Leipzig], vol. 84, pt. 2 (1913), pp. 441–442.

Investigation made by author in the city and rural districts of Hamm of height and weight of children of all ages from birth to 19 years. Neither number of cases nor findings are given. Only the methods of weighing and measuring are briefly described. The children in the rural district were superior to the city children in physical development.

4 **Bachauer:** "Der Rohrersche Index als Kriterium für die Auswahl zur Amerikaspeisung" [Rohrer's index as criterion for selection of children to be fed under American auspices]. *Münchener Medizinische Wochenschrift*, vol. 67, pt. 2 (1920), p. 1296.

The Rohrer index for nutrition, $\frac{\text{weight}\times 100}{\text{height}^3}$ the author accepts as the best of its kind, but he considers none so safe as a medical examination. He has used this index on a large number of children and found it misleading not only for very tall and very short but also for ordinary children. The relation of weight and simple height has proved more useful.

5 ——— **and Lampart:** "Vorschläge zur einheitlichen Organisation der Kinderwägungen und -messungen" [Proposals concerning a uniform organization for weighing and measuring children]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 32 (1919), pp. 97–109.

A discussion of the best way to secure absolutely accurate measurements of height, weight, etc., and of the conditions that make measurements inaccurate. The indexes of Pirquet, Rohrer, and Livi are compared.

6 **Baker, S. Josephine, and J. L. Blumenthal:** "Comparison of methods of determining malnutrition in school children, based upon the pelidisi method, the Wood height and weight scale, and physical examinations recorded by the Dunfermline scale." *Monthly Bulletin of the Department of Health of New York City*, vol. 12, no. 9 (1922), pp. 201–208.

About 1,800 children were examined and their nutrition noted according to the three methods mentioned above. Apparatus and methods of obtaining the sitting height are described, and ages and nationalities of children examined are stated. The percentages of children falling in the various groups according to their state of nutrition as estimated by each of the three methods are given in tables.

7 **Baldwin, Bird T.:** "A measuring scale for physical growth and physiological age." *Fifteenth Year Book of the National Society for the Study of Education, Bloomington, Ill.*, pt. 1, pp. 11–23. Public School Publishing Co., 1916.

A paper formulating norms of height, weight, and lung capacity, to be used by physical directors and teachers as standards for comparison, with all types and races of children between the ages of 5½ and 18 years. Details of deriva-

tion, and source material are given in author's "Physical Growth and School Progress" (see this list, Sec. I, No. 34). The paper includes a distribution age chart of prepubescent, pubescent, and postpubescent boys, from observations by other investigators of about 5,000 individuals, and a table of appearance of pubescent changes in 1,241 girls.

8 Baldwin, Bird T.: "The use and abuse of weight-height-age tables as indexes of health and nutrition." *J. A. M. A.* [Chicago], vol. 82 (1924), pp. 1–4.

The Baldwin-Wood weight-height-age tables for boys and for girls are reproduced with directions for their accurate use, a statement of the basic essentials of health examinations, and discussion of variability in growth and yearly increments in growth as they may be calculated from the tables.

9 ——— Weight-height-age standards in metric units for American-born children. *American Journal of Physical Anthropology* [Washington], vol. 8 (1925), pp. 1–10.

In response to requests from scientists in various countries for a detailed analytic presentation of the Baldwin-Wood weight-height-age tables, the author presents, in metric units, his original exact averages on nude children. These are based on records selected from those of 74,000 boys and 55,000 girls who had at least five repeated annual or semiannual measurements; all were presumably healthy American-born children from 12 schools in the eastern and middle portions of the United States. Tables 1 and 2 present 498 weight-height-age relationships for boys and 437 for girls between the ages of 6 and 19 years; Tables 3 and 4, increments in weight for each centimeter in height; Tables 5 and 6, increments in weight for each year; and Tables 7 and 8 weight-height indexes for each year.

10 Bardeen, C. R.: "General relations of sitting height to stature and of sitting height and stature to weight." *American Journal of Physical Anthropology* [Washington], vol. 6 (1923), pp. 355–388.

An extended discussion dealing with many races and ages, and containing a bibliography of literature relating to sitting height, supplementary to that published by Bean (American Journal of Physical Anthropology, vol 5, 1922, p. 385). The author finds the ratio, $\frac{100\ W}{Si^3}$, where W=weight and Si=sitting height, especially useful in the comparative study of groups of children.

11 ——— "The height-weight index of build in relation to linear and volumetric proportions and surface area of the body during postnatal development." *Contributions to Embryology, Carnegie Institute of Washington*, nos. 27–46, vol. 9 (1920), pp. 485–552.

A technical discussion to illustrate the value of the height-weight ratio as an index of the proportions of the human body. There are 16 tables, 11 charts, and an appendix of 25 additional tables.

12 Barnes, G. C.: "Inspection of school children." *Brit. M. J.* [London], vol. 1 (1910), p. 930.

Suggestion of a method for calculating the average height and weight of a group of children by using the tables in the report for 1883 of the anthropometric committee.

13 Batkin, S.: "Die Dicke des Fettpolsters bei gesunden und kranken Kindern" [Thickness of the fat pad in healthy and sick children]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 83 (1915), pp. 103–122.

After discussing the fat pad as a means of estimating physical condition, or even as an index of the same, the author describes his observations of 28 male and 18 female infants; 14 boys and 13 girls, from 1 to 10 years of age, all healthy, and 127 sick children. He measured the fold of fat in eight places—below the chin, lower edge of scapula, breast, umbilicus, thigh, calf, upper arm, and lower arm. He ascertained that the fat pad grows in thickness with age, is thicker in girls than in boys, is thicker in healthy children than in sick ones, and is thicker on the abdomen than elsewhere.

14 Bauer, J.: "Über eine Formel zur Beurteilung von Säuglingen in Bezug auf ihren Allgemeinzustand" [A formula for judging infants with reference to their general condition]. *Monatschr. f. Kinderh.* [Leipzig and Vienna], vol. 9 (1910–11), pp. 383–384.

As an aid to young physicians, Bauer suggests the following formula for judging the development of infants:

$$X=\frac{\text{Weight in grams}}{6\ (\text{length in millimeters} + 3 \times \text{age in days})}.$$

15 Bedeke: "Über die Eignung des Rohrerschen Index zur Bestimmung der Unterernährung der Schulkinder und über die dazu gestellte Tabelle" [The fitness of the Rohrer index to indicate the malnutrition of school children, and a table compiled thereon]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 34–35 (1921–22), pp. 4–11.

A discussion, with examples, of cases in which the Rohrer index gives a false indication of the state of a child's nourishment.

16 **Benedict, F. G.:** "A photographic method for measuring the surface area of the human body." *Am. J. Physiol.* [Baltimore], vol. 41 (1916), pp. 275–291.

A photographic method of establishing the relationship between the area of the body computed from certain photographic poses and the area measured by the Du Bois linear formula.

17 **Berliner, Max:** "Normalgewicht und Ernährungszustand" [Normal weight and state of nutrition]. *Berliner Klinische Wochenschrift*, vol. 58 (1921), pp. 58–60.

After discussing briefly the normal-weight formulas of Broca, Bornhardt, and Livi the author expresses his preference for Rohrer's formula, $\frac{\text{weight} \times 100}{\text{height}^3}$ which grows higher with increase of fat. He has found the index to be 280 in a robust newborn infant, 115 to 120 at the age of 11 or 12, 180 in the adult. He has applied the formula to extensive material in the second medical clinic of the University of Berlin. In 1919 the index for the twelfth year fell to 108 or below, and in general the five to six years of undernourishment brought down the index for German children. The author gives tables of weights for heights from 40 centimeters to 200 of height and cites the table of index numbers for children from 6 to 15 published by the relief commission sent to Germany by the American Quakers.

18 ——— "Über die Beziehungen des proportionellen Brustumfanges zum Index der Körperfülle bei männlichen Individuen im Wachstumsalter" [The relations between proportional chest girth and the index of robustness in growing males]. *Berliner Klinische Wochenschrift*, vol. 57 (1920), pp. 33–34.

The author measured the height, weight, and chest girth of 60 boys between 10 and 18 years of age in a polyclinic of Berlin. In one table he compares the chest girth with Rohrer's index, $\frac{\text{weight} \times 100}{\text{height}^3}$, finding a parallel increase. The same agreement between index and chest is to be seen in the other two tables, which give height, weight, and age. The author calls attention to the fact that height and weight alone do not sufficiently indicate the constitution.

19 **Bertillon, Jacques:** "Sur un questionnaire anthropométrique à remplir dans les écoles du département de Loire-et-Cher" [An anthropometric questionnaire for the schools of the Department of Loire-et-Cher]. *Bulletins de la Société d'anthropologie de Paris*, ser. 3, vol. 3 (1880), pp. 169–177.

Recommendation of instruments to be used and questionnaires to be filled out in the extended anthropometric school investigation.

20 **Boas, Franz:** "The growth of children." *Science* [New York], vol. 19 (1892), pp. 256–257, 281–282.

The author discusses the observation of Bowditch that in curves representing distribution of cases classified as to growth, the average and median values do not coincide, and he derives a mathematical formula by which the curve of distribution around the average may be expressed. He also demonstrates the method of deriving from an extensive series of observations, by mathematical formulas, the value which belongs to the average individual and the mean variation.

21 ——— "The growth of children." *Science* [New York], vol. 20 (1892), pp. 351–352.

The author discusses the inaccuracy of the generalizing method in arriving at curves of growth and the superiority of the method of repeated measurements at stated intervals, modified with reference to changes in social status and health of the individuals.

22 ——— "The growth of children." *Science* [New York and Lancaster, Pa.] new ser. vol. 36 (1912), pp. 815–818.

A discussion of acceleration and retardation of growth at different periods of physiological development, with sex comparisons. A table shows the mean square variability of the chronological age at which a certain point in the physiological development of an individual is reached. Dentition and ossification are used as main criteria of physiological epochs.

23 **Brown, A., and G. A. Davis:** "Prevalence of malnutrition in the public-school children of Ontario." *Public Health Journal* [Toronto], vol. 12 (1921), pp. 66–72.

Height-weight standards of Boas and Burk for older children, and of Holt for younger, were used. Estimates were made for both 7 per cent and 10 per cent underweight, clothing having been allowed for. Results showed 26 per cent undernourished, the greater number coming from the middle class and being of native birth. Intelligence was slightly affected. Ten tables of height, weight, and intelligence quotients of the malnourished show the findings in eight schools.

24 **Brunn, Lisa:** "Rohrerscher Index und Ernährungszustand" [Rohrer's index and nutrition]. *Zeitschrift für Schulgesundheitspflege* [Hamburg and Leipzig], vol. 34 (1921), pp. 51–56.

In order to choose undernourished children quickly and justly, the relief commission sent to Germany by the American Quakers used Rohrer's index. The author believes that height and weight alone can not accurately determine nutrition, and in discussing cases from 1,000 Kiel school children between ages of 6 and 15 tested according to the table published by said commission, she proves that Rohrer's index is only approximately accurate.

25 **Calvet, M.:** "Note sur le coefficient de robusticité applicable aux enfants" [On the coefficient of robustness of children]. *Pédiatrie pratique* [Lille], vol 5 (1907), pp. 56–58.

The author shows that the formula of Pignet, expressing physical development in adults in terms of weight, height, and chest circumference, is not applicable to children, inasmuch as their development is not regular but rythmical. He suggests coefficients for the different ages, which should be verified by further research.

26 **Carter, W. E.:** "The Pirquet system of nutrition and its applicability to American conditions." *J. A. M. A.* [Chicago], vol. 77 (1921), p. 1541.

After fully explaining the Pirquet system of feeding the author reports the result of an examination of 1,282 normal children in the San Francisco schools to determine the relative nutritional status of children in: (1) The very poor district, (2) the industrial district, and (3) the wealthy residential district. By the Pirquet standards 66 per cent in the poor district, 45 per cent in the industrial district, and 49 per cent in the wealthy district showed undernutrition.

27 **Chernisheff, D. P.:** "Sravnenie resultatov izmerieniia dlini mladentzev izmeritelnoi lentoi i priborom" [Comparison of results obtained in measuring length of the infant body with tape measure and a more exact instrument]. *Russkii Vrach* [St. Petersburg], vol. 10, pt. 2 (1911), p. 1831.

The author criticizes the use of a tape measure for measuring length of the infant body as giving unreliable results and recommends instead the use of an instrument which he describes.

28 **Children's Bureau, U. S. Department of Labor:** April and May Weighing and Measuring Test. (Part 2. Suggestions to Examiners.) Publication No. 38. Washington, 1918. 4 pp.

Suggestions are given as to the best methods of obtaining accurate records of weight and height of preschool children. Apparatus and points of technique are briefly discussed.

29 ——— Physical Status of Preschool Children, by Anna E. Rude. Publication No. 111. Washington, 1922. 84 pp.

A study was made of about 3,000 children from 2 to 7 years of age and of about 100 infants under 2 years. The children are grouped according to the extent to which they deviated from the average weight for height for their age. The methods and apparatus used in measuring and weighing are described. The children were also studied as to their state of nutrition and grouped in that respect as very poor, poor, good, or excellent.

30 ——— What Is Malnutrition? By Lydia Roberts. Publication No. 59. Washington, 1927. 19 pp.

The signs that indicate malnourishment are described in detail, and a brief discussion of the best-known systems for grading children according to their degree of malnutrition is included, in addition to material relating to the prevention and cure of this condition.

Clark, Taliaferro, Edgar Sydenstricker, and Selwyn D. Collins: Indices of Nutrition: Application of Certain Standards of Nutrition to 506 Native White Children without Physical Defects and with "Good" or "Excellent" Nutrition, as Judged from Clinical Evidence. *See* U. S. Public Health Service.

——— Weight and Height as an Index of Nutrition. *See* U. S. Public Health Service.

31 **Cisi, Camillo:** "Il metabolismo basale in pediatria" [Basal metabolism in pediatrics]. *Rivista di clinica pediatrica* [Florence], vol. 22 (1924), pp. 12–56 and 98–108.

After theoretically discussing basal metabolism and quoting a number of writers, the author gives a description of the method for determination of basal metabolism used in the pediatric clinic in Genoa, with case records. Several tables and charts. References.

32 **Clough, H. D.:** "A photographic method for studying the growth and nutrition of children." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 21 (1923–24), p. 422.

The method consists in making stereoscopic photographs of growing children, under standardized conditions, at three-month intervals. Apparatus and method of use are briefly described. Stereoscopic prints and stereoscopic projections make possible visualization of form at each growth stage and, together with prints from superimposed negatives, afford much information not procurable from anthropometric measurements.

33 **Davenport, C. B.:** "The best index of build." *Quarterly Publications of the American Statistical Association* [Concord, N. H.], vol. 17 (1920), pp. 341–344.

A mathematical study leading to the conclusion that the best index of build is the weight divided by the square of the height.

34 **Debenedetti, E.:** "Antropometria hidrostatica" [Hydrostatic anthropometry]. *La Semana Médica* [Buenos Aires], vol. 15 (1908), pp. 1781–1785.

The author describes his own method of obtaining the volume of the human body, including the head, submerged in water.

35 **Del Duca, Giuseppe:** "Intorno ad una modificazione dell'esame antropometrico del bambino (Nota preventiva)" [Suggested change in the method of making anthropometrical examinations of children]. *Rivista di clinica pediatrica* [Florence], vol. 22 (1924), pp. 229–240.

The purpose of this article is to propose a new table by which the development of children may be judged. The table is arranged to show the normal increase in the value of each body segment at six-month intervals from birth to adult age and to compare it with the sizes attained at the ages which mark the changes of rhythm, such as the age of 6 to 7 years and adolescence. The values obtained were checked by the author by means of numerous observations.

36 **Dreyer, Georges:** "Investigations on the normal vital capacity in man and its relation to the size of the body." *Lancet* [London], 1919 (II), pp. 227–234.

Data for this article were obtained by measuring 16 boys and men, aged 13 to 52. Weight was taken without clothing, height in stocking feet, chest circumference by tape measure at nipple line, stem length and vital capacity by methods fully described. From these measurements the author shows statistically that vital capacity is a simple function of body surface; that the relations between vital capacity and stem length, vital capacity and circumference of chest, and circumference of chest and body weight can all be expressed by formulas, and that a satisfactory formula can be devised showing the relationships between stem length, chest circumference, and vital capacity.

37 ——— **and G. F. Hanson:** The Assessment of Physical Fitness. Paul B. Hoeber, New York, 1921. 127 pp.

A book designed to supply a method of assessing physical fitness on the basis of a few simple physical measurements. These are: (1) Weight without clothing; (2) trunk length (ischial tuberosities to top of head); (3) circumference of the chest; (4) vital capacity (Boullite's spirometer). Simple but complete directions are given for avoiding inaccuracies in measurement. Duplicate tables, given in the metric and the English system, for each sex, show: (1) Normal weight of body calculated from length of trunk and normal weight of body calculated from circumference of chest; (3) normal circumference of chest calculated from length of trunk; (4) normal vital capacity calculated from weight of body; (5) normal vital capacity calculated from length of trunk; (6) normal vital capacity calculated from circumference of chest. The method of using the tables is shown by 17 pages of examples, and a reduction table for the two systems is appended.

38 **Dublin, L. I., and J. C. Gebhard:** Do Height and Weight Tables Identify Undernourished Children? New York Association for Improving the Condition of the Poor, 1924. 23 pp.

In a physician's examination of 1,878 boys and 2,169 girls, Italians from the Mulberry district of New York City, 34 per cent were declared undernourished. Baldwin-Wood-Woodbury tables, with the 7 per cent limit, identified 12.4 per cent as undernourished; with the 10 per cent limit, 6.2 per cent. Special tables, constructed from measurements of Italian children only, gave a closer agreement with the physician's diagnosis, but failed to identify a large number of cases.

39 **DuBois, Delafield, and Eugene F. DuBois:** "A formula to estimate the approximate surface area if height and weight be known." *Archives of Internal Medicine* [Chicago], vol. 17 (1916), pp. 863–871.

A continuation of previous work of the authors in deriving the "linear formula" for surface measurement. The method of calculating the surface area from this formula is given, with a slight correction in the factor for the

arms, and an alternative measurement for the thighs. A simpler height-weight formula is devised to estimate the surface of subjects if their height and weight be known, and a chart plotted from this formula so that the approximate surface area may be determined at a glance.

40 **DuBois, Delafield, and Eugene F. DuBois:** "The measurement of the surface area of man." *Archives of Internal Medicine* [Chicago], vol. 16 (1915), pp. 868–881.

The authors devise a formula for determining the area of each part of the body by linear measurements alone. To test the accuracy of this formula they measured five individuals of widely varying types by making a mold of paper pasted over tight-fitting underwear. The area of the mold was then determined by cutting it in pieces, printing a pattern on photograph paper, cutting out the pieces, and weighing them. By comparison of the results it was found that surface area as determined by the linear formula was correct within 1.7 per cent.

41 **Duckworth, W. L. H.:** "The international agreement for the unification of anthropometric measurements to be made on the living subject." *American Journal of Physical Anthropology* [Washington], vol. 2 (1919), pp. 61–67.

Report of the commission appointed by the Fourteenth International Congress of Prehistoric Anthropology and Archæology at Geneva (1912), to supplement the work commenced by the thirteenth congress in the session at Monaco (1906). It contains detailed definitions of the measurements approved by the commission and the congress.

42 **Dufestel, L.:** "Des mensurations anthropométriques chez l'enfant" [Anthropometric measurements of children]. *Pédiatrie pratique* [Lille], vol. 5 (1907), pp. 193–198.

Directions as to apparatus and methods designed to standardize French anthropometric research.

43 **Emerson, Wm. R. P., and Frank A. Manny:** "The new weight-height tables and malnutrition." *Arch. Pediat.* [New York], vol. 41 (1924), pp. 677–685.

The authors reproduce and discuss tables based upon the work of the committee of the National Child Health Council appointed to evolve a single weight-height table to replace the many now in use. Tables showing increase in weight at various ages are included.

44 ——— "Weight and height in relation to malnutrition." *Arch. Pediat.* [New York], vol. 37 (1920), pp. 468–485.

The authors established a zone of normal nutrition by using the Boas-Burk height-weight tables set forward a half year to offset the depression of averages caused by the inclusion of a large number of malnourished children, and estimating the zone boundaries as 7 per cent below and 20 per cent above the Boas-Burk figures. This test which they applied to a large number of children showed 20 to 40 per cent malnourished.

45 **Faber, Harold K.:** "A critique of the Pirquet feeding system with special reference to its underlying principles." *Am. J. Dis. Child.* [Chicago], vol. 25 (1923), pp. 339–349.

A critical study of von Pirquet's system of feeding and index of nutrition.

46 ——— "Variability in weight for height in children of school age." *Am. J. Dis. Child.* [Chicago], vol. 30 (1925), pp. 328–335.

An attempt is made to define more clearly the significance of weight variation in children. For the study, heights and weights of about 60,000 San Francisco school children were available. All measurements had been made by experienced workers and by a uniform technique. Computation of the mean variability in height and weight for both sexes and for each year of age showed that variability in the direction of both underweight and overweight increases with age in both sexes; that girls show a greater variability and a more rapid increase in variability with age than do boys; that therefore no single standard of variation can be satisfactory, but that a table of percentages for underweight and overweight, taking age and sex into account, used in connection with the Baldwin-Wood tables, would greatly increase the usefulness of weighing as an aid to diagnosis.

47 ——— **and Margaret S. Melcher:** "A modification of the DuBois height-weight formula for surface areas of newborn infants." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 19 (1921–22), p. 53.

In a series of observations on 100 newborn infants, none over 12 days old, ranging in weight from 2,140 to 4,520 grams and in height from 45.2 to 56.9 centimeters, the surface area was computed by the Sawyer, Stone, and DuBois methods and the results compared with those derived from the height-weight formula of DuBois. This gave a mean error of −8.6 per cent. By correcting the constant used by DuBois the average error was ±2.5 per cent when applied to infants.

48 **Faillie, Robert:** "Measurement of the body surface in men and in women." *Archives of Internal Medicine* [Chicago], vol. 35 (1925), pp. 626–631.

Discussion and conclusions are based on about 80 measurements made by the triangulation method on persons varying greatly in size. A graph is presented by which body surface may be easily calculated.

49 **Fehr, C., and von Pirquet:** "Ernährung nach der Darmfläche (System der Ernährung IV)" [Nutrition according to intestinal surface (system of nutrition IV)]. *Ztschr. f. Kinderh.* [Berlin], vol. 15 (1916–17), pp. 100–116.

The authors discuss the relation between the amount of absorptive surface of the intestine and the sitting height, and explain in detail the system by which the food requirements of a child may be estimated from the sitting height. The terms coined for reckoning food values are also explained.

50 **Feldman, W. M., and A. J. V. Umanski:** "The nomogram as a means of calculating the surface area of the living human body." *Lancet* [London], vol. 202 (1922), pp. 273–274.

The method of constructing a nomogram and its use in calculating surface area are given by the authors in detail.

51 **Féré, Ch.:** "La taille dans la station et dans le décubitus dorsal" [Stature standing and lying on the back]. *Comptes rendus des séances et mémoires de la Société de biologie* [Paris], ser. 9, vol. 3 (1891), p. 620.

To determine the difference in height brought about by change of posture the author measured 165 subjects, aged 18 to 70 years, standing erect and lying upon the back. In 22 subjects from 18 to 20 years of age he found an average difference of 1 centimeter.

52 **Finlay, T. Y.:** "An investigation upon the value of two methods of estimating nutrition in infancy (the Pirquet method, and the $\frac{W}{H}$ to height-age method). *Edinburgh Medical Journal*, new ser. vol. 31 (1924), pp. 317–328.

A study undertaken to discover a simple, mechanical method by which health workers at child-welfare centers may estimate nutritional condition. Three hundred and fifty infants, varying in age up to 1 year old, were weighed and their total and stem length measured by experienced workers under the direction of the writer. Methods are described. A careful clinical examination, "noting especially (1) quality of the blood, (2) the contents of fat of the skin, (3) the tension of the skin through the water contents contained therein, and (4) the development of the muscles," was the basis for classifying the infants as well nourished, poorly nourished, or emaciated. They were then classified by Pirquet's index and by a $\frac{W}{H}$ to height-age index. The latter was found to agree much oftener than the former with clinical results. A chart devised by the author shows how this index may be easily and quickly used.

53 **Fortune, John:** "The relation of height and weight in school children." *Medical Officer* [London], vol. 7 (1912), pp. 191–194.

An explanation of the "dot" method of representing the height-weight relation of a number of individuals. Charts from the records of the Ipswich (Eng.) school are shown.

54 **Frassetto, F.:** "Accordo internazionale per l'unificazione delle misûre antropometriche sul vivente" [International agreement for the unification of anthropometric measurements of living beings]. *Rivista di antropologia* [Rome], vol. 17 (1912), pp. 413–419.

A discussion of the rules prepared by an international committee in 1912 for the purpose of unifying anthropological measurements made in various countries.

55 **Fuld, L. F.:** "The measurement of height." *American Physical Education Review* [Springfield], vol. 20 (1915), pp. 80–84.

Specific directions for taking height measurements for purposes of anthropometrical research.

56 **Galton, F.:** Anthropometric laboratory; arranged . . . . for the determination of height, weight, span, breathing power, strength of pull and squeeze, quickness of blow, hearing, seeing, colour sense, and other personal data. William Clowes & Sons, London, 1884. 12 pp.

A pamphlet descriptive of the laboratory for public measurements arranged by the author at the International Health Exhibition, London, 1884, and of apparatus and methods used.

57 **Galton, F.:** "Notes on the Marlborough school statistics." *Journal of the Anthropological Institute of Great Britain and Ireland* [London], vol. 4 (1875), pp. 130–135.

The mathematical treatment of statistics on 540 boys measured at Marlborough College, presented that the author might indicate how he proposed to treat a larger mass of statistical material which was being assembled for his use.

58 ——— "On the anthropometric laboratory at the late International Health Exhibition." *Journal of the Anthropological Institute of Great Britain and Ireland*, vol. 14 (1884–85), pp. 205–219.

The methods and apparatus used in measuring 9,337 persons, each in 17 ways, at the International Health Exhibition, Great Britain, 1884.

59 ——— "Some results of the anthropometric laboratory." *Journal of the Anthropological Institute of Great Britain and Ireland*, vol. 14 (1884–85), pp. 275–287.

The author summarizes the results of measurements of 9,337 persons by methods described in a preceding paper (*see* No. 58 this section) at the International Health Exhibition, Great Britain, 1884. He explains in detail his system of percentile grades and tabulates the results of his investigations by anthropometric percentiles. He tabulates also results of measurements of height sitting, height standing, span, breathing capacity, squeeze, and highest note audible.

60 **Giardina, A.:** "Gli indici di altezza, di larghezza e di lunghezza in corpi aventi diametri fra correlativi loro" [Indexes of height, width, and length in bodies having diameters among their correlations]. *Archivio per l'antropologia e la etnologia* [Florence], vol. 44 (1914), pp. 148–218.

Theoretical discussion of indexes of height, width, and length, proposed by several writers, including the author himself.

61 **Giuffrida-Ruggeri, V.:** "L'indice barico in certe sezioni di populazione e nei due sessi" [Baric index in certain parts of the population and in both sexes]. *Rivista di antropologia* [Rome], vol. 23 (1919), pp. 91–99.

Study of "baric" index $\left(\frac{\text{weight} \times 100}{\text{height}^3}\right)$, called by some writers index of body development, of certain parts of the Italian population of both sexes. As a basis for his study the author uses the figures of weight and height of the Italian people obtained by Livi and other writers. A few quotations from non-Italian sources are given.

62 **Gottstein, Adolf:** "Körpermessungen" [Body measurements]. *Die Naturwissenschaften* [Berlin], vol. 12 (1924), pp. 353–360.

A history and criticism of various systems of body measurements used by the well-known anthropologists, beginning with Quetelet and coming down to Pfaundler and Martin; also an account of the various purposes for which these systems of body measurements are used.

63 **Gray, Horace:** "Against measuring the chest girth at rest." *J. A. M. A.* [Chicago], vol. 79 (1922), pp. 349–350.

By studying two normal series, one of 40 men, the other of 114 private-school boys, the author found that measure of the chest girth at rest, except as a necessity in the case of children who do not breathe freely, is not as satisfactory as the average of measurements taken at full inspiration and complete expiration and recorded as midway girth.

64 ——— "Sitting-height and stem length in private-school boys." *Am. J. Dis. Child.* [Chicago], vol. 23 (1922), pp. 406–418.

The object of this paper is to offer tentative standards of sitting height and stem length for children. Observations were made on healthy children of American parentage in private schools. One hundred and fourteen cases were observed. The sitting height and stem length are compared graphically and in tables and by the indexes: $\frac{\text{sitting height}}{\text{height}}$; $\frac{\text{stem length}}{\text{height}}$; $\frac{\text{stem length}}{\text{sitting height}}$. Comparative charts are made summarizing observations from other sources. The author's conclusions are that height measurement is rivaled and may be superseded by trunk measurement. Stem length is the least variable trunk measurement and should replace sitting height, the next best measure. The absolute values of stem length and sitting height in the author's cases exceed any previously reported. This is explained because the cases were selected for their health and careful rearing. The author agrees with Hrdlička that in the badly nourished the principal defect of growth is in the extremities.

65 ——— and **G. H. Edmans:** "Indices of the state of nutrition in children." *Am. J. Dis. Child.* [Chicago], vol. 23 (1922), pp. 226–237.

The object of the study was to determine a standard of nutrition in children. One hundred and fourteen private-school boys in Brookline, Mass., were weighed; standing and sitting height and chest girth at rest, during inspiration, and during expiration were recorded. The cases studied were presumed to be normal. Each case was compared with the predicted normals of von Pirquet

and with Dreyer-Hanson tables, and the error in prediction of weight by the different methods was estimated. The range, mean, standard deviation, coefficient of variation and percentage of estimates for high, low, and correct weight are given in a table. A synopsis is given of previous studies of indexes of nutrition. The authors' conclusion is that the Dreyer-Hanson "weight for stem" and "weight for chest" are most accurate, but the mean girth would be better substituted for the resting girth.

66 **Gray, Horace and H. F. Root:** "Stem-length and trunk-length." *Bost. M. & S. J.*, vol. 184 (1921), pp. 439–443.

A paper tracing the development of the various measurements of the length of the torso, ending with a discussion of the sitting height urged by von Pirquet, and the stem-length formula for predicting weight proposed by Dreyer.

67 ——— ——— "Weight prediction by the formulae of Bornhardt, of von Pirquet, and of Dreyer." *Bost. M. & S. J.*, vol. 185 (1921), pp. 28–32.

A continuation of a former paper (No. 66 this section) discussing Dreyer's formula for weight prediction, using both stem length and chest girth, and testing it by data on 16 normal males, aged 22 to 52, in combination with Dreyer's own table of measurements of 16 normal males aged 13 to 52. The authors conclude that the formula deserves further trial. Bibliography.

68 ——— **and A. M. Walker:** "Length and weight" *American Journal of Physical Anthropology* [Washington], vol. 4 (1921), pp. 231–238.

A discussion of the methods of predicting normal weight from one or more physical measurements. The author gives a brief synopsis of his trial tests of formulas devised by various investigators and criticizes at length and unfavorably Oeder's upper-length and weight formula. References.

69 **Griffith, J. P. Crozer:** "The weight in the first two years of life with a description of a new weight chart." *New York M. J.*, vol. 69 (1899), pp. 292–297.

A chart devised after study of most of the available published material on the subject, following Camerer's curve more nearly than any other. References.

70 ——— "Weight of clothing and its relation to weight of the child in the first five years of life." *New York M. J.*, vol. 106 (1917), pp. 823–825.

Tables showing ratio of weight of clothing to gross normal weight of children up to the age of 5 years, based upon weighings of 194 children of both sexes.

71 **Gulick, Luther:** Manual for Physical Measurements. The International Committee of Young Men's Christian Associations, New York, 1892. 48 pp.

Description of apparatus and detailed instructions as to methods to be used in physical examinations at Y. M. C. A. gymnasiums.

72 **Hall, W. S.:** "The evaluation of anthropometric data." *J. A. M. A.* [Chicago], vol. 37 (1901), pp. 1645–1648.

The author discusses the broad application of anthropology to medical science and the necessity of critical analysis of the data collected. Quetelet's median value, he says, is more accurate and more easily determined than the arithmetical average; the use of the median value should by its simplicity increase the application of anthropometry to the practice of medicine.

73 **Hammond, William A.:** A Treatise on Hygiene, with Special Reference to Military Service. J. B. Lippincott & Co., Philadelphia, 1863. 596 pp.

In the early part of this work by the Surgeon General of the United States Army are given the physical standards accepted at that time for recruits 18 years of age or over.

74 **Harris, J. A.:** "Formulae for determination of the correlations of size and of growth increments in the developing organism." *Proceedings of the Society for Experimental Biology and Medicine* [New York], vol. 18 (1921), pp. 4–5.

A technical presentation of algebraic formulas for representing stages and increments of growth.

75 **Hastings, W. W.:** A Manual for Physical Measurements—Boys. International Young Men's Christian Association Training School, Springfield, Mass., 1901. 95 pp.

One of a series of manuals issued by the author, professor of anthropometry and physical training in the Y. M. C. A. training school at Springfield, having introductory chapters on the history, use, and methods of anthropometry, and the value of physical examinations, and detailed instructions as to the instruments and methods to be used in anthropometrical work.

76 **Hawkins, Cecil:** "The physical measurements of public-school boys." *Journal of Education* [London], new ser. vol. 21 (1899), pp. 33–35, 187–190.

The author, a director of a gymnasium at Haileybury, England, describes, with diagrams, the method by which he estimates the physical development of the boys under his care.

77 Heller, R.: "Über den Wert der Indices zur Beurteilung des Ernährungszustandes von Kindern bei Massenuntersuchungen" [Value of indexes for judging the nutritional condition in investigations of large numbers of children]. *Wiener Medizinische Wochenschrift*, vol. 71 (1921), pp. 1415–1418.

In the light of wide experience, including measurements of 16,359 children, the author contends that the subjective estimate of the physician gives a more accurate idea of the nutritional condition than does Rohrer's index or Pirquet's gelidusi (pelidisi). The article contains weights, heights, and sitting heights of 30 children in different classes; it also gives the averages in these dimensions of 6-year-old children before the war and after the war.

78 Herz, Ralph: "Pelidisi and sacratama in Czechoslovakia." *American Medicine* [Burlington and New York], vol. 27 (1921), pp. 655–657.

A description of the method used by von Pirquet to estimate the state of a child's nutrition, with an explanation of the meaning and derivation of the terms pelidisi and sacratama, coined by him. Sixty-five per cent of 50,000 children examined had a pelidisi of 94 or less.

79 Hitchcock, E.: "Anthropometry." *Proceedings of the American Association for the Advancement of Physical Education, 5th meeting, Boston (1890)* [Ithaca], 1890, pp. 6–8.

An average anthropometric table based on weight of 61.2 kilograms (134.6 pounds) and height of 1,725 millimeters (67.9 inches), prepared by the writer from a study of nearly 8,000 Amherst students 17 to 26 years of age. It includes 55 items arranged for the use of the individual in recording his own deviations from standard.

80 Howland, John, and Richard T. Dana: "A formula for the determination of the surface area of infants." *Am. J. Dis. Child.* [Chicago], vol. 6 (1913), pp. 33–37.

The authors applied a new algebraic formula for the determination of surface area in children. They used as a check the actually measured surface areas of 14 cases reported by Meeh and Lessauer. No original data were collected. Two tables show (1) the actual surface area and the calculated surface area using the coefficient of Meeh, Rubner, Heubner, and Lessauer, and the formula of the authors; (2) a comparison of the percentage of error in the various methods of calculation. This new formula is simpler and shows less variation when applied to infants in different stages of nutrition.

81 Jessen, Ernst: "Der Umriss des menschlichen Körpers" [Outline of the human body]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 18 (1882), pp. 60–77.

The author describes his method of tracing the outline of his subjects lying supine, with Vierordt's instrument. The subjects were all of the male sex—four fetuses, two newborn, a few mature men, and the rest young men and children. Data are shown in a large graph and six tables. The relative proportions of the different parts of the body at various ages is discussed.

82 Jones, D. Caradog: "Applicability of Dreyer's anthropometric formulae to boys." *Lancet* [London], vol. 1 (1926), pp. 945–946.

A criticism of Dreyer's tables published in "The Assessment of Physical Fitness." The author finds Dreyer's "constant" K not a constant, but a function of age as well as of class.

83 Kaup, J.: "Ein Körperproportionsgesetz zur Beurteilung der Längen-, Gewichts- und Index-Abweicher einer Populations-Altersgruppe" [A law of physical proportions for judging deviations in height, weight, and index of an age group in a population]. *Münchener Medizinische Wochenschrift*, vol. 68 (1921), pp. 976–978, 1021–1023.

The nutrition of millions of German children, between 6 and 15, was estimated in 1919 for German Austria and in 1921 for Germany by Rohrer's index $\frac{\text{weight} \times 100}{\text{height}^3}$ and used by the Friends of America for charitable purposes.

After a long mathematical discussion the author draws the conclusion that this index is not appropriate for normally developed and nourished children, but only for a small group of variants within the population group. He believes that the simplest scheme for judging development is the relation between absolute height and average, normal cross section. This value fluctuates between 2.3 and 2.4 for the German race.

84 Kerr, James: "Standard measurements for school children." *American Journal of School Hygiene* [Worcester], vol. 2 (1918), pp. 2–19.

An extended discussion and criticism of anthropometric work done by the leading investigators in England and the United States, with suggested standards of height and weight for boys and girls.

85 Knoop, L.: "Zum Index aus Körperhöhe und Armspannung" [Index from height and reach of arms]. *Archiv für Anthropologie* [Braunschweig], new ser. 16, vol. 44 (January–April, 1918), p. 26.

The author studies the index $\frac{\text{arm reach}}{\text{height}}$. From measurements on boys of 14 and on the same individuals 12 years later he finds that age has little

effect. He gives tables of measurements on 24 subjects, most of them over 21 years of age, from Braunschweig. The index is smallest in the Germanic or blond type and highest in the brunette type. The index 94 seems to accompany the dolichocephalic head.

86 **Lambolez, René:** "Graphique du poids et de la taille de l'enfant" [A formula of weight and stature of the infant]. *Bulletin médical* [Paris], vol. 39 (1925), p. 644.

From the tables of Variot and Comby the author derives a formula expressing in terms of weight, height, and age the growth of the child from birth to 2 years of age.

87 ——— "Loi de croissance de la taille et du poids dans la première et la seconde enfance" [The law of growth in height and weight for infants and children]. *Bulletin médical* [Paris], vol. 39 (1925), pp. 1232–1234.

From the tables of Variot and Chaumet, the author derives a formula of growth involving height, weight, and age, and applicable from 2 to 16 years of age.

88 **Lassablière, P.:** "Évaluation de la surface cutanée chez le jeune enfant" [Estimation of the surface area of the young child]. *Comptes rendus hebdomadaires des séances et mémoires de la Société de biologie* [Paris], vol. 1 (1910), pp. 339–341.

The author derives three formulas for estimating the surface area of a child, one as a function of the weight, one of height, and one of chest circumference. He feels that the average obtained by using the three formulas will be practically exact.

89 **van Leer, S. A.:** "Einige Formeln für das Kindesalter" [Some formulas for childhood]. *Arch. f. Kinderh.* [Stuttgart], vol. 34 (1902), pp. 293–295.

The author compiles formulas for weight, length, and chest girth of infants from data of Bouchaud and Quetelet and compares resultant figures with those of Monti and Hochsinger.

90 **Le Gendre, P.:** "Pesage des enfants" [Weighing children]. *Revue pratique d'obstétrique et d'hygiène de l'enfance* [Paris], vol. 2 (1889), pp. 147–157.

A description of an instrument for weighing infants, with a discussion of average weights at birth, monthly increases in weight, etc.

91 **Leo-Wolf, Carl G.:** "Logarithmic charts in pediatrics." *Am. J. Dis. Child.* [Chicago], vol. 27 (1924), pp. 556–561.

The author presents a series of charts so designed as to record graphically not absolute changes of bodily condition but relative or percentage values. The plan is the same as that now in use in many industrial establishments where production, cost, and other items are best represented in percentages.

92 **Lincoln, D. F.:** "Anthropometry individualized." *Report of the American Association for the Advancement of Physical Education* [Concord], vol. 10 (1896), pp. 4–11.

A paper showing the errors which arise from considering measurements of a large number of individuals, taken but once, and urging that repeated measurements be made of the same individuals as an aid to the correct understanding of the laws of development.

93 **Livi, R.:** "L'indice ponderal ou rapport entre la taille et le poids" [The index of weight or relation between height and weight]. *Archives italiennes de biologie* [Turin], vol. 32 (1899), pp. 229–247.

A general study of "index weights," by which the author means relation between height and weight, on the basis of data obtained by other writers. In several tables the author quotes from Quetelet, Mies, and others the height and weight of children and adults, calculates the index of weight and concludes that after a slight increase in the first year of life the index decreases constantly and rapidly until the age of 10 to 11 years; then there is a stationary period lasting through the age of puberty, after which the index again resumes its upward course, and again slightly declines at middle age.

94 **McCurdy, J. H.:** "Physical-efficiency tests during adolescence." *Transactions of the Fifteenth International Congress on Hygiene and Demography*, 1912 [Washington], vol. 3 (1913), pp. 420–428.

A preliminary statement and illustration of the individualizing method of study, adopted by the author after some years of investigation by the generalizing method. The following studies were made: Height and weight studies of 212 boys (51 examined five times between October, 1910, and March, 1912; the remainder in October, 1911, and March, 1912); a lung-capacity study of 179 boys (57 examined twice); heart-rate and blood-pressure studies carried over four years (1908 to 1912); study of scholarship in relation to pubescence. The author finds an obvious need for standards of growth and efficiency related to maturity rather than to chronological age. References.

95 **Martin, Rudolf:** Die Bedeutung einer anthropologischen Untersuchung der bayrischen Jugend für die körperliche Ertüchtigung [Significance of an Anthropological Investigation of Bavarian Youth for Physical Excellence]. Munich, 1920. 18 pp.

The author gives directions for taking anthropological measurements, especially height and weight measurements and measurements of the limbs and torso, with relation to an index of robustness.

96 **Matusiewicz, Jakob:** Der Körperlängen-Körpergewichts-Index bei Münchner Schulkindern [Index of Height and Weight for Munich School Children]. Munich, 1914. 28 pp.

Inaugural dissertation (University of Munich). The author together with Dikanski and Reinus collected material on the height and weight of 1,517 boys from 5½ to 7½ years of age in two classes of three public schools in Munich. These children had been divided by three school physicians into three groups—good, moderate, bad—according to state of nutrition and general health. The author calculates and puts in tables for the whole group the Pirquet index $\left(\frac{\text{height in centimeters}}{\text{weight in grams}}\right)$. He finds that the mean value of Pirquet index rises with age in every category and rises with increasingly bad physical condition in each year. He next presents variation polygons on the height-weight index for the two years he is considering with relation to good health and moderate health, and comes to the conclusion that the indexes are not to be relied upon as an indication of general bodily condition, at least in school children.

97 **Meeh, K.:** "Oberflächenmessungen des menschlichen Körpers" [Surface measurements of human body]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 15 (1879), pp. 425–458.

A description of methods of measuring body surface, body weight, and lung capacity. The author gives a formula to show relation of body surface to weight.

98 **Merejkovski, K.:** "O zadachakh i metodakh izsliedovanii fizicheskavo razvitia dietiei" [On the problems and methods of studying the physical development of children]. *Meditzinsko-pedagogicheski Vestnik* [St. Petersburg], 1886 (2), no. 1, pp. 63–97; no. 2, pp. 53–76.

A theoretical discussion of the value of study of the physical development of children and the need of concise methods in such study. An explanation is given of methods of measuring head, trunk, and extremities; of weighing the body; and of describing the data found. Several references.

99 **Miwa, S., and W. Stoeltzner:** "Bemerkungen über die Bestimmung der Körperoberfläche des Menschen" [Comments on the determination of the body-surface area of human beings]. *Zeitschrift für Biologie* [Munich and Leipzig], vol. 36 (1898), pp. 314–318.

A criticism of a formula presented by Meeh for determining the body surface, and a presentation of another formula for showing the relation of height, weight, chest girth, and surface measurements.

100 **Mochan, V. O.:** "Ob obiektivnom opredelenii razvytia grudnoy klietk i" [An objective method of determining the degree of development of the chest]. *Pediatria* (Moscow), vol. 8 (1924), pp. 51–64.

From body measurements of 630 boys and 496 girls, ranging in age from a few months to 25 years, the author derived a pectoral index. This index, obtained by multiplying the sagittal diameter of the chest by the transversal diameter and dividing the product by the square of the sitting height, he considers an exact and sensitive measure of chest development. The growth of the human body in the first nine years of life is disproportionate, but from 9 to 25 years all parts of the body grow in harmony. The application of this pectoral index permits the discovery of disproportion in body constitution and disharmony in growth.

101 **Montessori, M.:** Pedagogical Anthropology. (Translated from the Italian by F. T. Cooper.) Frederick A. Stokes Co., New York, 1913. 500 pp.

Chapters are included on forms and types of stature, weight, craniology, the thorax, the pelvis, the limbs, the application of biometry to anthropology in studying body proportions according to age and for computing the cephalic and ponderal indexes.

102 **Mumford, A. A.:** "Estimation of physique and stamina for school purposes." *Lancet* [London], vol. 1 (1915), pp. 115–117.

The author recounts methods that have been used to estimate stamina, by Pignet's factor, height-weight measures, respiration, and general muscular build, with the value of each in diagnosis. School boys of to-day rank better than those of a generation ago. (Report of Medical Officer, Manchester, 1910.)

103 **Munch, Ludwig:** "Die Pirquetsche Messtafel über Alter, Länge, und Gewicht des Kindes" [Pirquet's table of measurements on age, height, and weight of the child]. *Das Österreichische Sanitätswesen* [Vienna], vol. 26 (1914), pp. 1267–69.

The author discusses the value of von Pirquet's system of measurements and his experience in using it in the university clinic at Vienna.

104 **Neumann, H.:** "Die Dicke des Fettpolsters bei Kindern" [The thickness of the fat pad in children]. *Jahrb. f. Kinderh.* [Berlin], new ser. vol. 75 (1912), pp. 481–488.

After discussing the feasibility and technique of ascertaining the thickness of the fat pad on children's stomachs to the left of the navel, the author presents the results he obtained from measuring 219 boys and girls from 4 to 17 years old in his own practice and in a Berlin infirmary for children. He obtained an average of 5 millimeters for boys 4 to 13 years old and girls 4 to 7. In the case of the girls it rises to 7 millimeters for the period 8 to 10 years, to 11 millimeters for the period 11 to 13 years, and to 13 millimeters for the period 14 to 17 years.

105 **Noback, Gustave J.:** "The lineal growth of the respiratory system during fetal and neonatal life as expressed by graphic analysis and empirical formulae." *American Journal of Anatomy* [Philadelphia], vol. 36 (1925), pp. 235–273.

The material used in this study consisted of 104 fetuses and full-term newborn infants ranging in crown-heel or total body length from 10 to 55 centimeters. No material was used in which pathological conditions were observable macroscopically. Measurements of crown-heels and crown-rump length, and of various dimensions of the larynx, trachea, bronchi, and lungs, were made the basis of an extended statistical study. From this were derived two plates showing growth values at 5-centimeter intervals from 10 centimeters to 55 centimeters total body length, and for each month from the third to the tenth.

106 **Nobel, Edmund:** "Säuglingsernährung" [Infant nutrition]. *Wiener Medizinische Wochenschrift*, vol. 72 (1922), pp. 726–727, 781–782.

The author explains in detail the characteristic features of the Pirquet system of nutrition and the standards established by Pirquet that signify normal nutrition. Diets based on Pirquet's system used in the Vienna Children's Clinic are described.

107 **Oeder, G.:** "Die Fettpolsterdicke als Index des Ernährungszustandes bei Erwachsenen" [Layer of fat as index of nutrition in adults]. *Medizinische Klinik* [Berlin], vol. 6, pt. 1 (1910), pp. 657–662.

The author deplores lack of exact and universal nomenclature to denote state of nourishment. He believes that the best criterion of such state is the layer of fat on the abdomen, for measuring which with Collins' compasses he gives directions. On the basis of measurements from 1902 on, of 681 men and 603 women, all over 24, he derives three groups of people—thin, normal, and fat. A thickness of 0.75 centimeter or less means absolute leanness; 0.1 to 1.75, relative leanness; 3.25 to 5, relative fatness; 5.25 to 9.5, absolute fatness. Between are the normal types. The author gives many graphs and discusses the factors of sex, height, and age.

108 **Oppenheimer, Karl:** "Über eine Methode zur Bestimmung des Volumens bei Säuglingen" [A method to determine the volume of infants]. *Ztschr. f. Kinderh.* [Berlin], vol. 3 (1911–12), pp. 237–250.

The author discusses methods of determining the volume of nurslings. He describes his "water method," which he tested by immersing infant corpses and comparing the figures thus obtained with those found by measurements. The difference amounted to 7 per cent. He also tested the water method on living children, contrasting the "head method" with the "thorax method," according to how the child was held when immersed. From 37 determinations on 15 newborn infants he found the average specific gravity to be 0.992 and the specific equivalent weight to be 1.315. All these results, as well as those from tests on 13 children in the first year, are shown in the tables.

109 **Pearson, K.:** "Dilettantism and statistics." *Nature* [London], vol. 51 (1894), pp. 145–146.

A criticism of the methods of observers in handling statistics with especial reference to Porter's "Growth of St. Louis Children."

110 **Peiser, Julius:** "Über objektive Beurteilung des kindlichen Ernährungszustandes" [Objective judgment of the state of children's nutrition]. *Jahrb. f. Kinderh.* [Berlin], vol. 44–46 (1921), pp. 195–206.

The author discusses efforts to obtain an objective idea of the state of children's nourishment by pinching their cheeks and by calculating index of Quetelet, Livi, Rohrer, and others and considers in more detail determination of the fat pad by Oeder, Neumann and Batkin. This last method he himself employed in the autumn and winter of 1920 on the abdomens of 225 boys and 275 girls between 6 and 14 years of age from the poorer classes in Berlin. He found the Pirquet-positive children to number 66 per cent and the Pirquet-negative 34 per cent. His figures show extreme undernourishment. Neumann's figures from the same material in 1912 are much more favorable. Von Pirquet's index on the author's material would show an undernourishment of only 12 per cent. Besides the fat pad other considerations play a part—circulation, musculature, and turgor.

111 **Peiser, Julius:** "Zur Kenntnis der Körperproportionen des wachsenden Kindes" [On the knowledge of the body proportions of the growing child]. *Monatsschrift für Kinderheilkunde* [Leipzig], vol. 28 (1924), pp. 227–231.

The purpose of the study was to find out the variations in the proportions between various parts of the body during the period of growth. Thorough investigations of this subject have been very few, according to the author. Instead of measuring the length of the trunk from the jugular notch to the symphysis, the author obtained the sitting height and compared it with the total length of the body. He studied for this purpose 117 boys and 218 girls 6 to 14 years old, all of them properly developed and well built. He gives in a few tables, by sex and for each year of age, the average total height of the body, the difference between sitting height and half of the total height, and the maximum, average, and minimum index of sitting height. The index of sitting height equals $\frac{\text{absolute sitting height} \times 100}{\text{absolute total height of body}}$. This index in both sexes decreases between the ages of 6 and 13 years, and begins to increase slightly at the age of 14 years. He concludes that the index of the sitting height indicates the degree of the child's development and maturity.

112 **Pfaundler, M.:** "Körpervolum- und Körperdichtbestimmung am lebenden Säugling" [Determination of the body volume and of body density on a living infant]. *Ztschr. f. Kinderh.* [Berlin], vol. 3 (1911–12), pp. 413–427.

Discussion of a method of determining body volume and body density of the living infant. The study was made on four infants.

113 **von Pirquet, C. F.:** "Körpergewicht und Darmfläche. (System der Ernährung VII)" [Weight and intestinal surface]. *Ztschr. f. Kinderh.* [Berlin], vol. 15 (1916–17), pp. 213–224.

The relation that the absorptive surface of the intestine bears to the sitting height of an individual is calculated, and the system of nourishment based upon this relation is explained. Tables give weight, daily caloric requirements, intestinal surface, etc., for an infant, a 6-year-old child, and an adult.

114 ——— "Sitzhöhe und Körpergewicht" [Sitting height and body weight]. *Ztschr. f. Kinderh.* [Berlin], vol. 14 (1916), pp. 211–228.

The author had collected a mass of anthropometrical material since 1914 by having all the children in his clinic measured—the infants every two weeks, the older children every month—and by obtaining from other observers the measurements of newborn and stillborn infants and of men and women. He describes what he considers to be important measurements and his methods of taking them and gives many tables on standing height, sitting height, and weight at different ages. The author believes the sitting height to be the most important measure of the body; he found a constant relation between the cube of the sitting height and weight for all ages.

115 **Porter, W. Townsend:** "On the application to individual school children of the mean values derived from anthropological measurements by the generalizing method." *Publications of the American Statistical Association* [Boston], vol. 3 (1893), pp. 576–587.

A statistical discussion of anthropological measurements based on certain of the author's records from his study of St. Louis school children. The author concludes that the means derived from anthropometrical measurements by the generalizing method can be used to determine whether the physical dimensions of an individual are normal in relation to height; consequently, that the condition of health may be known and used to measure the school work which may be exacted.

116 ——— "The heels of Boston school children." *Bost. M. & S. J.*, vol. 188 (1923), p. 644.

A table showing the results of measuring the shoe heels of not less than 100 Boston public-school boys and girls at each age from 5 to 13, inclusive, to be used in correcting measurements of children wearing shoes.

117 **Retan, G. M.:** "The measure and development of nutrition in children." *Arch. Pediat.* [New York], vol. 37 (1920), pp. 32–39. See also *New York State Journal of Medicine*, vol. 19 (1919), pp. 397–400.

A study to arrive at a standard of measurement of nutrition. From various observations (number of cases and method of measurement not given) the author derives a chart showing zones of overnutrition, excellent nutrition, passable nutrition, and malnutrition, from which, height and weight of child being given, his state of nutrition may be determined. He discusses the relation of height to weight and finds it unnecessary to remove shoes for measurement by this standard; he also finds that factors of sex and nationality need not be considered. References.

Roberts, Lydia: What Is Malnutrition? *See* Children's Bureau.

118 **Robertson, T. Brailsford:** "Criteria of normality in the growth of children." *Medical Journal of Australia* [Sydney], vol. 1 (1922), pp. 570–576.

A discussion of the method of using standard curves of growth in determining the normality or subnormality of the individual, with mathematical demonstrations of degrees of variability which may be regarded as normal or suspicious. References.

119 ——— "Explanatory remarks concerning the normal rate of growth of an individual and its biochemical significance." *Biologisches Centralblatt* [Leipzig], vol. 30 (1910), pp. 316–320.

The author replies to criticisms, mostly mathematical in character, of his previous publications on normal rate of growth of an individual. Very little discussion of growth as such is included.

120 ——— "Tables for the computation of curves of autocatalysis with especial reference to curves of growth." *University of California Publications in Physiology* [Berkeley], vol. 4 (1915), pp. 211–228.

A discussion of mathematical formulas used in determining curves of growth.

121 **Rotch, T. M.:** "Röntgen-ray methods applied to the grading of early life." *American Physical Education Review* [Springfield], vol. 15 (1910), pp. 396–420.

The author illustrates with several plates the correspondence between the development of the brain and the ephiphyses, and argues that this correspondence may be used as an aid in grading human beings mentally and physically.

Rude, Anna E.: Physical Status of Preschool Children. *See* Children's Bureau.

122 **Sauer, L. W.:** "Clothing of infants in summer and winter." *Am. J. Dis. Child.* [Chicago], vol. 18 (1919), pp. 20–24.

The indoor clothing of 400 children (1 week to 2 years of age) was weighed (200 in summer and 200 in winter). The tables classify the children in three groups according to body weight. The percentage of weight of clothing to body weight is derived. The author's results are compared with those reported by Griffith.

123 **Sawyer, Margaret, Richard H. Stone, and Eugene F. DuBois:** "Further measurements of the surface area of adults and children." *Archives of Internal Medicine* [Chicago], vol. 17 (1916), pp. 855–862.

Continuation of previous work (*see* No. 39, this section), giving methods of securing surface measurement of living subjects and demonstrating the degree of accuracy of the "linear formula."

124 **Schick, B.:** "Das von Pirquetsche System der Ernährung" [von Pirquet's nutrition system]. *Ergebnisse der Inneren Medizin und Kinderheilkunde* [Berlin], vol. 16 (1919), pp. 384–420.

A detailed discussion explaining the terms used by von Pirquet and his method of estimating the state of a child's nutrition. The author gives his results in using this system of nutrition with 55 children.

125 **Schlesinger, Eugen:** "Die Indexmethode, insbesondere der Rohrersche Index als Mass zur Beurteilung der Entwicklung der Kinder" [The index method, especially the Rohrer index, as a measure to judge the development of children]. *Zeitschrift für Schulgesundheitspflege* [Leipzig], vol. 34–35 (1921–22), pp. 33–40. See also *Münchener Medizinische Wochenschrift*, vol. 67, pt. 2 (1920), pp. 1523–1524.

After commenting in general on the indexes of Livi (Rome, 1900), of von Pirquet (Vienna, 1916), and of Rohrer (Zurich, 1908) for physical development the author demonstrates how Rohrer's used by the Quakers in Germany may be misleading. The author himself examined the height, weight, and index of Frankfort schoolgirls from 7 to 14 years old in three social strata, 100 individuals in each for each year; the poorest girls attended a school in the center of the city, the middle class came from two public schools of a different neighborhood, and the best-situated class from private schools. He concludes that the Rohrer index $\left(\frac{100 \times \text{weight}}{\text{height}^3}\right)$ accentuates the growth at expense of nutrition state. For instance, the small, thin children most needing aid are not discovered by the index.

126 **Seaver, J. W.:** Anthropometry and Physical Examination. New Haven, Conn., 1896. 200 pp.

Directions for physical examinations designed for the use of teachers, with description of apparatus and record forms. Methods of examination, by inspection, palpation, auscultation, and percussion are described, and there is a chapter on the significance of certain physical signs. The appendix includes an anthropometric table arranged from measurements taken by the author, and

two charts, one as a sample for use in recording measurements and one showing average measurements from 1,500 college students, as compiled by Hitchcock.

127 **Shirokogoroff, S. M., and V. B. Appleton:** "Growth of Chinese." *China Medical Journal* [Shanghai], vol. 38 (1924), pp. 400–413.

A statistical analysis of measurements of 873 males and 266 females between the ages of 3 and 20. Methods of measurement are not recorded. Tables show the maximum, minimum, and average weight in pounds, stature in inches, and the relative weight average for age for both sexes, and from these the authors derive various formulas of growth.

128 **Shrubsall, Frank C.:** "Some notes on anthropometric measurements and their interpretation." *School Hygiene* [London], vol. 1 (1910), pp. 380–387.

The author discusses factors to be considered in interpreting anthropometrical measurements. He finds weight of clothing may amount to 5 per cent of body weight. The various types of formulas for estimating nutrition are discussed.

129 **Silvester, A. R.:** "Malnutrition among school children." *American Physical Education Review* [Springfield], vol. 25 (1920), pp. 157–161.

A description of the amount of malnutrition and overweight found among 4,500 children of various nationalities and ages in Montclair, N. J. The standard taken for judging malnutrition was the point next above 7 per cent of normal weight for height and age as given in the Wood scale. Twenty-eight per cent of the children were found to be malnourished, the condition being most prevalent among American stock.

130 **Simon, Gerhard:** "Untersuchungen an wehrpflichtigen jungen Badnern nach dem Pirquetschen Erfahren" [Investigations by Pirquet's method on the young men of Baden summoned to military service]. *Archiv für Soziale Hygiene* [Leipzig], vol. 7 (1911–12), pp. 138-190.

The author emphasizes the importance and usefulness of the Pirquet index. He considers at great length the physical condition of the 20-year-old military recruits of the Grand Duchy of Baden in 1911—9,980 in number out of 28,791, the total number of boys born in 1891. His numerous tables show index classes from A to E for these young men, arranged according to 33 administrative districts and 21 occupations.

131 **Simpson, J. V. A.:** "Nutrition." *Lancet* [London], vol. 1 (1925), pp. 472–474.

The Baldwin-Wood method applied to the records of 148 English children who had attended an open-air school failed to classify as malnourished about 30 per cent of those clinically designated as suffering from malnutrition.

132 **Smith, Harold W.:** "Rotch method of Roentgenographic age determination." *U. S. Naval Medical Bulletin* [Washington], vol. 7 (1913), pp. 1–20.

A report of an investigation to determine whether the Rotch method could be extended in age so that it might be used in examination of candidates for admission to the Naval Academy. An investigation involving the collection of a large number of Roentgenograms and statistics of height, weight and age, was conducted and reported on, but led to no establishment of standards. References.

133 **Stalnaker, E. M.:** "A comparison of certain mental and physical measurements of school children and college students." *Journal of Comparative Psychology* [Baltimore], vol. 3 (1923), pp. 181–239, 431–468.

The subjects of this study were 64 freshman college students, 135 pupils in a private school from the fifth grade up through high school, and 425 public-school pupils of the seventh, eighth, ninth, and tenth grades of the junior and senior high schools. Wood's and Dreyer's standards were used in assessing physical development. No demonstrable relation was found between physical development measured by height-weight ratio and mental development measured by certain accepted standards. The author suggests that this lack of correlation can not be said to be proved until the validity of both mental and physical standards is more fully established. The article includes a review of the literature of this subject with a lengthy bibliography.

134 **Stephani:** "Über Körpermessungen und einen neuen Körpermessapparat" [Body measurements and a new apparatus for taking them]. *Deutsche Med. Wchnschr.* [Leipzig], vol. 32 (1906), pp. 1789–1790.

An illustrated description of apparatus for measuring children in a sitting position.

135 **Stevenson, Paul H.:** "Anthropometry in China: An extended outline of research." *China Medical Journal* [Shanghai], vol. 40 (1926), pp. 95–127.

With a view to standardizing anthropometric work in China, the author presents an outline for research workers, describing the necessary anthropometric equipment, noting the anatomical landmarks to be used, and giving directions as to the methods of making body measurements. A table for con-

verting Chinese ages to their foreign equivalents, and directions as to the personnel and equipment required for a satisfactory investigation and as to the selection and grouping of subjects complete the article.

136 **Stevenson, Paul H., and Pan Ming-Tzu:** "On converting Chinese ages to their foreign equivalents: A conversion formula and table of subtractions." *China Medical Journal* [Shanghai], vol. 40 (1926), pp. 128–130.

The authors explain the difficulties in reducing Chinese statements of age to their English equivalents, and present a table of subtractions for standard use, explaining the method of its derivation.

137 **Tarenezky, A. I.:** "Nieskolko zamechanii po povodu antropologicheskikh izsliedovanii na zhivikh" [Some remarks on anthropological investigations of the living subject]. *Vrach* [St. Petersburg], vol. 10 (1889), pp. 985–986; 1011–1013.

A detailed description of a method recommended by the author for the anthropological study of the living human being.

138 **Terrien, Eugène:** "Procédé pratique permettant d'apprécier rapidement la croissance d'un jeune enfant" [Practical method of rapidly estimating a young child's growth]. *Médecin praticien* [Paris], vol. 1–2 (1905–6), pp. 13–15.

The author gives data on weight increases of the infant and on dentition, and suggests rules for remembering data on normal growth and for judging whether a child is up to standard.

139 **Tonina, Teodoro A.:** "Selección de los escolares debiles" [Diagnosis of physical inferiority among school children]. *La Semana Médica* [Buenos Aires], vol. 32 (1925), pt. 1, pp. 854–870; 1009–1022; 1111–1126; 1271–1286.

After a general discussion on the measurement of school children and the diagnosis of physical inferiority, the author, who is medical inspector of a school for physically unfit children in Buenos Aires, discusses in detail the methods of examining, weighing, and measuring the children. In several tables he gives the following data for 195 boys and 137 girls ranging in age from 6 to 13 years, pupils in this school: Height, weight, sitting height, chest circumference, cephalic index, vital capacity, degree of muscular power, and hemoglobin. All this is given by sex and for each year of age. A separate table gives the growth per year. There are quotations from several other writers on most of these data. Several chapters are devoted to a description of methods of examination of each part of the body.

140 **Tsurumi, M., and K. Nakatate:** "Critical studies of Pirquet's nourishment theory, and on our new method." *Japan Medical World* [Tokyo], vol. 4 (1924) pp. 87–89.

By a study of 1,926 persons, children and adults of both sexes, the authors devised a modification of the Pirquet index of nutrition which is applicable to the Japanese.

141 **Tuxford, A. W.:** "A measure of physical development in school children." *School Hygiene* [London], vol. 8 (1917), pp. 65–69.

In examining school children the author applied the formula

$$\frac{\text{weight in grams}}{\text{height in centimeters}} \times \frac{381 - \text{age in months}}{54}$$

for boys and a similar formula for girls, using a different constant. These formulas are empirical, but in the author's work they gave an average index of development from 990 to 1,010.

142 ——— "A nutritional index for school children." *Public Health* [London], vol. 27 (1913–14), pp. 377–378.

The author corrects a current height-weight index of nutrition,

$$\frac{100\sqrt[3]{\text{weight in kilograms}}}{\text{height in centimeters}},$$

to include an age factor. the resulting formula,

$$\frac{100\sqrt[3]{\text{weight in grams} \times (\text{age in years} + 1)}}{\text{height in meters} \times (\text{age in years} + 2)},$$

although superior in value to the original, still requires correction by a consideration of the average heights and weights of children in the section of the country where it is used.

143 **U. S. Public Health Service, U. S. Treasury Department:** Indices of Nutrition; application of certain standards of nutrition to 506 native white children without physical defects and with "good" or "excellent" nutrition, as judged from clinical evidence, by Taliaferro Clark, Edgar Sydenstricker, and Selwyn D. Collins. Reprint No. 842, Public Health Reports. Washington, 1923. 35 pp.

These children were tested by three standards of weight—those of Wood, Dreyer, and Pirquet. Although the best specimens of health that could be

found, one-fifth were underweight by the Wood standard. Many individuals classed as underweight by one standard were normal, or even overweight, by another. Data are given and statistical analysis.

144 **U. S. Public Health Service, U. S. Treasury Department:** The New Baldwin-Wood Weight-Height-Age Tables as an Index of Nutrition, by Taliaferro Clark, Edgar Sydenstricker, and Selwyn D. Collins. Reprint No. 907, Public Health Reports. Washington, 1924. 8 pp.

An extension of the authors' study (Reprint 842) testing the same group of children by the Baldwin-Wood tables published by the American Child Health Association in 1923. The percentage of underweight was less when determined by the Baldwin-Wood standard than by the Wood standard. Tables.

145 ——— Weight and Height as an Index of Nutrition, by Taliaferro Clark, Edgar Sydenstricker, and Selwyn D. Collins. Reprint No. 809, Public Health Reports. Washington, 1923. 22 pp.

Physical examinations were made of 9,973 school children, 6 to 16 years of age, inclusive, in South Carolina, Virginia, Maryland, Delaware, and New York State, the physician recording at the time of the examination his judgment of the child's nutrition as "excellent," "good," "fair," or "poor." Compared by single years of age, children grouped as "good or excellent" were consistently larger in mean weight, mean standing height, mean sitting height, and in the mean weight-height index than those grouped as "fair or poor." Individuals, however, in the "fair" or "poor" class weighed more than some individuals of corresponding age in the well-nourished classes; and analysis of the findings led to the conclusion that if average weight is used as an index of nutrition, the percentage deviation allowed for normal variation from the average should vary for different ages and sexes, rather than be the constant 7 or 10 per cent generally used in school health work.

146 **Variot, G.:** "Un pédiomètre pour mesurer le poids et la taille des enfants" [A pediometer to measure weights and stature of children]. *Bulletins de la Société de pédiatrie de Paris*, vol. 7 (1905), pp. 137–144.

A description of a combination apparatus for weighing and measuring children up to 5 years of age.

147 ——— **and Saint-Albin:** "La messuration de l'aire cutanée des jeunes enfants par l'enveloppement avec des feuilles d'étain" [Measuring the surface area of young children by covering with tinfoil]. *Bulletins de la Société de pédiatrie de Paris*, vol. 5 (1903), pp. 307–311.

A report of results obtained by the authors in measuring the surface area of two children by weight of sheets of tinfoil exactly covering the body surface.

148 **Viura y Carreras:** "El pesa-niños del doctor Sutils" [Dr. Sutils' scale for weighing children]. *Revista de ciencias medicas de Barcelona*, vol. 16 (1890), pp. 257–260.

Description of a scale for weighing infants invented by Dr. Sutils, of France.

149 **Vonessen:** "Der Ernährungszustand von Cölner Schulkindern; der Wert des Rohrerschen Index für die Beurteilung des Ernährungs- und Entwickelungszustandes der Kinder" [Nutrition of school children of Cologne; value of Rohrer's index for determination of nutrition and development of children]. *Öffentliche Gesundheitspflege* [Braunschweig], vol. 6 (1921), pp. 196–209.

The author gives the weights and heights (taken according to principles of Martin and Bachauer Lampart) of 340 boys and 315 girls from 6 to 14 years old in a public school of Cologne, attended principally by the lower middle class, and works over the material with the Rohrer formula $\frac{\text{weight} \times 100}{\text{height}^3}$. He examines individual cases carefully from every point of view and shows that in fact Rohrer's index gives an inadequate picture of nutrition and development. Also by comparing classes he demonstrates that Rohrer's index is not accurate. Pirquet's index he considers better. Bibliography.

150 **Wentzler, E.:** "Ein Apparat zur Messung des Schädelinnendruckes an der Fontanelle des Säuglings" [Apparatus for measuring inner pressure of skull at fontanel of infant]. *Arch. f. Kinderh.* [Stuttgart], vols. 69–70 (1921–22), pp. 241–245.

This apparatus is described and pictured. Manometric measurement in the sinus longitudinalis gives an average value of 16 millimeters mercury for rest and 21.5 millimeters mercury for crying in a lying position, and 7 millimeters mercury and 17 millimeters mercury, respectively, in sitting position. The various uses of the apparatus are discussed.

151 **Whipple, G. M.:** Manual of Mental and Physical Tests. Warwick & York, Baltimore. Vol. I, 1914, 365 pp. Vol. II, 1915, 336 pp.

A book of directions for the experimental study of school children in laboratory or classroom. The author explains the nature and purpose of mental tests; gives rules for the conduct of tests; explains the mathematical treatment of measures in construction of tables and graphs. He gives in detail

anthropometric tests; tests of physical, motor, and sensory capacity, of attention and perception, description and report, association, learning and memory, suggestibility, imagination and invention, and intellectual equipment. He quotes many tables from other observers and derives a few from his own observations of complex processes. Bibliography.

152 **Wightman, Grace S.:** "Yardsticks for measuring children." *Bulletin Chicago Municipal Tuberculosis Sanitorium*, vol. 3, no. 3 (1922), pp. 10–18.

The author condemns the system of determining malnutrition by height and weight alone and finds every other system in use cumbersome. She presents a sample of an anthropological chart and score card by which 6,000 children had been measured and 7,000 more were to be measured to arrive at a table of nutrition standards.

153 **Wilcke:** "Merktafel über Gewicht und Länge der Kinder" [Memorandum on weight and height of children]. *Zeitschrift für Medicinalbeamte* [Berlin], vol. 27 (1914), p. 175.

As aids in remembering normal weight and height of children in kilograms and centimeters, respectively, the author gives two tables. Weight of a given year equals number of year times 3 plus 8 minus number of year; and height equals 80 plus number of year times 5.

154 **Wilson, May G.:** "Report of the Cornell nutrition class." *Arch. Pediat.* [New York], vol. 36 (1919), pp. 37–44.

One hundred and forty-seven children 1 to 16 years of age were graded by the Dunfermline classification and by the Holt-Burk-Boas nutrition standards and the two classifications compared. The physicial defects found and the gains made are given in tables.

155 **Zoja, G.:** "Misure della forza muscolare dell'uomo" [Measures of the muscular force of the human being]. *Reale Istituto Lombardo di Scienze e Lettere, Rendiconti* [Milan], ser. 2, vol. 20 (1887), pp. 196–204.

Description of methods of measuring muscular strength and instruments used for that purpose.

156 ——— "Proposta di una classificazione delle stature del corpo umano" [Suggested classification of the height of the human body]. *Reale Istituto Lombardo di Scienze e Lettere, Rendiconti* [Milan], ser. 2, vol. 14 (1881), pp. 46–54.

The author complains of the lack of uniformity in the classification of the height of the human body as discussed by various writers. To overcome this difficulty, he recommends a new system of classification devised by himself.

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