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DEFECTIVE CHILDREN

EDITED BY
T. N. KELYNACK, M.D

Defective Children

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T. N. KELYNACK, M.D.

Member of the Royal College of Physicians of London; Fellow of the Royal Society of Medicine; Medical Adviser to the National Children's Home and Orphanage; Hon. Physician to Mount Vernon Hospital for Consumption and Diseases of the Chest; Metropolitan Examiner for the David Lewis Epileptic Colony; Member Hon. Medical Consulting Staff, National Association for the Feeble-minded; Hon. Physician to the Ragged School Union; Editor of "Medical Examination of Schools and Scholars," "Tuberculosis in Infancy and Childhood," "National Health Manuals," "Human Derelicts," "The British Journal of Tuberculosis," "The Tuberculosis Year Book and Sanatoria Annual," "The Year Book of Open-air Schools and Children's Sanatoria," "The Child," &c.

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To

SIR GEORGE NEWMAN,

M.D., F.R.S.E.

Chief Medical Officer of the Board of Education.

Organizer and First Medical Administrator of the School Medical Service for England and Wales.

First Edition Published, March, 1915.

PREFACE.

"A NATIONAL scheme of child-welfare—including medical inspection, medical care and treatment, and physical education—needs time for its development, and cannot rightly claim to be judged by any other result than the growth of a strong and healthy race of children. Such result must be, in fact, the aim of any nation which is provident of its future. For the existence and strength of a nation ultimately depend upon the survival of its children and their physical and mental health. This is the task which the Education Service of the country, aided by many thousands of workers, both voluntary and professional, has taken in hand."

These concluding words of Sir George Newman, in the introduction to his last Annual Report as Chief Medical Officer of the Board of Education, may well serve as justification for this volume.

The Education (Administrative Provisions) Act, 1907, instituted powers whereby a national system of medical inspection was provided for the children attending the Elementary Schools of this country. An effective School Medical Service has been organized. In England and Wales there are 317 areas for Elementary Education, each with a principal School Medical Officer. In 162 of these areas there are, in addition, 524 Assistant Medical Officers. The total number of School Medical Officers and Assistant Medical Officers, excluding specialists, is 841, and of these 93 are women doctors working in 54 different education areas. It is estimated that there are (including Higher Elementary Schools) 5,365,101 scholars in attendance, and in 1913 the total number of children medically inspected was approximately 1,830,000.

Systematic medical examination of school-going children has revealed an immense amount of physical defect. An approximate summary in percentage form gives the following: Defects of vision, 10; defects of hearing, 5; ear disease, 3; adenoids or enlarged tonsils, 3; injurious decay of the teeth, 50; uncleanliness of body, 10; ringworm of the head, 1; tuberculosis, 2; heart

disease, 1; and malnutrition, 10. The Chief Medical Officer is careful to point out that the percentage given respecting dental disease refers only to a condition which is injurious and more or less urgently calling for treatment, but that in those districts where dental disease is most fully investigated the return exceeds 90 per cent. Whilst the number of tuberculous children actually in attendance at school is estimated at less than 1 per cent., it is rightly pointed out that this does not include children suffering from incipient tubercle, or children excluded from school on account of advanced tuberculosis. "There can be little doubt that, taking the elementary school children as a whole, somewhere between 1 and 5 per cent. are suffering from tuberculosis of some form or another. Some authorities estimate a much higher incidence. The figure of 2 per cent. is quoted as a minimum figure." As medical inspection becomes more fully organized and more completely administered, defects and disorders of every kind will be detected at an early age in the life of the child, and at an earlier period in the course of many of the diseases. Meanwhile, in almost every area more derangements have been detected than can be adequately dealt with by the forces available for prophylaxis and treatment.

Shortly after the coming into force of the Education (Administrative Provisions) Act, 1907, a collection of studies relating to the organization and administration of a State School Medical Service was issued under the title of "Medical Examination of Schools and Scholars" (published in 1910 by Messrs. P. S. King and Son, Orchard House, Great Smith Street, Westminster, London, S.W., price 10s. 6d. net). That volume dealt mainly with methods of investigation, and was intended to assist the newly constituted body of school doctors commencing work in a practically unexplored region of medico-sociological work.

The present book, "Defective Children," is to be viewed and used as a sequel to "Medical Examination of Schools and Scholars." Its aim is to provide reliable and authoritative information regarding the chief classes of defective children requiring special medical supervision and educational care.

The nation is awake to the urgent necessity for securing the conservation of its children. Every form of defectiveness must be reduced to its minimum, and all varieties of preventible disorder must be dealt with by effective agencies, if we are to provide healthy citizens

for coming days. Sir George Newman has well expressed this growing conviction in his last report: "There is widespread evidence of the growth of the view that the sphere of an Education Authority should not be confined to the training of the intellect only, but should be extended to comprise *the fitting of the child in every respect for its purpose in life*, physical as well as mental. . . . Medical treatment, as it concerns Local Education Authorities, is, practically speaking, twofold: there is, first, the improvement of all school conditions reacting on the child; and there is, secondly, the cure or alleviation of certain well-defined personal ailments or maladies which tend to disable a child, prevent it from taking full advantage of the education provided for it, or one sufficiently widespread to constitute a menace to the physical welfare of the population."

This work has been prepared in order to provide in a succinct and practical form information regarding the various kinds of defectiveness met with in children of school-going age. It seeks also to afford helpful direction regarding prophylactic measures where such are likely to prove applicable, but its chief purpose is to assist in the establishment of ways and means whereby effective measures may be organized and administered for the rectification, arrest, or amelioration of all forms of defect. And even where permanent defect or the results of disease are irremediable, it endeavours to indicate how the maximum of benefit may be attained for the physical well-being and educational development of the defective child. The work is a collective contribution to the comparatively new field of medico-educational literature.

It may be wise to point out that it is not the aim of this work to deal with the diseases and disorders of infants and children from the standpoint of the ordinary medical text-book, but to provide all scientific workers for child welfare with a representative collection of studies of those problems awaiting solution which relate definitely to the care and control of defective children.

Each chapter of the volume is written by a recognized expert. Every writer has been allowed a free hand in the expression of his or her own opinions, and, of course, must be held responsible only for the chapter contributed.

It is quite impossible for me to express adequately the thanks due to each contributor and to all who in various ways have assisted in the preparation of this work. To

each and to all warmest thanks are due for their loyal co-operation and unbounded patience.

In the correction of proofs and in the preparation of the indices I have to acknowledge the assistance of my wife, Mrs. Violet Kelynack, M.B., Ch.B.

It is also a duty, as well as a pleasure, to testify to the ready co-operation of our publishers, who, amidst delays and many other unavoidable difficulties, have throughout exercised forbearance and afforded encouragement.

Many difficulties have arisen in the completion of the book. The outbreak of war has delayed its publication, and the continuance of the great conflict will, it is feared, limit its sphere of usefulness, at least for the present. It has, however, been thought that even in the midst of a campaign of unexampled severity and world-wide import this volume will contribute valuable assistance to those who are carrying on the heavy responsibilities and arduous duties of medico-educational work at home.

Considerable pains have been taken to make the work worthy the subject it seeks to serve. It is hoped that the chapters contributed by our *confrères* in Canada, America, and France, as well as those coming from Germany and Hungary, may be of interest and service. Needless to say, the communications relating to the two latter countries were written prior to the outbreak of war.

A special effort has been made to arrange for the provision of a helpful bibliography for each section. In order to make such of practical service to school doctors and other active workers, pains have been taken to make the references as representative as possible, and, in order to increase their utility, the names of publishers and prices have, wherever possible, been given. The Editor will be greatly obliged if he may be informed of any errors of omission or commission.

This book will probably be of most help to members of the School Medical Service, but it is addressed also to medical advisers of all educational and philanthropic institutions, as well as to such medical practitioners as have to advise parents and teachers or others in regard to the management of children, or who are called upon to undertake the treatment and supervision of defective children. It is believed also that the work will be of service to directors of education, school managers, superintendents of public and charitable institutions,

managers of philanthropic agencies devoted to the care of crippled and other necessitous children. The volume is commended to the serious study of all workers anxious for scientific guidance in the conduct of medico-educational work relating to all classes of defective children.

In conclusion it may be permissible to venture on the expression of a hope that School Medical Officers will be able to favour us with copies of their official reports. We shall also be glad to receive particulars of any new schemes or agencies regarding the medical treatment, hygienic management, education, and general care of defective children, in order that some account of the same may appear in the medico-educational journal, *The Child*, which is issued monthly by the publishers of this volume.

T. N. KELYNACK.

139, *Harley Street*,
London, W.
February 20, 1915.

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CONTRIBUTORS.

DEFECTIVE CHILDREN.

I

DEFECTIVE CHILDREN AND THE CO-RELATION OF THE PUBLIC SERVICES.

BY

E. W. HOPE, M.D., D.Sc.

Medical Officer of Health for the City and Port of Liverpool; Professor of Public Health in the University of Liverpool; President of the Association of Medical Officers of Health; Hon. Secretary, Royal Institute of Public Health; Author of "Manual of School Hygiene," &c.

THE medical inspection of school children, instituted with the complete concurrence of Parliament seven years ago, has revealed an amount of mental and physical suffering amongst children previously quite unsuspected, suffering in most cases remediable, in many preventable. The time has arrived when every local education authority, after the careful perusal of the periodical reports of its medical officer, is faced with the problem of dealing with the defects which inspection has brought to light. The term "Defective Children" as used in this work is a comprehensive one, and includes, on the one hand, those with mental or moral defects, and on the other those presenting physical defects. Many of these, as in the case of blindness, deafness, or tuberculosis in many of its manifestations, are serious enough to require teaching in a special school, while other defects of a less

serious character, such as defective vision, carious teeth, ringworm, or dirt conditions, still call for early recognition and proper care.

Principles guiding Co-relation.

The lines upon which action should proceed are two-fold: first, prevention, the basis upon which modern hygiene in its widest sense is founded, and, secondly, treatment and remedial measures when, despite all precautions, disease has been contracted. It may be mentioned in passing that the suggestion of the Minority Report of the Poor Law Commission, to make education authorities responsible for children from birth until they leave school, would make for efficiency by saving a great amount of unnecessary overlapping, and by making it possible to supervise more closely the health and treatment of these children.

Preventive Measures.

Though the hygienist may derive some assistance in his preventive measures from certain of the Sections of the Mental Deficiency Act, 1913, which deal with segregation, his main efforts must be concentrated upon infancy and the early years of childhood. The Notification of Births Act, which should be compulsorily adopted everywhere, will facilitate the early visitation of nursing mothers by health visitors, who by careful advice and useful leaflets will endeavour to secure a fair start in life for the infants. Use can be made in this direction of municipal milk depôts, both for necessitous mothers and for infants who are, unfortunately, deprived through unavoidable reasons of their natural food. Classes for mothers dealing with all matters relating to the home should be encouraged or organized, and parental ignorance or indifference, the cause of much unnecessary child suffering, combated. The various organizations dealing with this matter should be linked up with the medical officer of health—and with the school medical officer, too, where these posts are not held by the same officer—and these officers should be *ex-officio* members of the committees of these organizations.

The question of proper housing accommodation vitally affects the young child, and is one which is perhaps only less important than the necessity of suitable and sufficient nourishment. The principles of domestic economy are very insufficiently understood or utilized in this country, and even children whose parents can well afford good food are having their health undermined by injudicious dieting, whilst the food of the children of the poor is frequently hopelessly inadequate, and often injurious also. The rapid improvement in certain forms of ill-health which frequently results when the children are placed in better surroundings bears this out. For instance, children suffering from certain types of phlyctenular conjunctivitis with photophobia are sometimes cured in two or three days by a stay in a hospital, where they receive good food and are in clean surroundings, whereas the condition becomes chronic and often leads to corneal ulceration, with subsequent serious impairment of eyesight, when ineffectively treated at home.

If the child of school age is found to be underfed, the local education authority has now power to feed it, but its younger brothers and sisters may be, and commonly are, in just as bad a condition; the Poor Law is in most places the only organization which can assist, and it has not got the available machinery to ensure proper attention to the child, whilst parental indifference is sometimes so great that, sooner than take the necessary steps to obtain assistance, the parents will keep the family on short commons. Close co-operation should exist between the committee dealing with the feeding of school children and the Poor Law Guardians for a frequent interchange of names and views in order to prevent overlapping, and to bring to light such cases as should be dealt with either by one body or the other.

Amongst organizations doing excellent work in connection with the prevention of suffering and disease may be mentioned the Societies for the Prevention of Cruelty to Children, Invalid Children's Aid Associations, the various homes for waifs and strays and for orphans, summer and holiday camps, as well as central relief and charity organization societies. Opportunities

for referring suitable cases to these bodies frequently occur to the medical officer of health and school medical officer.

The Children Act of 1908, with its most valuable Section 12 relating to neglect of all kinds, has proved itself to be a valuable adjunct when put into operation on the failure of other measures, and its existence has stimulated the sense of duty of many a negligent parent.

For the later years of childhood, by-laws under the Employment of Children Act, 1903, should be made obligatory on authorities, and the pernicious half-time system abolished without delay.

The provisions of the Mental Deficiency Act, 1913, and regulations thereunder make it compulsory for each education authority to take steps to ascertain what children are mentally defective, and which of these children are incapable of receiving benefit by instruction in special schools.

In the Elementary Education (Defective and Epileptic Children) Bill, which was not successful in passing into law in 1913, and which is again being considered by Parliament, it is proposed to make it obligatory for education authorities to provide special schools for those defectives who are educable, and this is a very necessary provision, owing to the large number of education authorities who have taken no steps to provide for these poor children. Measures require to be adopted with regard to epileptic children for whom very few authorities have made any provision. For these children, and for the ineducable mentally defectives, farm colonies seem to be necessary.

Certain useful preventive measures lie within the power of education authorities, as, for example, the teaching of hygiene and domestic science, theoretical and practical, to the elder scholars, and the ensuring of suitable hygienic arrangements in the school curriculum and of the school premises. The prevention of infectious disease is also a most important problem in which health and education authorities both are vitally interested, not only on account of the diseases themselves, but because of their numerous sequelæ. In this

connection the education of the teachers in the early detection of the common diseases is of prime importance, and, seeing how much depends upon the alertness of the teacher, this should never be left as in the past to lay instructors.

Where there are underfed children the Education (Provision of Meals) Act should be put into force, and the Poor Law Guardians should co-operate with the Education Committee in seeing that children whose parents are in receipt of Poor Law relief get the meals provided under the Act. The diet provided requires, however, to be carefully supervised. The Education (Administrative Provisions) Bill, now before Parliament, granting power to feed necessitous school children during school holidays will, if passed, meet a need felt in some districts. Whilst the medical officer cannot, in many cases, tell by the physical condition of the child whether or not the child has been underfed, yet there are many instances in which he can say that the child would benefit by having the meals, and he should be in a position to order these meals to be given where necessary, a power which is permitted him in the above-mentioned Bill.

The Application of Curative Measures.

Passing to curative measures, the matter may be considered under two heads: (1) Arrangements for bringing the defective child into relation with the necessary treatment. (2) Treatment proper. In the case of the former, so far as the school child is concerned, the first step is to inform the parent of the defect, and to urge treatment by means of printed notices delivered at or posted to the home, or by word of mouth if the parent is present at the inspection. This has frequently been found to be insufficient without a visit being paid to the parent, and the seriousness of neglecting to attend to the conditions explained. This may be carried out by the school nurse, by official health visitors, or by the school attendance officers, and where financial considerations permit these methods have worked satisfactorily. Where these duties do not devolve upon

officials, the alternatives are the formation of care committees or the utilization of voluntary visitors belonging to other organizations, such as the Charity Organization and Central Relief Society, who can pay friendly, quite unofficial, visits and use their persuasive powers. These visitors require to work in close co-operation with the department of the medical officer, and require some preliminary training and instruction in the common ailments of childhood, and considerable knowledge of the local institutions where treatment can be supplied. Properly organized, these care committees or voluntary workers can be a very useful addition to the central authority dealing with the children. It is desirable, however, that the number of different organizations paying domiciliary visits in any particular district should not, as is sometimes the case in cities, be too numerous, each visiting a home for a different purpose, as parents are apt, very naturally, to resent being interviewed by a number of different persons.

Voluntary work has done, and is doing, valuable service to society. Much of the progress that has been made in the past has been initiated by private enterprise, and where there are voluntary helpers willing to be utilized every effort should be made to secure their co-operation.

Care committees have been organized in London on a large scale with success, and in Liverpool a scheme has been initiated by which the friendly visitors of the Charity Organization and Central Relief Society follow up the cases where defects have remained untreated.

In many districts the endeavour should be made to enlist the services of the school managers in this direction. When by one means or another the parents have come to realize their responsibility toward their children the question of treatment proper has to be considered. In large towns there are usually several institutions where the children of poor parents can be treated, but there is often a waste of force owing to want of co-operation, if not actually a spirit of competition, between these organizations. In the country districts organizations are few or non-existent, and the problem

more difficult, the nearest institution being sometimes quite a long distance away. Possibly here a travelling clinic organized by the local authority offers a likely solution.

In towns there are some or all of the following organizations: General and special hospitals, and dispensaries, where ordinary or special diseases can be attended to; societies which, like the Invalid Children's Aid Association, help children to obtain necessary surgical apparatus; agencies which will provide spectacles for poor children; a district nursing association, which will render nursing assistance to children requiring it; associations for the supply of clothing or clogs; convalescent homes; summer camps; privately supported sanatoria; voluntary school clinics; voluntary institutions for the blind, deaf or cripple children; epileptic colonies; voluntary societies providing meals for poor children; and perhaps other associations, all supported by voluntary contributions, carrying on good work for the treatment of defective children. Most of these work quite independently of one another, and, owing to the absence of linking up, the best use cannot always be made of them by officials and others who come into contact with the defective child. A central society, linking up these various voluntary organizations and having a certain amount of control, as is to some extent the case of the Hospital Saturday Fund in London, is needed also in the provinces.

An important difficulty in connection with the treatment of children at a voluntary institution is the non-control of their attendance, so that it is difficult to make note of their progress and to ascertain whether they are carrying out the prescribed treatment. As will be pointed out later, this difficulty is solved by the school clinic.

As in the case of the preventive measures, the medical officer of health and school medical officer must be officially connected, and the education authority in touch with these different organizations; when desirable the education authority should consider the question of a rate-aided subsidy.

Section 13 of the Education (Administrative Provisions) Act, 1907, in referring to treatment by local education authorities, states that "in any exercise of powers under this section the local education authority may encourage and assist the establishment or continuance of voluntary agencies and associate with itself representatives of voluntary associations for the purpose."

It must be recognized that, according to the regulations in force at present, the education authority can only be considered responsible for such defective children as can, during the period of treatment, receive education in an ordinary or special school, and that when the nature of a child's illness results in its treatment under conditions which make it difficult for it to receive education, the authority has no power to render assistance.

In certain districts school clinics have been started by voluntary enterprise and have done excellent pioneer work; in some instances the object lesson has been so marked as to result in the enterprise being taken over by the local authority. Amongst others may be mentioned the Deptford School Clinic and the Cambridge Dental Clinic, the latter having been now taken over by the municipality.

Absence from school for remediable ailments is extremely common, and leads to a heavy loss in Government grant and to a set-back to the education of the children. Under these circumstances it is desirable that local authorities should themselves initiate schemes of treatment where there are not well-administered organizations which can cope with the work.

Treatment at local voluntary institutions has led to the overcrowding of these institutions and the overworking of the honorary staffs to the detriment of the ordinary patients, so that at least in towns of any size the school clinic has become a practical necessity if the children are to have their ailments attended to at all. The principles governing such schemes for treatment have been clearly laid down in Circulars 596 and 792 of the Board of Education and in the Annual Reports of the Board's Chief Medical Officer. One great advan-

tage attaching to the school clinic is the fact that by means of the School Attendance Department one can ensure the regular attendance of the patients and constant attention to treatment.

A very considerable number of defective children come from a class for the treatment of which the Poor Law authority is really responsible, and it is unfair to saddle the education rate or the voluntary institutions with the cost of the treatment of these children. There is no reason, however, why, where the Poor Law authority has not the facilities for dealing with the special needs of these children, grants should not be made by that authority to the local education authority or the voluntary institutions treating them, and suitable representations to the Boards of Guardians to that effect, backed up if necessary by an appeal to the Local Government Board, which has given a ruling on this point, will usually result in some fairly satisfactory *modus vivendi* being found.

For serious physically defective children special schools are necessary, as these children cannot be exposed to the rough-and-tumble of the ordinary schools. Where tuberculosis exists or various forms of debility, open-air day or residential schools should be provided by the local education authority, and the children kept if necessary to the age of 16. Separate provision is required for the blind, the partially blind, and the deaf.

For such of the mentally defectives as are educable special schools are also required, and for the ineducable farm colonies seem to be necessary, as also is the case with the epileptics. In these cases, too, the Poor Law authorities should co-operate with the local education authorities, and after-care committees are required to follow the course of the children after leaving school.

The Insurance Act will, so far as the children are concerned, render valuable assistance in the sanatorium treatment of tuberculosis, whilst for children dependent upon insured persons domiciliary treatment will also be available. Large grants from the Board of Education are now available for open-air schools for day or residential scholars for the treatment of tuberculous

conditions, and for conditions which may predispose the system to tuberculous infection. In this connection certain voluntary associations have erected and equipped country hospitals, and by arrangement education authorities can make use of beds in these institutions.

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The Medical Adviser should also consult the original Parliamentary Acts relating to child life and its protection, the Annual Reports of Sir George Newman as Chief Medical Officer to the Board of Education, the Annual Reports of school medical officers in different parts of the country, and the Records and Reports of various associations and institutions dealing with child welfare.

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II

THE MENTALLY DEFECTIVE CHILD.

BY

HAMILTON C. MARR, M.D., F.R.F.P.S.GLAS.

H.M. Commissioner of Control for Scotland; formerly Medical Superintendent of Glasgow District Asylum, Woodilee, Lenzie.

UNTIL 1899, when the Defective and Epileptic Children (Education) Act[1] became law, no special provision existed for the education and care of a relatively large class of children who were neither idiotic nor imbecile, and yet of such marked mental deficiency as to designate them "feeble-minded."

GENERAL CONSIDERATIONS.

The Defective and Epileptic Children (Education) Act empowered education authorities to establish special classes and schools for the feeble-minded, and compel attendance of the children until they had reached the age of 16 years instead of 14 years, as is required of ordinary children. The children thus affected were defined in the Act as those who, "not being merely dull and backward, are defective—that is to say, by reason of mental and physical defect are incapable of receiving proper benefit from the instruction in the ordinary public elementary schools, but are not incapable by reason of such defect of receiving benefit from instruction in such special classes and schools as are in this Act mentioned." Similar provision for the education and care of the feeble-minded and epileptic

[1] Elementary Education (Defective and Epileptic Children) Act, 1899.

children who, not being idiots or imbeciles, are unfit by reason of severe epilepsy to attend the ordinary schools, was introduced into Scotland in 1906. No suitable provision has as yet been extended to the same class in Ireland. In no division of the Kingdom are parents compelled to send their children to special classes or schools; further, school boards are instructed by the several Acts to establish the requisite facilities for the special education required only if they see fit. Feeble-minded children receive adequate attention until the age of 16 years, in large and progressive centres only, where the question of cost is not felt. Thus special classes and schools have been in operation in London and large provincial towns; elsewhere such education as the feeble-minded may receive is given them in the classes of the elementary schools or in their homes. The advantage conferred by these Acts is to a large extent minimized by their non-compulsory nature and by the age limit of 16 years, as at that age children are entering on the threshold of manhood and womanhood, a period of life which requires special attention and guidance. In childhood there is a natural disposition, if the subjects are capable of exercising it, to self-protection. The onset of puberty brings with it new conditions of mind which make the feeble-minded particularly disposed to rebel against all authority—parental or otherwise. The guidance of ordinarily mentally endowed young people at the age of puberty is one that exercises the thoughtful attention and care of their guardians, and such attention and care is much more required where self-control is markedly lacking, as it is in so many of the mentally defective. The trend of legislation, however, is entirely in the proper direction. The medical inspection of school children undertaken in pursuance of Section 13 of the Education (Administrative Provisions) Act, 1907, will in time lead to correct information regarding the numbers and exact position of feeble-minded children, and in conjunction with the extensive adoption of the recommendations of the Royal Commission on the Care and Control of the Feeble-minded, in the Mental Deficiency Acts of 1913, will go far to remedy the defects referred to. The

Mental Deficiency Acts apply to England and Wales, and to Scotland. The Act for England and Wales is entitled "Mental Deficiency Act, 1913," while that for Scotland is "The Mental Deficiency and Lunacy (Scotland) Act." Both Acts proceed on similar lines; one is adapted to meet the requirements of English law, the other to meet Scottish law. General Boards of Control have been established which have absorbed the Boards of Lunacy and their functions. The local authorities are those which formerly had the local supervision and care of the insane, with the addition of the local education authorities, acting under regulations made by the Board of Education. This addition is of far-reaching importance, and ensures to the defective adequate opportunities of education, where such education can be effective, and in all cases continuous care and supervision from the age of 7 until the age of 16. When in the opinion of the Board of Education a defective cannot with advantage be educated in special schools or classes, the facts are notified to the local authorities under the Mental Deficiency Acts (*i.e.*, the County Councils, Borough Councils, Boards of Guardians of a Poor Law Union, and in Scotland Parish Councils), so that whichever local authority in whose district the defective is resident, or found, or the local authority to which the defective is chargeable, may take action by placing the defective in an institution or under guardianship. The classes of defectives are idiots, imbeciles, feeble-minded persons, and moral imbeciles. Each of these several classes is defined in the Acts. Thus the definition of the feeble-minded is as follows:—

"Persons in whose case there exists from birth or from an early age mental defectiveness not amounting to imbecility, yet so pronounced that they require care, supervision, and control for their own protection or for the protection of others, or, in the case of children, that they by reason of such defectiveness appear to be permanently incapable of receiving proper benefit from the instruction in ordinary schools."

Defectives may be dealt with under the Acts by being sent to or placed in an institution for defectives or under guardianship:—

(*a*) At the instance of his parent or guardian, if he is an idiot or imbecile, or at the instance of his parent if, though not an idiot or imbecile, he is under the age of 21; or

(*b*) if in addition to being a defective he is a person—

(i) who is found neglected, abandoned, or without visible means of support, or cruelly treated; or

(ii) who is found guilty of any criminal offence, or who is ordered or found liable to be ordered to be sent to a certified industrial school;

(iii) who is undergoing imprisonment (except imprisonment under civil process), or penal servitude, or is undergoing detention in a place of detention by order of a court, or in a reformatory or industrial school, or in an inebriate reformatory, or who is detained in an institution for lunatics or a criminal lunatic asylum; or

(iv) who is an habitual drunkard within the meaning of the Inebriates Acts, 1879 to 1900; or

(v) in whose case such notice has been given by the local education authority as is hereinafter in this section mentioned; or

(vi) who is in receipt of poor relief at the time of giving birth to an illegitimate child or when pregnant of such child.

When a defective is sent to an institution or placed under guardianship, certificates on a prescribed form must be signed by two duly qualified medical practitioners. A distinction is drawn between the modes of dealing with defectives at the instance of parent or guardian and those to be dealt with otherwise. In the former case the procedure is simpler, and judicial authority is only required when the defective is not an idiot or imbecile; in the latter instance judicial authority or the order of the Secretary of State is necessary.

Elaborate regulations for the guidance of all authorities and persons interested or wishing to inform themselves about the Acts have been issued by the Home Secretaries, the Boards of Control, and the Board of Education, and the necessary forms for the admission of defectives to the institutions or to be placed under guardianship may be obtained from the Boards of Control in London and Edinburgh.

Statistical Estimates.

The number[2] of feeble-minded children is variously estimated from a minimum of ·24 to a maximum of 1·25 per cent. of all children attending elementary schools. These percentages do not take into account many children who, on account of their mental defect, are cared for and educated at home. Again, many whose defect is of a slight or unintellectual nature are not recognized until of an age when education and training is difficult of attainment. Pronounced feeble-mindedness is easily recognized, but there are many cases which require specially trained medical observation, such as in time will be given by the medical inspection already referred to, but which has not hitherto, except in special circumstances, been available; the percentages thus given may therefore be regarded as a minimum. Explanation of the extreme variability of the statistics is difficult. While to some extent it is probably due to the different points of view of the several observers as regards feeble-mindedness, it is probably more the result of certain social conditions which have proved of importance in explaining the distribution of insanity. The important relationship of the feeble-minded to the insane will be pointed out later on. Meantime, it may be noted that the number of the feeble-minded increases *pari passu* with the amount of insanity in the community. Feeble-mindedness is more prevalent in country districts than it is in large cities, where its greater prevalence might naturally be expected. The explanation of this apparent paradox is due to the fact that young people of both sexes, who represent the mental and physical strength of the country districts, are attracted by the better pecuniary conditions offered in the great cities; and so mingle their healthy blood with the corrupted stream of city life. This tends, on the one hand, to reduce the percentage of the insane and mentally defective in the cities. On the other hand, the feeble, old, mentally weak and infirm remain in the country

[2] Report of the Royal Commission on the Care and Control of the Feeble-minded, vol. viii, 1908.

districts, and the percentage of insanity and weak-mindedness in these districts is a comparatively large one.

Definitions.

The definition of feeble-mindedness is, like all others that have been attempted in relation to insanity, unsatisfactory. Objections might be urged against it, which are, that it draws an arbitrary and unnatural distinction between the imbecile and feeble-minded on the one hand, and on the other excludes moral imbeciles, epileptics, inebriates, and those labouring under deprivation of one or more of the senses, in all of whom feeble-mindedness is common. Further—and to emphasize the practical difficulty of the definition and the preconceived ideas of the feeble-minded it may lead to—it is generally believed that in practice a distinction can be drawn between children who are capable of education and those who are not. Such is not the case, and the physician or teacher who begins with the preconceived idea that there is an ineducable class will speedily be undeceived. One has only to read of or see the effects of teaching by such a system as the Montessori method[3] to change one's opinions. No child on account of mental defect alone is in the common sense of the term ineducable. It is true that many of these children derive little benefit from education, but this is entirely due to physical defects, such as gross paralyses and not to mental conditions. The definition already quoted will have served a useful purpose if it draws attention to the fact that many defective children are susceptible to such a high degree of education as to be capable of earning their own living, or at least of working for themselves in such a way so as not to be a serious burden to the community. The guidance of an adequate definition, while it would be extremely advantageous if such could be got, is not necessary. "No man can draw a stroke between the confines of day and night, yet on the whole darkness and light are tolerably distinguishable." On the whole feeble-mindedness is tolerably distinguishable

[3] Fisher, D. C. : "A Montessori Mother." London : Constable and Co., Ltd. 1913.

from imbecility on the one hand, and insanity on the other, and the cases which fill the vague borderland between the several forms are relatively few.

Causation.

Although mental enfeeblement can rarely be attributed to one cause alone, the principal underlying cause is hereditary transmission, which becomes more progressively accentuated in the descendants, and ultimately leads to sterility. The inheritance is chiefly insane, but ancestral drunkenness is of very great importance. Excluding forms associated with epilepsy, evidence of inherited defect was present in 624 children under 16 years of age out of 752 examined, or nearly 83 per cent. In 47 per cent. of the number a history of insanity which necessitated care and detention in an asylum was noted. In the cases of children where no such history was obtained there was frequently found a history of ancestral drunkenness, or of varied nervous disease, such as neurasthenia, hysteria, epilepsy, chorea, tubercle, scrofula, rheumatism, and in three instances there was consanguinity of parents. The numerous stigmata of degeneration also found pointed not only to congenital defect in the children, but to a probable history of ancestral neuroses. Ancestral drunkenness is, in the mind of the writer, specially potent in promoting feeble-mindedness. Dr. Bevan Lewis,[4] in discussing the relationships of inebriety, pauperism, and insanity, is of opinion that the maximum incidence of inebriety coincides with that of crime, epilepsy, and what may be considered as the convulsive mental affections commonly found in the feeble-minded. The effect of alcohol in inducing mental deficiency amounting to feeble-mindedness is not to be wondered at. If the physiological amount of alcohol which can be chemically changed in the body is exceeded, as it so frequently is, alcohol as such passes into the system. The destructive influence that alcohol has on the liver,

[4] Lewis, Bevan: "Alcohol, Crime and Insanity." *Journal of Mental Science*, 1906.

kidneys, and nerve cells cannot wholly pass over the sperm and germ cells which originate the future offspring. The elaborate experiments of Féré,[5] referred to in another chapter, emphasize this statement. Dr. Clarke, of H.M. Prison, Wakefield,[6] has investigated cases of epileptic and feeble-minded criminals, and has found that in 85 per cent. a history of alcoholic excess in the ancestors is present. In the epileptic feeble-minded examined by the writer 65 per cent. have an alcoholic parentage. While the developing mind has its own natural tendencies due mainly to heredity, and these tendencies largely determine its ultimate form, the influence of surroundings cannot be ignored. All the nerve cells are in existence about three months after birth, and although they are incapable, according to our present knowledge, of increasing in number, they increase largely in bulk. Vierordt has shown that the male brain increases from 381 grm. at birth to 945 grm. at the end of the first year, and by the end of the seventh year the brain is only 140 grm. less than the average maximum weight, viz., 1,488 grm. The increase of the brain during the first seven years of life is four times greater than the final increase that takes place subsequently. These facts reveal the importance of healthy environment during the early years of life, not only for normal children, but especially for the feeble-minded, whose nerve cells, already unstable or defective, are more prone to injury as the result of defective nutrition and unhealthy environment. Many delicate children are rendered feeble-minded by such moral influences as fear, shock, or trauma, although it is well to bear in mind that the influence of traumatic causes tends to be overestimated, as parents are rarely desirous of attributing mental affections to heredity, and, without intention of leading one astray, ascribe the feeble-minded condition of their offspring to an injury which has often very little foundation on fact. Of special importance in causing feeble-minded conditions are the effects of injurious processes, especially when these cause deprivation of

[5] FÉRÉ, CH. : " La Famille Neuropathique," p. 21, 1894.

[6] *Loc. cit.* (4).

one or more of the special senses—blindness, deaf-mutism, &c. Feeble-mindedness is also frequently associated with rickets, scrofula, congenital syphilis, paralysis, and epilepsy. In any attempted classification the important work of Tanzi[7] cannot be overlooked. This observer divided infantile mental conditions into two classes: idiocy and intellectual feeble-mindedness. The former is acquired, it may be, in the earlier stages of existence, and is the result of pathological processes that lead to more or less general inflammatory conditions of the nervous system and consequent destruction of tissue and arrest of development. These conditions manifest themselves clinically in characteristic irregularities of movement, nutrition, sensibility, and intelligence, which are not, however, always serious or numerous, and may be even so slight and localized as to leave a large number of persons with pathological brain defect (cerebro-pathics) a greater degree of intelligence than is presented by some intellectually feeble-minded, and even perfect integrity of mind. Intellectual feebleness, on the other hand, is congenital, and does not present traces of pathological brain disease, present or past. The absence of pathological brain conditions is thus the distinguishing feature of feeble-minded conditions, compared with those of idiocy. The advantages of the classification referred to aid an observer in distinguishing the feeble-minded generally; and subsequent diagnosis must be based on individual characteristics. The lines on which such an examination should proceed are based on objective observation, and the result to be obtained by means of reaction time and other instruments. In general the feeble-minded, when in suitable care, may be described as in fairly robust health, and where there are evident signs of ill-health some disorder or disease of a physical kind is present. When neglected they are more prone to the attacks of disease than their normal fellows. Special care must therefore be exercised in determining the exact state of their bodily health.

[7] TANZI, E.: "Mental Diseases." 1909.

Symptomatology and Diagnosis.

The differentiation of feeble-mindedness does not rest on any single symptom. In each case there is a series of symptoms with generally a marked individuality which prevents elaborate classification. The general circulation is languid, and, especially when the patient is not kept actively engaged, lividity or bloodlessness of the extremities is common, and in cold weather chilblains are apt to develop. The skin is often rough and dry, and is subject to eruptions; acne is specially common. The nails are hard and brittle, and the absence of hair in adult life gives a feminine appearance to the male, and its presence—the phenomena of masculinism—is found in the female. Senile changes also present themselves early, and are seldom delayed beyond middle life. More frequently than in any other of the mentally affected classes are those anatomical or physiological deviations from the normal known as "stigmata of degeneration" met with. In themselves these stigmata are of little importance as regards the vitality of the organism, but are characteristic of a marked or latent neuropathic disposition.

Stigmata of degeneration are broadly divided into three classes: Anatomical, physiological, and mental. Anatomical stigmata are easily recognized, and consist mainly of irregularities in the shape and size of the cranium, facial asymmetry, deformities of the hard palate, defective teeth, ocular defects, such as squint, narrow palpebral fissures, micropthalmia, anomalies in the disposition, size and shape of the ears, and defects and irregularities in the several parts of the external ear. Many bodily conditions affect mental efficiency, and when uncorrected may cause a pseudo-feeble-minded state. These stigmata of degeneration may exist apart from mental affection, but are more often to be found associated with these conditions.

Physiological stigmata are more difficult of recognition. Thus the persistent vomiting ushering in a hysterical paroxysm in an epileptic, feeble-minded girl has led to the operation of gastro-enterotomy being performed for the relief of an intestinal condition which did not exist. Vomiting and intestinal conditions of

several kinds are not infrequently, as in this case, associated with the onset of a hysterical attack in the feeble-minded. Functional stigmata in connection with the sensory and motor organs are not uncommon, *e.g.*, anæsthesia, hyperæsthesia, deaf-mutism, tics, or convulsive movements, tremor, epilepsy, stuttering, and defective speech. The mental stigmata are more conveniently discussed in the general application of the several clinical manifestations found in the feeble-minded, but it must be borne in mind that moral tics, such as the varieties of phobias, fears of shut places, of fire, animals, &c., are as important in arriving at a diagnosis as a markedly defective palate.

An examination of the nervous system and special sense organs, for the reasons already mentioned, must not be lacking in an effort to ascertain any motor and sensory defects which are capable of restoring the child to health, and allowing him or her to have the benefits of education. Motor and sensory defects in the feeble-minded cannot be thus remedied, and, as will appear in the sequel, such children have to be segregated and specially dealt with.

In the investigation of mental phenomena the observer must be constantly on the watch not to assume that the mental processes in the child are identical with those in himself. An adult cannot accurately recall the processes which his mind went through in childhood, and, as much depends on the study of actions and looks, those of children are difficult to interpret. The difficulty is increased by the fact that every child has his or her own idiosyncrasies. Much help can be derived from the teacher in whose care the child has been placed, or from information given by the parents. It has long been the ambition of observers to be able to investigate mental conditions by physical means,[8] in the same way

[8] The physical means referred to originated in certain investigations by E. H. Weber. The results of these investigations have been elaborated and formulated by G. T. Fechner ("Elemente der Psycho-physik," 1860), and are based on what is known as Weber's Law. "There will be the same sensible difference of intensity between two sensations, provided the relative intensities of the stimuli producing them remain the

as bodily conditions are ascertained by means of a stethoscope, an ophthalmoscope, or a microscope. Efforts in this direction have resulted in what are known as psycho-physical methods. The benefit derived from these methods is at present highly problematical. De Sanctos has made numerous experiments on children with reaction time instruments. He has come to the conclusion that the only favourable apparatus for this purpose is Greisbach's æsthesiometer. The essence of Greisbach's method is that the greater or lesser constancy of the degree of acuteness of tactile perception in a series of experiments is a measure of the greater or lesser capacity of concentrating attention. The oscillations of the acuteness under the influence of destroying stimuli acting on the various senses is an inverse measure of tenacity of attention. The power of attention of the feeble-minded is very weak. From the bright and pleasant manner in which many of these children listen to an interesting story or description, this may at first sight appear not to be the case, but subsequent questioning on the subject to which the feeble-minded child has been listening will easily prove the truth of the statement. In school this inattention becomes more marked. Learning is acquired with difficulty, and what has been learnt is soon lost. If a feeble-minded child is not separated from other school children, he loses his usual brightness and playfulness and becomes listless. Healthy children soon recognize mental weakness in their school companions, and subject them to ill-treatment, which causes them to become irritable, bad-tempered, and mischievous. In a few cases unusual ability in certain directions is not uncommon. The writer has had under his care artists of unusual merit, and some whose memory may be described as exceptionally good. Lightning calculators also come under this category. Details of these have

same." Since Weber's day the science which deals with this subject, psycho-physics, has been much extended. Its present position and importance may be grasped by a study of such a work as "Experimental Psychology," by C. S. Myers, 1909. See also "Nervous and Mental Diseases," by A. Church and F. Petersen, p. 691 New York, 1904.

been recorded (see Chambers's "Book of Days," vol ii, pp. 19, 20), and one of them who is not feeble-minded gives his mental experiences, from which it is evident that memory has less to do with this power than is generally supposed; the processes are actually worked out seriatim, but with a rapidity inconceivable. The mental faculties in the feeble-minded reveal defects in other directions. They are not able to arrange any knowledge they have, nor can they apply it well, nor use it to make any advance, either in theory or in practice.

It is in the ordinary schools that the fears of feeble-minded children may become highly developed—fears of animals, of spiders, of being alone, &c., and this servitude to dominant ideas may lead to graver mental derangement. Night terrors, convulsive movements of individual muscles are common, although not so constant or tumultuous as those of idiocy. Many of the feeble-minded show marked moral stigma, such as lying, stealing, swearing, &c. One boy, aged 9, who came under the writer's observation, used such blasphemous and shocking words that for fully six months he had to be separated from the other children, who were beginning to learn these words from him. This boy, while backward educationally, and somewhat small for his age, presents otherwise no anatomical stigmata of degeneration. His backwardness educationally makes it very difficult for him to read, and he is able to write his own name with the very greatest difficulty and wrongly spelt. He adds small and simple sums in a very faulty manner; still, he is able to do many things rationally, though obviously perverted in his conduct. On one occasion he got sixpence from his friends and walked from the Institution to Glasgow, fully eight miles, spent the sixpence in going to the music hall and in buying sweets, and came back again to the Institution. Generally the feeble-minded have no marked emotional faculties. They are timid and distrustful, or, on the other hand, they may be cruel and mischievous, not so much from the absence of emotion as from the interest that the novelty gives them for the time being. They may also be removed from the care

of their friends or parents without showing any anxiety or distrust, and they exhibit apparently affectionate interest in strangers, of whom they have had little or no experience. The will-power is generally feeble, and good habits are difficult to inculcate. Thus it happens that these children become dirty and filthy, neglect themselves, and fall under the influence of any kind of evil guidance which panders to the natural display of their animal passions.

When a bright and active child becomes gradually more and more stupid, careful inquiry must be made to discover the presence of epilepsy or the physical signs of general paralysis of the insane. In epilepsy the convulsions may appear at first dentition, and are frequently nocturnal. They are generally of the variety of grand mal, or of petit mal, with transient unconsciousness, and both types may co-exist. Epilepsy may supervene on feeble-mindedness, or it may cause a state of dementia simulating it. In general paralysis of the insane the mental signs may antedate the physical signs by years, often as many as nine. The physical signs often become well marked at the onset of puberty, and this has led to the use of the term "developmental general paralysis," which in many cases is misleading. The affection is more properly described as "juvenile general paralysis." The dementia in these early forms of general paralysis is insidious in origin and slow in development until the beginning of the physical signs, when it becomes markedly progressive. It may begin as early as the fifth or sixth year. The affection is usually associated with signs of congenital syphilis, and careful inquiry will elicit some of the minor ocular phenomena, such as irregularity of the pupils, absence of light reflex, and absence of the power in accommodation. Difficulties in speech may be marked, and the tongue have a fine fibrillar trembling. The dementia in both types of cases is distinguished from congenital mental conditions and from feeble-mindedness by its progressive nature. In feeble-minded children there is a slight improvement noticeable as the result of education. The pathology of feeble-mindedness (cases which have a pathological lesion of the brain are ex-

cluded from the category of the feeble-minded) has been the subject of recent investigation, and in great part remains unsolved. In the majority of cases the weight of the brain is less than normal. The convolutions are simple, broad, and not differentiated, and the sulci are shallow. The density of the brain is less than normal, and this is undoubtedly due to diminution of the essential elements of the brain—the neurones. Shaw Bolton,[9] whose researches in this particular subject are most important, has measured the depths of the layers of nerve cells in the cortex of the brain. Normally, according to this author, the several layers of nerve cells in the cerebral cortex consist of three primary layers—a layer of pyramidal, a layer of granule, and a layer of polymorphic cells. These layers of nerve cells are of equal depth at birth, or shortly after birth. With the evolution of mental phenomena there is a corresponding increase in the depth of the pyramidal layer of cells until this layer may become four times as large as the other two. In conditions of amentia, or want of mind, the layer of pyramidal cells does not develop. It is in this layer the marked absence of cells in the feeble-minded occurs.

Principles of Management.

The first essential in the care and treatment of the feeble-minded is to separate them from their fellows. They are very imitative, and easily acquire bad habits which are very difficult to get rid of. The only places for the education of the feeble-minded in this country are the special classes established in large centres. In these the control exercised is often counteracted by home influence. The suggestion of the Royal Commission on the Care and Control of the Feeble-minded[10] that these children should be confined in special institutions, where they would be constantly and permanently cared for, is the only conclusion that can be

[9] Bolton, J. Shaw: "Amentia and Dementia: A Clinico-pathological Study," *Journal of Mental Science*, 1905-1908.

[10] *Loc. cit.* (2).

reached from the mass of evidence placed before this Commission. From the point of view of prophylaxis this suggestion, if carried out, would be of great benefit to the children, and would permit of their intelligence being used to the very best advantage. It would also relieve our prisons and reformatories of many cases which would never have been there had their mental condition been recognized in early life and appropriate remedies employed. Attention to the physical health is of the greatest importance. As already noted, many of these children suffer from the effects of defective nutrition. Easily digested food, especially of a farinaceous kind, and little butcher meat often relieve constant restlessness and irregular and broken sleep. Indigestion, constipation, and other troubles of weak digestive organs are the source of much annoyance. The teeth especially must be cared for. Regular and systematic teaching is used to counteract irregular habits; children of uncleanly tendencies should be made to go regularly to the water closet until the habit is acquired, or their tendencies will lead to dirty habits. Education, in the ordinary sense of the term, is less important than those methods of instruction which tend to rouse the mind to interest and raise the tone of the body, such, for instance, as kindergarten teaching and the Montessori method, already noted, for young children. In older children mechanical labour of various kinds is necessary. Generally speaking, the best methods of mental training are those which aim at teaching the individual to do some simple manual labour until the work becomes mechanical. Varied farm and garden work may be done in the open air, both by boys and girls. It is specially necessary in a climate such as ours, where constant outdoor work is only possible for the most robust, to have numerous varieties of useful indoor work. Of much use in this respect is training in workshops of all kinds, such as carpentering, rug making, basket making, &c. Every child should be taught to make his or her own bed, and the things about them should be kept tidy and in methodical manner. Kitchen, laundry, and general house work offer a wide field.

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The following official publications may be consulted with advantage :—

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Report of the Royal Commission on Physical Training in Scotland, 1903.

Report of the Royal Commission on the Care and Control of the Feeble-minded, 1909.

Reports of the Medical Officer of the Board of Education.

Reports of the London County Council.

Reports of the National Association for the Feeble-minded.

Reports of the Lancashire and Cheshire Society for the Permanent Care of the Feeble-minded.

A list of institutions dealing with feeble-minded cases will be found in the following :—

"The Medical Directory." London : J. and A. Churchill. Published annually. 14s. net.

"The Annual Charities Register and Digest." London : Charity Organization Society, Denison House, 296, Vauxhall Bridge Road. 5s. net.

A list of institutions for feeble-minded subjects will also be found in "Human Derelicts," edited by T. N. Kelynack, M.D. London : C. H. Kelly. 1914. 5s. net.

Much information regarding the protection and training of the feeble-minded child may be obtained on application to the Secretary, The National Association for the Feeble-minded, Denison House, 296, Vauxhall Bridge Road, Westminster, S.W.

Full particulars regarding the feeble-minded, with explanation of the Mental Deficiency Act, 1913, will be found in the new edition of Dr. A. F. Tredgold's work on "Mental Deficiency (Amentia)." London : Baillière, Tindall and Cox. 1914. 12s. 6d. net.

See also : "A Guide to the Mental Deficiency Act, 1913," by John Wormald and Samuel Wormald. London : P. S. King and Son. 1913. 5s. net.

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III

IDIOTS AND IMBECILES.

BY

DOUGLAS WILLIAM HUNTER, M.B., D.P.H.

Late Assistant Medical Officer to the North Riding Asylum, Clifton, York; formerly Assistant Medical Officer to the Royal Albert Institution for the Feeble-minded of the Northern Counties, Lancaster.

It is rather unfortunate that in dealing with a subject where simplicity was much to be desired so many names and classes have been introduced, apt to be interpreted by the lay mind as constituting separate and distinct conditions, and not always associated with the same significance in the minds of medical men themselves. The stages in mental defect are marked by no leaps and bounds. Some grouping there may be, but all grades are met with, from the individual whom circumstances have allowed of muddling along somehow in the community at large, to the low-grade idiot who, in his utter helplessness, becomes little more than a living log. "The highest of the lower-class of idiots can hardly be distinguished from the fool, the least stupid of fools can hardly be distinguished from the simpleton, and the highest among simpletons stand very near the level of hundreds who pass in society for feeble-minded persons, but still responsible free agents. These latter, indeed, are looked down upon by the crowd; but the crowd is looked down upon by the few intellectual giants of each generation who stand higher by the whole head and shoulders than the rest."[1]

The definitions adopted in the Mental Deficiency Act, 1913, are as follow:—

(*a*) *Idiots*, that is to say, persons so deeply defective in mind from birth, or from an early age, as to be unable to guard themselves against common physical dangers.

[1] Howe, S. G.: "On the Causes of Idiocy," 1848.

(*b*) *Imbeciles*, that is to say, persons in whose case there exists from birth, or from an early age, mental defectiveness not amounting to idiocy, yet so pronounced that they are incapable of managing themselves or their affairs, or, in the case of children, of being taught to do so.

(*c*) *Moral Imbeciles*, that is to say, persons who, from an early age, display some permanent mental defect, coupled with strong vicious or criminal propensities on which punishment has little or no deterrent effect.

The definitions in the Act are based on those accepted by the Commissioners on the Care and Control of the Feeble-minded, who aimed at in their definitions, by attaching to names already in use a distinct significance, the facilitation for administrative purposes of the separation and classification of the different grades of mental defect. Capacity for work, and the amount of supervision necessary to care for and control these cases, generally form the basis of classification on practice. A moral imbecile, perhaps of considerable intelligence—an intelligence, however, which but increases his capacity for evil—may require so much supervision that, whatever capacity for work he may possess, it becomes practically valueless.

The Commissioners estimated that there were in England and Wales alone about 150,000 mentally defective other than certified lunatics, and of these some 70,000 were reported as "needing provision" either in their own interest or for the public safety. About one-fourth of the total number of defectives belong to the idiot and imbecile classes, and of the same two classes are referable about one-sixth of the number "needing provision."

Causal Factors.

Mental defect, once it has appeared in a stock, tends strongly to be inherited. It does not, however, appear suddenly as a sport in a stock otherwise healthy. In the experience of the writer either one or other parent, often both, have varied sufficiently from the average that one would describe them as not normal. Some attempts have been made to deal with the inheritance of mental defect

on Mendelian lines, and to treat such defect as a simple Mendelian unit. There is no doubt, of course, that segregation does occur, but the subject is altogether too complicated, too irregular, to admit of any such simple treatment. Mental defect tends to breed true, but only within certain limits. The defect, which may appear in one member of the family as idiocy, may in other members be represented as insanity, diabetes, tuberculosis, &c., some physical malformation or, perhaps, in exceptional instances by certain types of ability. There is also a tendency to breed true to type. Thus if one Mongolian idiot occurs in a family, a second idiot occurring is generally of the same type. But, on the other hand, Mongolian idiocy may be associated in the same family with the occurrence of cretinism or of idiocy of the paralytic type. Sometimes cretinism is associated with Mongolism in the same individual. The same holds true of other forms of idiocy, where a type is recognizable, *i.e.*, microcephaly, hydrocephaly, &c.

As with many other allied conditions, males suffer more frequently than females from mental defect, roughly in the proportion of 5 to 4.

The various factors to which importance in the etiology is commonly attached may be briefly considered.

Maternal Impressions.—It would probably be easy to find a history of maternal impressions in 30 to 40 per cent. of cases. In most instances, however, the impression has been a very transient one, and is only recalled after the birth of the idiot. The mother, moreover, who can give as the cause of her child's condition that, when pregnant, she saw a fish's eyes move, or that she heard the bagpipes played, somehow suggests a condition of mind not far removed from that of the child to which she has given birth. One could understand the health of an extremely nervous woman, obsessed with the fear of giving birth to an idiot, becoming so undermined that the obsession acted as the last straw on the camel's back. But we practically never meet with histories of this kind; the impression is invariably a fleeting one, and in any case the dissociation of the primary defective condition of the mother from the superadded cause would be impossible.

Convulsions.—Convulsions in these children are very frequent in infancy, and perhaps constitute the cause

most commonly given by parents to account for the defective condition of their child. Convulsions and maternal impressions as causes stand in a sort of inverse ratio to one another. Where convulsions occur in infancy, the parents generally find in them a sufficient cause; where they are absent, it is necessary to seek a cause further back, and this the mother succeeds in doing in some maternal impression, fright, or worry during pregnancy. That convulsions may still further reduce the mental capital of the defective child is probable, and we know that in a few instances they may occur in a child previously healthy, and be associated with the onset of definite pathological lesions, as meningitis, encephalitis, &c., which are responsible for subsequent defective development. Still in the great majority of cases their occurrence in infancy is only a symptom of the defective and unstable inheritance.

Tuberculosis.—Tuberculosis is almost certainly more common in the ascendants and collaterals of these children than in the general run of the population. There are, however, in this connection no statistics worth quoting which the writer is aware of. Histories of phthisis can generally be found in Asylum Case Books in about 30 per cent. of cases, but since we have no idea of the number of persons passed in review in the individual families such a figure is of no practical value. The Mongolian idiot shows a high predisposition to tuberculosis, and it has been supposed that this condition is especially liable to occur in a stock with the tuberculous diathesis. This type of idiocy tends to occur when the parents are becoming old, and in such late born types, whether Mongolian or not, one does find that a history of tuberculosis is obtained more frequently than in the ordinary run of idiocy. Whether this is really significant, or simply due to the fact that in such cases the parents and more of their immediate relatives would have an opportunity of reaching the phthisical age, cannot yet be answered. Tredgold[2] is inclined to attach considerable importance to tuberculosis as a factor in the deterioration of the germ plasm. The only evidence in support of this is the probable prevalence of tuberculosis in defective

[2] TREDGOLD, A. F.: "Mental Deficiency." Second Edition. London: Baillière, Tindall and Cox. 1912.

stocks. But there is a good deal of evidence, on the other hand, to suggest that the association is not one of causation. Insanity, which is very closely allied to mental defect, certainly has not diminished over the last sixty years, although there has been a marked decline in tuberculosis. The distribution of mental defect in the family is not what we would expect if phthisis were an important factor in the etiology; and, finally, it is very rare to meet with a history of phthisis in the mother during pregnancy which resulted in the birth of the idiot.

Alcohol.—Dareste and Féré's experiments on the chick showed the enormous power which alcohol had for the production of monstrosities and for retarding development. Like results, however, were produced by many different agents, chemical and mechanical, and the same dose of toxic agent did not always produce the same result, sometimes the variation being in the direction of increased development. Experiments upon mammals as regards the effect of alcoholization of the parents upon the offspring have mostly given negative results. It is a great pity that among human beings the zeal of workers in this sphere has detracted so much from the value of their observations. Almost all the French writers lay great stress on inebriety of the parents being, perhaps, the most important cause in producing defect in the offspring. Bourneville, out of 2,104 cases, found 1,053 were the offspring of drunken parents (933 had drunken fathers, 80 drunken mothers, and 40 both parents drunken). Lamurien, quoted by Langdon-Down[3], attributed the greater number of his cases to this cause. Shuttleworth and Beach[4] found 16 per cent. of cases with history of parental drunkenness, Langdon-Down 12 per cent. of the fathers and 2 per cent. of the mothers, and notes how among those of the lower social class drunkenness "became a factor of increasing importance."

When we consider, however, the close association of feeble-mindedness and alcoholism in the individual, the fact that some 65 per cent. of the women in our Inebriate Homes are mentally defective, it is obvious that a mere

[3] LANGDON-DOWN: "Mental Affections of Childhood and Youth." London: J. and A. Churchill. 1887.

[4] SHUTTLEWORTH and BEACH: Hack Tuke's "Dictionary of Psychological Medicine," article on "Idiocy." London: J. and A. Churchill. 1892.

record of drunkenness in parents is not going to be of much help to us. "The mentally defective become extreme alcoholists, inebriates in constant conflict with the police, because the mental defect is antecedent to the alcoholism." [5]

Ethel M. Elderton, in an inquiry into the effect of parental environment upon the offspring, concludes that "drink has practically no influence on the general health and intelligence of boys and girls, and the little influence it has is in favour of the children of drinking parents; they are healthier and more intelligent." These results are "rather startling and rather upset our preconceived ideas, but it is probably a consolation that to the obvious and visible miseries of the children arising from drink, lowered intelligence and physique are not added." [6]

Special importance was at one time attached to the drunkenness of the parents at the time of conception. Toussenel, quoted by Ireland,[7] wrote in "Le Monde des Oiseaux": "On sait que les enfants se ressentent généralement de l'influence passionnelle qui a presidé à leur conception. La plupart des idiots sont des enfants procrés dans l'ivresse bachique." The latter part of the statement is not true and there is little evidence as to what effect, good or ill, the emotional state or the condition as regards alcohol of the parents at the time of conception has upon the offspring.

Ballantyne,[8] Saleeby,[9] Horsley and many others have recently dealt with the problem and recent writers clearly indicate the difficulty of arriving at a dogmatic conclusion. For much information on the subject see volumes of *British Journal of Inebriety*, edited by Dr. T. N. Kelynack.

Consanguinity. — The belief in the undesirability of consanguineous unions is very ancient and widespread

[5] BARRINGTON, AMY, and PEARSON, KARL: "A Preliminary Study of Extreme Alcoholism in Adults." London: Dulau and Co. 1910.

[6] ELDERTON, ETHEL M.: "The Relative Strength of Nature and Nurture." London: Dulau and Co. 1909.

[7] IRELAND, W. W.: "The Mental Affections of Children." Second Edition. London: J. and A. Churchill. 1900.

[8] BALLANTYNE: "The Expectant Mother." London: Cassell and Co. 1914.

[9] SALEEBY: "The Progress of Eugenics." London: Cassell and Co. 1914.

and whatever may have been its exact origin, differing, perhaps, in different countries, there were, at any rate from the biological point of view, sound foundations for such belief. One idiot or imbecile in a family may be accounted for by a maternal impression, fall or illness in infancy, but when three or four occur such an explanation obviously fails, and as such wholesale disasters tend specially to occur with the offspring of consanguineous unions, it was a reasonable inference that consanguinity of the parents itself had a detrimental effect.

Even at the present day there is still no very satisfactory evidence which would enable one to come to a definite conclusion on the subject. Animals closely inbred generally show some loss of constitutional vigour and fertility, while crossing tends to improve these conditions. Most writers on heredity, however, seem agreed that so long as the stock is healthy such a union is not disadvantageous to the offspring. Professor Thomson goes so far as to say that "the idea that there can be any objection to the marriage of two healthy cousins who happen to fall in love with one another is preposterous."[10] The difficulty is that there are few or none who are quite healthy ; in the best stocks there are defects (perhaps not always patent) of some kind or another, and these defects tend to be much exaggerated in the offspring of a consanguineous union. Out of 1,840 cases in the books of the Royal Albert Institution, Lancaster, where the presence or absence of consanguinity of parents was ascertained, 80 (4·3 per cent.) were the offspring of consanguineous marriages, first cousins accounting for about 2 per cent. These figures hardly exceed some of the estimates that have been made of the prevalence of such marriages in the general community. If, however, we take those families where two or more idiots occur, we find out of 112 such, in no fewer than 22 did consanguinity of the parents occur ; in 19 the relationship being that of first cousins. The writer has been unable to satisfy himself that the double dose of defective heredity in the consanguineous marriage will explain the facts. Where the parents are not related "defect" on both sides appears to have much less effect. The perfect

[10] THOMSON, J. ARTHUR : "Heredity." London : Walter Scott Company. 1908.

man may marry his cousin possibly even with advantage, but such a marriage would appear undesirable for the great bulk of ordinary mortals. It might be well if such marriages were altogether prohibited.

Order of Birth, Age of Parents, &c.

Prof. Karl Pearson[11] and Mr. David Heron[12] have shown how insanity, albinism, consumption, &c., tend to weigh heavily upon the elder-born members of the family. A similar incidence is to be found in idiocy, with an increased prevalence, also on late-born members of large families or rather on offspring born to an old mother. That a large family should precede the late birth is usual but not necessary. Havelock Ellis,[13] writing of the distribution of ability in family, says: "In the small and medium sized families it is the eldest who most frequently achieves fame; in the large families it is the youngest." The distribution of idiocy is essentially similar. This double incidence at the opening and again at the closing of the reproductive period will probably be found to hold for most constitutional diseases.

Heron's figures on insanity suggest that in addition to the elder born incidence there may also be a late born incidence, at any rate such an incidence has been described by some Italian observers.

Brehmer[14] draws attention to the facts that where phthisis appears in a family free from hereditary taint, it tends to affect the late born. His selection of cases is, unfortunately, not a random one. Where it is possible, however, in his group of cases to approximate to such a selection, there is evidence also of the elder born incidence. Tuberculosis in the young mentally defective shows an almost entirely late born distribution and it is possible that in the general population an acute tuberculosis of young children would give a sensibly different distribu-

[11] Pearson, Karl: "A First Study of the Statistics of Pulmonary Tuberculosis." London: Dulau and Co. 1907.

[12] Heron, David: "A First Study of the Statistics of Insanity and the Inheritance of the Insane Diathesis." London: Dulau and Co. 1907.

[13] Ellis, Havelock: "A Study of British Genius." 1904.

[14] Brehmer, Hermann: "Die Aetiologie der chronischen Lungenschwindsuch., &c." 1885.

tion to that of consumption. As in Brehmer's cases of phthisis free from hereditary taint, so in the case of the idiot the late born incidence tends to be associated with the less unsound stocks. A similar variation in quality of offsprings according to order of birth has been shown by Mr. J. B. Robertson[15] to obtain in the thoroughbred. Dealing with ability to win races he finds that there is defect in this respect of offspring born at either end of the reproductive period, those born at the close being the worse.

It is worthy of note that the liability of a mother to death in confinement, to miscarriage or stillbirth, and to some extent to multiple births, follows the same law; there is slight increased risk at the commencement of childbearing and a marked increased risk towards its close.

To return to order of birth in the case of the mentally defective, and it is necessary to emphasize here that one is only speaking on the average. From the first to the seventh born there is a progressive diminution in the liability to idiocy, with the eighth born the pendulum begins to swing rather suddenly in the opposite direction, and with the still larger families the incidence is almost entirely on the late born. The distribution of the order of birth of the parents and grandparents of these children is similar, and it would appear probable that in both parents and offspring the late born tends to be more severe than the early born defect. The early and late born distribution of idiocy can readily be established by anyone who chooses to gather the necessary data. In the larger families, however, say from eight upwards, there would also appear, in addition, to be some suggestion of a mid-born incidence. Unduly prolonged intervals between pregnancies are certainly disadvantageous to the offspring; it is also possible that too frequently recurring pregnancies are likewise undesirable. The finer points in problems of order of birth and pregnancy intervals will require the collection of a huge amount of material which only the trained statistician, skilled in modern methods, will be capable of interpreting.

There is an interesting fact as regards sex distribution in idiocy. Female idiots have a greater tendency than

[15] ROBERTSON, J. B.: *Sporting Chronicle*, March 2, 1912.

male idiots to appear at the two extremes of the reproductive period and are accordingly associated with slightly larger families.

Mothers of Female Idiots: Total 725.

Under 24 years of age, 148 = 20·4 per cent. | Over 37 years of age, 135 = 18·6 per cent.

Average size of family = 6·5 (uncompleted).

Mothers of Male Idiots: Total 1,338.

Under 24 years of age, 233 = 17·4 per cent. | Over 37 years of age, 201 = 15 per cent.

Average size of family = 6 (uncompleted).[16]

Age of Parents.—A big difference in ages of parents has been supposed to produce an unfavourable effect upon the offspring. In many cases, however, the important factor is age itself, not difference of age. Further, in such unions, under ordinary circumstances, one or other partner is often abnormal. Of the effects of age of the father upon the offspring we have at present little evidence and of the defect which tends to appear at the close of the family it is probably almost entirely associated with the mother. As idiocy tends to be associated with the relatively barren periods of the reproductive life, I think we might take it that from about 24 to 28 years of age, the time of woman's greatest reproductive vigour, the liability to defect in the first born would be reduced to its minimum. Further, that on the whole the woman who had passed this optimum age would be worse off in this respect than the woman who had not yet reached it. As regards the tendency to defect in offspring with increasing age of the mother, at 37 years of age it is quite marked and increases with increasing years.

Accident.—We may include under this head cases due to birth injuries, zymotic diseases, concussion, sunstroke, &c. Such cases are rare. I doubt if I have ever met with a case of pure accidental idiocy.

[16] Masculinity (the proportion of male to female births) varies in different countries and has declined in England. It varies somewhat also throughout the reproductive period. . . . Unless, however, there has been some great change in masculinity relative to the age of the mother, from the Scotch natality figures of 1855, the above distribution can hardly have arisen as a matter of chance. (*See* "Natality and Fecundity," by C. J. Lewis and J. N. Lewis. Edinburgh, 1906).

Syphilis.—Syphilis plays but a little part in the etiology of idiocy. Tredgold[17] found that "the number of aments, whose condition was the result of syphilis alone, without neuropathic heredity, was but ·2 per cent. Barr,[18] under similar circumstances, found but ·2 per cent. Sutherland[19] thought syphilis of special importance in the etiology of Mongolian idiocy. His results, however, have not been borne out by subsequent observers. Sollier[20] has never seen syphilis as the sole cause of idiocy. Recently several Continental workers, using the Wassermann reaction, have found a high proportion of idiots syphilitic, but considering the close association between intemperance, prostitution, &c., and mental defect statistics on this matter would require to be very carefully dealt with.

Attempts to procure Abortion, Illegitimacy, &c.—To these factors, at one time, considerable importance was attached. It is obvious, however, that under such circumstances other causes probably of still greater importance and difficulty to discount are present.

In conclusion, for all practical purposes environment is of little importance in the etiology of this form of degeneracy. Intemperance, tuberculosis, poverty and misery are associated conditions, they are not causes. In the defect which tends to appear in offspring born at either end of the reproductive period, in the survival of such individuals and their intermarriage over a series of generations resides probably one of the most important factors.

Defective Conditions associated with Idiocy.

I purpose under this head to consider some of the more common of the physical defects met with in association with idiocy, and remembering that the latter condition is one of defective or arrested development, we will understand how, in the majority of cases, these

[17] Tredgold, F. A.: "Mental Deficiency." Second Edition. London: Baillière, Tindall and Cox. 1914.

[18] Barr, W. Martin: "Mental Defectives." London: Rebman. 1904.

[19] Sutherland, G. A.: Article on "Mongolian Idiocy," *Practitioner*, vol. 63, 1899.

[20] Sollier, Paul A.: Article on "Idiocy," "Twentieth Century Practice of Medicine."

defects of development—these stigmata of degeneracy—are remnants of states which were natural to certain periods of development of the normal individual.

Nervous System.—The brain is generally much under size, and may weigh in extreme cases of microcephaly only about one-sixth or one-seventh of the normal weight. Occasionally, in cases of hypertrophy of brain (the enlargement is generally due to an increase in the neuroglia) the brain may considerably exceed the normal both in size and weight. The convolutions are flat, extremely simple in their arrangement. In places, there may be a patch of very small gyri which has failed to develop. The sulci are shallow, and annectant gyri, which, in the normal brain, are buried within the folds, lie open on the surface. The cerebrum may fail markedly in its development, so as to leave the cerebellum almost uncovered, or again, the cerebellum may fail in its secondary development, so that the relative proportion of cerebrum to cerebellum, which is characteristic of the infant at birth, may remain throughout life. It is rather the exception to meet with gross malformations such as porencephaly, or absence of the corpus callosum. Hydrocephalus is fairly common in all varieties. The grey matter of the cortex is thinner than usual. Microscopically the cells more irregular tend to retain the embryonic type and the fibres of association are fewer in number.

Circulatory System.—The circulation in these children is very feeble. The heart is generally small. Congenital heart defects are common at birth, but few so affected survive. Sclerosis of the arteries and veins appears early in life; endocarditis is very common as a terminal affection.

Gastro-intestinal System.—The gums are soft and spongy, the tongue large and "doughy" looking. A highly fissured sodden-looking tongue is characteristic of Mongolian idiocy. The teeth are late in making their appearance, and are liable to early decay. When the teeth are small and of worm-eaten type, there is generally plenty of room for them, and no irregularity in their arrangement results; when the individual teeth are large and well formed, displacements occur. The lower first bicuspids often tend to lose their inner cusps, and become caniniform in shape, the lower lateral incisors,

which in man are more strongly developed than the central, often remain dwarfed, the upper lateral incisors may fail to pierce the gum, and are often displaced; rarely one may meet with molars with crenated crowns, an embryonic condition which remains permanent, in the teeth of the orang. Supernumerary cusps are common, especially on the lingual aspect of the canines. Cleft palate and hare-lip are occasionally met with. While palates of all shapes are met with in the normal population, an extremely high and narrow palate with great hypertrophy of the alveolar processes would appear to be more common among the mentally defective. I do not think enlarged tonsils and adenoids to be much more prevalent among idiots than among children generally. The nasopharynx in these children is small and shallow.

Stomach and Intestines.—It is possible that mental defect is fairly frequently associated with congenital hypertrophy of the pylorus, but as such, children seldom survive long; the mental condition is not ascertained. The special incidence of this affection on males, first-borns, also its family prevalence, has been noted. Anomalies of development of the intestines are occasionally met with, congenital dilatation of the colon, &c., and the writer has seen the descending colon from the splenic flexure downwards represented by a glistening fibrous tube looking for all the world like a rather thick umbilical cord. Except for rather troublesome constipation, it has caused no symptoms during life. Dilatation of the stomach from their gluttonous habits, diarrhœa of a dysenteric type with mucus and blood in the stools, obstinate constipation, hæmorrhoids, rectal prolapse are common. In defective stocks one occasionally meets with instances of congenital absence of rectum.

Rumination.—The bringing of food back to the mouth and again chewing it, such as naturally occurs among the ruminants, is common in the lower types.

Reproductive System.—In the male, the external genitals are small, and the secondary sexual characters but poorly marked. The beard often fails to develop. Undescended testicles, cryptorchism, hernia, hydrocele of the tunica vaginalis, hypospadias are fairly common. Undue development of the male breasts is frequently seen. According to Jules Voisin,[21] there is no marked retardation

[21] VOISIN, JULES: "L'Idiotie." Paris: 1893.

in the onset of puberty in the female. Menstruation appears at the normal age; occasionally, especially perhaps in idiots of the Mongolian type, the menstrual function is never established at all.

The Skin.—The skin in these children is usually dry and covered with a fine branny desquamation. The secretions have a peculiarly unpleasant odour. The horny layer of the skin may be unduly developed, especially on the extensor aspect of the joints. There is often a lack of tone in the involuntary muscle of the skin quite appreciable to the touch. The skin on the hands may be much wrinkled, owing to the lack of fat in the subcutaneous tissues, a condition met with in the fœtus, and which persists throughout life in the apes. Mottling of the skin, such as we see in infants, is common in these children. It is specially marked on the limbs, but it may involve the trunk as well. Nævi are common. Chilblains are very frequent and many of these children are specially liable to attacks of erysipelas. The hair on the head may fail to develop. The body often has a fine downy covering reminiscent of the lanugo of the fœtus and specially in evidence over the lumbo-sacral region. There may be localized pigmented areas of skin, often on the back, covered by a dense mass of hair. The nails are very soft, thin and wrinkled, and often grow so little, and are so easily worn as to suggest the bitten nails of the nervous child. They are often set at an angle to the dorsum of the finger, recalling the terminal position which the nail occupies in development. Anomalies of pigmentation are very common.

The Eye.—Epicanthus is fairly common in infancy, but tends to disappear as the child grows older. Congenital cataract is present in a considerable percentage of cases. The eyeballs and orbits may be asymmetrical, one being smaller than the other. Strabismus and nystagmus are common. Many idiots, especially those of Mongolian type, suffer from chronic conjunctivitis as they grow older. Defects in development of the iris, colobôma, and partial albinism are rare, but occasionally seen.

The Ear.—Abnormalities of the external ear are very common. One ear may be on a higher level than the other. Both may be set almost at right angles to the head. Hæmatoma auris is common in the lower types. The lobule is often absent or adherent to the cheek. The

ordinary folds on external surface of the ear may be almost entirely absent, and a small ear of this simple type approaching the jug-handle ear of the Morel, in which the upper half of the ear bends forward so as to be at right angles to the head and in which the Darwinian inturcle is often well marked, is fairly characteristic of Mongolian idiocy. (One could probably diagnose Mongolian idiocy from the ear alone in perhaps 50 per cent. of cases).

Deaf mutism is common in association with idiocy.

Touch, taste and smell are generally but poorly developed.

Speech.—Defects of speech are very common in these children, stammering occurs in the more nervous, lisping is present in nearly all, and a gutteral nasal quality of voice is very common among Mongolian idiots. A condition of congenital motor aphasia may be met with among them, where the individual has fair intelligence, understanding all that is said to him and yet his vocabulary may be limited to two or three words.

The Face and Head.—Asymmetry of the face and head is common. The lower jaw is often small and chin receding. Occasionally the chin is more prominent than usual. The forehead may be markedly receding; when such is the case, there is often a considerable degree of prognathism.

Extremities.—(*a*) *Upper:* The forearm remains relatively long and the radio-humeral index is high. A skiagram may show a considerable degree of bowing of the radius. The skin of the hand is soft and has a pecularily doughy feeling to touch. Lateral deviation at finger joints is common. Variation in length of fingers from what is normal syndactylism (webbing of fingers), polydactylism (supernumery fingers), ectrodactylism (absence of fingers), are often met with. Even an entire hand may be absent. The finger pads often fail to develop, so that the individual has the tapering fingers characteristic of the infant. (*b*) *Lower:* The lower limbs relatively to the upper are short. Knock-knee is common. Flat-foot is present in nearly all cases. The large toe is often widely separated from second. This is, however, not to be regarded as a return to the prehensile foot of the ape. The flat-foot

and space between first and second toes are well marked in the normal infant, and the foot in the idiot fails to develop away from this infantile condition. Grasping power in the toes, which the normal infant possesses in considerable degree, is often present till fairly well on in life in these defectives. I have seen an old Mongol, over 40 years old, who retained the power in a very high degree. Deformities of toes similar to those described in connection with fingers are met with. The third and fourth toes often fall short of their normal development in the Mongolian idiot and occasionally one comes across an idiot whose toes are so long as almost to suggest fingers. Congenital dislocation of the hip is occasionally met with.

Thorax.—The idiot tends to retain the infantile type of chest, deep from before background.

Pelvis.—Measurement of the pelvis upon the living subject is rather an unsatisfactory procedure, but here also there can be no question the idiot again fails to develop away from the infantile type. Sometimes the pelvis is very high and assumes a simian character. The gluteal region is often poorly developed.

Height, Weight, &c.—The idiot and imbecile fall, as a rule, 5 to 6 in. below normal height. Giantism is, however, occasionally met with. The majority of these children have a tendency to put on flesh, and on bathing morning would probably contrast in this respect more than favourably with their normal fellows. The writer has met with more than one instance where the flesh-forming propensities of a rather hopeless idiot has enabled it to win first prize at a baby show. The Mongolian idiot especially has this tendency to formation of fat, a tendency which often becomes much more marked after puberty is reached. The muscles are often well developed but are hypotonic, and their strength is much below that of a normal individual of the same muscular bulk. The joints are loose, as they also are in normal infants. Most of us can remember our early school days, when the boy who could twist his fingers into all sorts of absurd positions was looked upon rather as a hero. In the defective child, the slackness of joints and hypotonicity of the muscles is very marked ; many of them have a tendency to adopt the double-up position, which the fœtus occupies in utero. On account of the

slackness of the muscles, their feeble power, the flat condition of the feet, almost all these children, are slovenly walkers. The inability to walk well and the defective speech are perhaps the two symptoms most commonly met with.

Types of Idiocy.

It is imposible to state with any degree of accuracy the proportion which the different varieties of idiocy and imbecility bear to one another, or to idiocy in general. Some of them, such as the Mongolian idiot and the microcephal, are very delicate and apt to die early. Hence the proportion found in Training Institutions do not represent the true frequency of such conditions at birth. Again, connecting links exist between all the different types, and even such as are referable to certain types only constitute about, perhaps, 20 to 30 per cent. of the whole; outside that, we have a huge number remaining, for whom no proper classification exists at all. They have defects here, or defects there, but the very variability of defect renders classification difficult or impossible. "La Dégénération est la Dissolution de l'Hérédité." Epilepsy occurs in all varieties, least frequent, perhaps, in the Mongolian idiot, most so in the idiot of the paralytic type.

Mongolian Idiocy.

Dr. Langdon-Down,[22] many years ago, in an attempt at an ethnological classification of idiocy, was the first to draw attention to the close physical resemblance existing between certain types of idiots and the different races which inhabit the earth. He described the Mongolian, the Negro, the Malay, the North American Indian type, and suggested that this tendency, occurring in idiots, to resemble races other than that to which they belong, was proof really of the close relationship existing between all human kind. Séguin,[23] under the head of "furfuraceous cretin," gives a very good description of the condition.

The term "Mongol" is an apt one, and the Mongolian

[22] Langdon-Down, J.: "Mental Affections of Childhood and Youth." London: J. and A. Churchill. 1887.

[23] Séguin, E.: "Idiocy." 1866.

idiot with his short head, puffy eyelids, narrow and oblique palpebral fissures, squat nose aud rounded face, presents many points of resemblance to the race from which he derives his name. Even further is the resemblance carried, for, like the Heathen Chinee of Bret Harte's poem, his prevailing expression is "child-like and bland," and the posture which many of them adopt when resting, of sitting upright with legs crossed tailor-fashion, recalls an attitude of rest certainly more common among the nations of the East.

Frequency.—Dr. Shuttleworth[24] estimated 5 per cent. of all idiots in institutions as belonging to this class; Dr. Telford-Smith, 5 to 10 per cent.; Dr. Langdon-Down,[25] among those he met with in General Hospital and at Earlswood, over 10 per cent. Dr. John Thomson[26] states that "of the mentally defective children who are recognized as such in infancy, certainly 10 to 15 per cent., at least, are Mongols." Dr. Still[27] found, of 350 imbeciles, seventy-seven were Mongols—22 per cent. Certainly, even being fairly generous as to what one recognized as Mongolian, the percentage in institutions would probably not much exceed 6 to 8 per cent.; however, an exact figure is not very serviceable. There are many idiots who, possessing in slight degree some of the less marked symptoms of Mongolian idiocy, are not generally returned as such; while others, with a well-marked condition such as narrow and oblique palpebral fissures, would invariably be returned as such. The difference in incidence of Mongolian idiocy in infancy, compared with that found to obtain in a Training Institution, is accounted for, in the first place and most important by the fact that the Mongolian idiot is very delicate and liable to early death; and, secondly, by a tendency which all Mongolian idiots have to more or less outgrow their Mongolian condition.

Etiology.—In most cases, the maternal factor would

[24] SHUTTLEWORTH and POTTS: "Mentally Deficient Children." London: H. K. Lewis. 1910.

[25] LANGDON-DOWN, J.: "Mental Affections of Childhood and Youth." London: J. and A. Churchill. 1887.

[26] THOMPSON, JOHN: "Clinical Examination and Treatment of Sick Children." Edinburgh: William Green and Sons. 1908.

[27] STILL, G. F.: "Common Disorders and Diseases of Childhood." London: Oxford Medical Publications. 1908.

appear to be the more important in the etiology, although the condition can be transmitted through the male. Mongolian idiocy is an expression of a diminished reproductive power in the mother, occurring either at the beginning of the child-bearing period, or more commonly towards its close, when the reproductive quality is declining. Thus of 136 cases at the Royal Albert Institution sixteen were first-born, fifty-four occupied an intermediate position, and sixty-six were last-born (average size of family 7·3). If it occurs at the beginning, there would appear to be a tendency to subsequent sterility: if it occurs towards the close, the Mongolian idiot is generally a last-born. Still draws attention to the fact that a mother who, approaching perhaps the close of her child-bearing period and having given birth to a Mongolian idiot, if she again become pregnant, the child will, in all probability, be normal. In many instances where the child is a first-born, the mother tends to be rather old for a primipara.

Description.—In the previous section dealing with defective conditions met with in these children, attention has been called to the fact that these stigmata are really only conditions of arrested development, and often in describing one of these defects the fact that the condition was specially marked in the Mongolian idiot has been referred to. The reason for this is that, on the whole, the Mongolian idiot is the furthest back failure of development we have to deal with in these children. If we took a four or five months' fœtus, and multiplied it by 30 or 40, we would, to all intents and purposes, have our fully-grown Mongol idiot. The signs which are more or less characteristic of the Mongolian idiot are all met with at different stages in development of the normal fœtus. Let us consider shortly some of the points in which the Mongolian idiot approaches the fœtus. The skull in each is brachycephalic, and the occipital and mastoid regions are poorly developed. In a fair percentage of Mongolian idiots, the occipital bone in the region of the posterior fontanelle projects above the level of the adjacent parietal. Féré, quoted by Ballantyne,[28] attributes cephalhæmatomata neonatorum to failure of ossification in this

[28] BALLANTYNE, J. W.: "Manual of Antenatal Pathology." Two vols. Edinburgh: William Green and Sons. 1902-1904.

region, hence the condition in the Mongolian skull may be regarded as one of defective development. The orbits in Mongol and fœtus are diminished in height. The nasal bones are poorly developed, and in each nostril point directly forward, the naso-pharynx small in each. The eye in the four months' fœtus is distinctly Mongolian, the lids are puffy, the outer canthus higher than the inner, and epicanthus is present as a rule. The stroma of the iris is devoid of pigment in the fœtus. The same tendency is found in the Mongol. The proportion of limbs, thorax, pelvis, the shape of hands, fingers and nails, the shape of feet and toes of the Mongolian idiot are all infantile. The laxity of the joints, the hypotonicity of the muscles, the relatively small cerebellum, a condition first pointed out by Wilmarth,[29] are characteristic of both. Congenital cardiac defects are more frequently met with in Mongolian than in other types of idiocy. The tongue of the Mongolian idiot possesses a peculiarly fissured and spongy appearance. This condition is not present at birth (according to Dr. John Thomson), but develops gradually during infancy. He attributes it to the persistent tongue-sucking met with in children, acting, perhaps, on a congenitally vulnerable organ. The writer would be inclined to attach considerable importance to the septic condition of the mouth, which always tends to be much more foul than in other idiots, the condition being really a chronic glossitis. The degree of fissuring varies with the age of the Mongol and the degree of his Mongolism; while, when the condition is marked it is diagnostic, milder degrees of it are occasionally seen in defectives who certainly have no Mongolian physiognomy. I have seen a very good Mongolian tongue develop temporarily during an attack of scarlet fever. These children are very delicate, and tuberculosis causes practically all deaths. The liability to tubercle is, however, not specific; they suffer heavily from all diseases. The Mongolian idiot, owing to his wonderful imitative faculty, is capable of a high polish, which often gains him credit for a foundation which does not exist. Dr. Shuttleworth states that a few of them, after training, are

[29] WILMARTH, A. W.: "Report on the Examination of one Hundred Brains of Feeble-minded Children." *Alienist and Neurologist*, October, 1890.

able to pass muster in an ordinary social way with their more gifted brothers and sisters. The great majority of these defectives are of a medium-grade intelligence, practically none are idiots ; sometimes we may run across an individual with the Mongolian type fairly well marked, appearing capable to take his place in the normal community. In institutions the Mongol makes a fair indoor worker. Their general health is so poor, however, and they chill so readily that only very exceptional ones can stand the ordinary run of out-of-door employment in this country.

Sporadic Cretinism.

Owing to the great improvement which takes place in cases of cretinism from thyroid feeding, this type of idiocy is, perhaps, better known than any other to the profession, and a description of it need not detain us. Cretinism appears under the same conditions as ordinary idiocy, tends to occur in degenerate stocks, is inherited, and often shows a marked family prevalence. It would seem also to have the same tendency as ordinary idiocy to appear towards the extremes of the reproductive period. There are certain glandular structures which are liable to be involved in conditions of defective development and, apart from the thyroid gland, the pituitary, testicles, adrenals, are often affected.

Mongolian idiocy is, perhaps, in the majority of cases to begin with, diagnosed as cretinism, and false hopes are held out to the parent of the child's improvement. If it were remembered that Mongolian idiocy is, perhaps, twenty to thirty times as common as cretinism, that Mongolian idiocy is present at birth, whereas the cretin is born apparently normal, mistakes should not arise. It might be worthy of note, as medical men are apt when meeting with a case of cretinism to give altogether too favourable a prognosis, that thyroid feeding, while it improves these children, seldom succeeds in bringing them up to the normal level. Many cases, for practical purposes, are hardly improved by it. Most cretins are idiots ; the thyroid defect is only a superadded condition.

Microcephaly.

This type of idiocy is very much less frequent than the Mongolian, and, if we exclude all but the well-marked cases, probably does not constitute more than 2 or 3

per cent. of the whole. The type depends not so much on the size of head as on the shape. The head is narrow, of the cone-shaped type, and the forehead markedly receding. The face relatively to head is large, the cheeks are plump, the nose is often fairly well developed, and chin small and receding. The condition tends to have a family prevalence. Around the microcephal, at one time, a huge controversy raged as to whether the condition was to be regarded as an atavism, a throw-back to our simian ancestors, or as a pathological human one; the brain of the microcephal does show some rather marked simian features in the presence of the occipital operculum, the orbital beak of the frontal lobes, in the position on the surface of the brain of the cuneolimbic annectant gyrus, &c., but so also does the Mongolian idiot.

Craniectomy was at one time done in many of these children under the mistaken idea that the condition arose from premature synostosis of the bones of the skull. The condition of the skull is, however, secondary to that of the brain, and craniectomy accomplishes nothing for these children.

All degrees of development of the brain are met with. The cerebrum suffers more than the cerebellum, which in the more marked may be entirely uncovered. The spinal cord is small. Hydrocephalus is fairly common in association with microcephaly. The vitality in the more marked cases is low, speech is absent, and the use of the limbs poor; and while, as a general rule, the smaller the head, the lower the intelligence, it is only a rule to which the exceptions are very numerous. The medium grades are often lively, of fair health, and moderate workers. The more marked cases are helpless.

Hydrocephalus and Oxycephalus.

Water on the brain is a condition in which there is an accumulation of fluid either between membranes and brain, or within the ventricles. The condition often exists at birth, and may give rise to difficulty at delivery. Probably in many cases, where the condition makes its presence known in infancy, it has been in existence since birth. Ballantyne[30] notes two cases where the

[30] BALLANTYNE, J. W.: "Manual of Antenatal Pathology." Two vols. Edinburgh: William Green and Sons. 1902-1904.

condition was marked, and only discovered post mortem. When present at birth associated defects are common. The distension of the skull may be enormous, and even an extreme degree may be compatible with average mental activity. In the more marked cases, the diagnosis is easy. The head has a distended look, the veins in the scalp are prominent, the sutures and fontanelles are widely open, and from pressure on the orbital plates the eyes protrude in a downward direction. In the milder grades the diagnosis is impossible.

In oxycephalus, "tower skull." This is a very rare type of idiocy only occurring once in 2,000 or 3,000 cases. The condition would appear to be really one of hydrocephalus in which, for some unknown reason, enlargement takes place only in the vertical plane.

Paralytic Idiocy.

This is a very common condition, and may be congenital in origin, or develop during infancy. In the former case the paralysis tends to involve both sides of the body; in the latter case, one side only. The defect being in the upper motor segment the paralysis is a spastic one. All grades of intelligence are met with, from individuals whose physical handicap and, perhaps, a slight instability have alone caused their backwardness, to idiots of the extreme type. Epilepsy is a very common associated condition. Irregular choreic-like movements, which are increased under excitement and attempts at movement, may involve the whole body.

Epilepsy.

It may complicate any variety of idiocy, and, when it does so, tends to the production, or is associated with the onset of, early dementia, and forms a serious handicap to the child's training. Epileptics are often cruel and vindictive, and will lie with great plausibility. Many of them are liable to become violent about the time fits are due.

Considerations regarding Treatment and Management and General Conclusions.

It is desirable, if best results are to be obtained, that such children be removed from the influence of home

environment, which is generally unfavourable at a comparatively early age. Bad habits are more easily forgotten and good ones acquired, and they adapt themselves more readily to life in a community much more suited to their mental capacity. Training should be on essentially practical lines. The ordinary school course, except for the higher grades, accomplishes little, and then only should be pursued so far as will render them more useful members of the community in which their lot is cast. A large institution on the colony system provides many and diverse occupations suitable to the strength and capacity of the different inmates, and it is well to remember that a great deal of domestic and unskilled work can be done by these defectives, which, while it makes no brilliant show, is a very considerable factor in diminishing the cost of their maintenance.

The recent advances in the study of heredity due to the discoveries of Abbot Mendel, the improvement and extension of the statistical method, the work of Sir Francis Galton and the Eugenics Laboratory which he founded, the reports of the Royal Commission on physical deterioration, Poor Law, and feeble-minded, have all contributed to the awakening of public interest in the facts pertaining to national health. In an uncivilized community, natural selection has full sway, the weakly die, the strong survive. With the advance of civilization, however, humanitarian ideas gain ground, an enhanced value is added to life, more care is taken of the weak and sickly, the poor, the criminal, the lunatic, the feeble-minded, with the result that more of these survive to perpetuate and increase their numbers in succeeding generations. Now it is right that we should look after these more unfortunate members of the community. No man is responsible for the physical and mental endowment with which he started life. But acknowledging our duty we have a still further duty, that we do not saddle the generation which will succeed us with an increase in their number. Had all classes of the population continued to increase at their natural rate, the problem would have solved itself. As numbers had increased, and means of subsistence became more difficult to acquire, natural selection would again have come into operation, with a clearing out of the physically and mentally less capable. Unfortunately, however, within the last fifty years, the

healthy and intelligent of all classes of the community, the aristocracy, middle classes, and skilled artizans have reduced the size of their families almost by one half, while the less desirable section of the community still hold merrily on pretty well at their old rate. "Where the mothers and fathers have the maximum of undesirability, there is produced a maximum of children."[31]

Apart altogether from the fact that the population is now mainly recruited from the less healthy and intelligent classes we have still the further ugly factor that, in itself, the small family contains a powerful element for the deterioration of the race. As already referred to, Prof. Karl Pearson[32] and W. David Heron[33] have shown how tuberculosis, insanity, &c., tend to weigh heavily upon the elder born members of the family. We find the same in idiocy. Not only does the idiot tend to appear early in the family, but so also his parents and grandparents. Although defect tends again to appear in the offspring at the close of the reproductive period, it is of much less importance from a practical point of view. There is much less of it, and it is of a severe type, often involving early death. Further, with increase in our knowledge we might, to a considerable extent, be able to exclude it.

As regards limitation of the numbers of the mentally defective, numerous suggestions have been made—lethal chambers, sterilization, state regulation and restriction of marriage, segregation. The first is hardly worth discussion, sterilization not practicable, and regulation of marriage would certainly have its drawbacks. The Royal Commission on the Feeble-minded fought shy of restriction of marriage, and could only see their way to suggest the restriction of marriage of those persons who exhibit the congenital and incurable forms of mental defects.

Under the Mental Deficiency Act, segregation will be, to a considerable extent at least, an accomplished fact. But it would be well not to expect too much from it.

[31] HERON, DAVID, M.A. : "On the Relation of Fertility in Man to Social Status," in Drapers' Company Research Memoirs. London : Dulau and Co. 1906.

[32] PEARSON, KARL : "A First Study of the Statistics of Pulmonary Tuberculosis." London : Dulau and Co. 1907.

[33] HERON, DAVID : "A First Study of the Statistics of Insanity and the Inheritance of the Insane." London : Dulau and Co. 1907.

Segregation of the obviously defective will not result in any great diminution of their numbers. Degeneracy, on the whole, is a progressive condition. The breeding-ground of the defective lies in the class above the "obvious." The thriftless, the unemployable, the vicious, the drunkard, the anti-this and anti-that, until we can reach these, there will be no great reduction in the output of the defectives. In the discussion on the Bill before Parliament last year, much criticism was directed to the fact that accurate definitions of the conditions dealt with under the Bill had not as yet been devised. But we are no better off in the matter of insanity, and even if we set out to define consumption we would find the problem hardly one whit easier. Yet inability to define insanity or consumption does not prevent us from dealing practically with these conditions, and ought not to in the case of mental defect. The deficiency of the individual is in the great majority of cases recognizable at a glance, and in the few cases where such deficiency is associated with a normal appearance it would require to be very marked indeed before anyone would dare certify as to its presence.

Finally it would be well to consider seriously where the limitation of the family among the more healthy, capable, and intelligent classes is likely to lead us. Out of a possible six or seven children they generally have saved the two or three least sound, least stable, those who will carry their race the least far. Further, the less healthy and capable have a fertility, allowing for excess of deaths among them, one and a half times as great. It may be, unless our habits change in this respect, that defect will increase more quickly than we can afford to deal with it.

REFERENCES.

Many references have been given as footnotes in the text. The following will be of service to those desiring authoritative descriptions of the various types of idiocy and imbecility and consideration of the problems connected with these classes of defective children :—

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SHERLOCK: "The Feeble-minded." London: Macmillan and Co. 1911. 8s. 6d. net.

SHUTTLEWORTH, G. E., and POTTS, W. A.: "Mentally Defective Children: their Treatment and Training." Third Edition. London: H. K. Lewis. 1910. 5s. net.

TREDGOLD, A. F.: "Mental Deficiency." Second Edition. London: Baillière, Tindall and Cox. 1913. 12s. 6d. net.

For lists of special institutions undertaking the care, control and training of mentally defective children, see the following:—

Appendix to Dr. C. Paget Lapage's "Feeble-mindedness in Children of School Age." Manchester: University Press. 1911. 5s. net.

"The Annual Charities Register and Digest," issued by the Charity Organization Society, Denison House, 296, Vauxhall Bridge Road, London, S.W.; and published yearly by Messrs. Longmans and Co. 5s. net.

"Human Derelicts," edited by Dr. T. N. Kelynack, ch. v. "The Feeble-minded," by Dr. Reginald L. Langdon-Down. London: Charles H. Kelly. 1914. 5s. net.

IV

THE EPILEPTIC CHILD.

BY

ANDREW FERGUS HEWAT, M.B., M.R.C.P.EDIN.

University Clinical Tutor in the Medical Wards of the Royal Infirmary, Edinburgh.

WE know from published statistics that epilepsy in childhood is a common disease. Sir William Gowers states that three-quarters of his cases occurred in patients under 20 years of age. Epilepsy may show itself in diverse ways in children, and for this reason it is very difficult to get a correct estimate of the number of epileptic children in a country or district. Adult patients may show very marked epileptic attacks who, during childhood, exhibited curious anomalous symptoms which were not noticed or were passed over as of little consequence. These patients, when children, in all probability showed pre-epileptic attacks, such as slight faints, periods of mental lassitude, &c., which are often considered to be abortive epileptic attacks. The whole subject of epilepsy is still shrouded in darkness, for, if we are perfectly frank with ourselves, we must confess that the etiology and pathology of the condition is, in the idiopathic type at least, of a highly conjectural and speculative nature.

THE CLASSIFICATION OF EPILEPTIC CHILDREN.

Before embarking further on the study of epilepsy in childhood it is necessary to have some classification of cases as a working basis. It will occur to everyone that a primary, simple clinical classification may be taken

from the point of view of the child's mental state. We have two great classes of child epileptics, viz.: (1) Mentally deficient children who are subject to epileptic seizures; (2) epileptic children who do not show any marked or obvious mental defect. In brief, the sane and the imbecile or insane epileptic.

It will, however, be granted on all hands that, generally speaking, children who are epileptic without obvious mental defect show gradually a mental deterioration as the disease progresses. The large proportion of those cases treated in institutions ultimately reach the stage of dementia. We know of outstanding examples of epileptics in history who were endowed with great mental capacity, *e.g.*, Julius Cæsar, Mahomet, Napoleon, &c., but they are the exceptions.

It is a lamentable but true confession that the prognosis of epilepsy is bad, and neurologists at present agree that most hope of progress seems to lie in the careful investigation of family histories, and in the recognition during childhood of those subtle symptoms which point to a neuropathic diatheses or to a pre-epileptic state, frequently termed "epileptic equivalents."

Causal Factors.

The causation of certain types of epileptic seizure in children is very obvious; in others no discoverable cause can be detected. The causal factors may be classified thus:—

I.—Epilepsy may arise from some form of cerebral lesion in a child who is mentally defective, or it may be a symptom of brain lesion in a child who is apparently mentally normal. Under this general heading may be included, according to Tredgold's classification: (*a*) Mentally defective children who suffer from some cerebral lesion and develop what may be termed secondary epilepsy. Amongst such cerebral lesions we find acquired and congenital palsies, hydrocephalus, encephalitis, thrombosis, embolism, hæmorrhage, intracranial tumours, cerebral syphilitic lesions, traumatism during birth, &c. (*b*) A child may suffer from any of the above diseases or accidents and yet remain mentally

clear, but subject to epileptic attacks of some kind. It is worth while remembering that children may suffer from a considerable cerebral lesion producing extensive paralysis and yet remain mentally efficient. If, however, to this is added epileptic seizures, then there is an undoubted tendency towards gradual mental deterioration. It is very difficult to say why one child has an extensive paralysis and no mental defect, and another child with a similar state of paralysis has marked mental deficiency. In all probability this difference depends largely on two factors: (1) The age of the patient, and (2) the presence or absence of a hereditary neuropathic diathesis. As Tredgold points out, the sooner an injury occurs after birth the more chance has the brain of compensating for the damage done by the development of its embryonic cerebral cells.

II.—The group of cases which suffer from primary amentia in which epilepsy occurs as a complication. This embraces a vast number of epileptic children, and it is interesting to note that the more marked the mental defect is the more frequently is epilepsy seen as a complication. Mongols are usually free from epileptic attacks. The exact etiology of this type of case is shrouded in the midst of the obscurity which surrounds the true idiopathic epilepsy, but it is generally granted that the most frequent cause of amentia is undoubtedly a neuropathic inheritance. This is a subtle process which has, doubtless, been fully dealt with in other chapters. Short reference will be made to it immediately, as it affects epilepsy.

III.—Idiopathic epilepsy may or may not produce definite symptoms of amentia. In this class are placed all those unclassified cases where no cause for the seizure or abortive attacks can be determined. Although no actual cause of idiopathic epilepsy has yet been determined, many interesting and suggestive facts have been unravelled from the tangle of dubiety and uncertainty which surrounds this complex subject.

Neuropathic Inheritance.—It is conceded that the greater number of patients suffering from idiopathic epilepsy show a definite neuropathic heredity, and it thus becomes a matter of some moment for those working

among children to realize that they have opportunities to study early signs of epilepsy in connection with a neuropathic diathesis. It is, therefore, fairly common to find the parents of epileptic children suffering from migraine, neurasthenia, hysteria, and other functional nerve troubles. The children of such parents have a tendency to develop a weakened nervous tissue which is lacking in its power of control, and is easily upset by trifling influences of an irritative type. This weakened cell-tissue becomes chronically irritated, and shows itself in the development of the neurotic child, which may even go a step further and become an epileptic or even an imbecile. If such neuropathic or epileptic children grow up and marry, the weakened nervous system is handed on, and the chance of producing imbecile epileptics is increased. Along with this hereditary predisposition there is, during childhood, a very rapid cerebral development, both anatomical and functional. Another potent factor in the production of an epileptic child who has a hereditary weakened nervous system is the question of environment. Many such children are brought up in an atmosphere of nervous tension and strain, which prevents any chance of their weakened brains developing a measure of stable equilibrium. Other factors play an important part in the production of an enfeebled nervous system, viz., alcoholism, specially on the part of the father at the time of conception. Such a condition is supposed to give a devitalized power to germ cells, which will show in the offspring as deficient mental equilibrium.

Tuberculosis has recently been shown in two series of statistics to have a distinctly prejudicial effect in the way of producing mentally feeble offspring.

Insanity in the family is, of course, considered a potent factor under the head of hereditary causes.

It should be borne in mind that too much must not be made of the hereditary origin of the disease, for few can go back more than three or four generations, and after that numbers mount up so quickly that by counting back to the twenty-first generation we must have had about one million ancestors, and surely there must have been some epileptics amongst them!

Convulsive Attacks.—When dealing with children it might be well to consider next the relationship of convulsions, so called, to epilepsy. There is a popular belief that most epileptics began their troubles by having convulsions when infants, and the converse is often considered to be true, viz., that children who have infantile convulsions develop epilepsy later in life. Convulsions in infants may be a reflex expression of some removable irritant, or they may be symptomatic of some gross cerebral lesion. It is, therefore, impossible to say at once if a case of convulsions will produce epilepsy or not. Gowers states that 12 per cent. of epileptics had convulsions at some time during infancy, and Osler puts the figure as high as 40 per cent. It seems that the most satisfactory way of dealing with children who suffer from convulsions is to make every effort to determine the cause, and, failing that—especially when the child takes convulsive attacks rather frequently at irregular intervals—to classify the child as a potential, if not an actual epileptic. This applies especially to children of a neuropathic stock.

Congenital Syphilis.—The relation of syphilis to epilepsy is an obscure problem, if we are to make our deductions from the presence or absence of a Wassermann reaction. If we look at it from a purely clinical standpoint we find few cases of epilepsy, with or without mental defect, showing definite syphilitic stigmata. Oppenheim is of opinion that idiopathic epilepsy is not infrequently caused by acquired and inherited syphilis. This statement was made on clinical grounds.

If we now turn to the question of the Wassermann reaction as a determining factor of the syphilitic origin of the disease we are met by the most diverse views. One series of Danish observers found one positive case out of 259, while Fraser and Watson in this country found a positive reaction in over 50 per cent. of cases of mental defect and epilepsy in a series of 100 cases. Among their conclusions the following is worth quoting: "Syphilis is also the main causative factor in the production of that type of epilepsy which manifests itself at early ages. Syphilis is present in an equal degree in those cases in which the epilepsy is asso-

ciated with mental deficiency, and in cases where no apparent mental defect exists." From the above it seems highly desirable that further investigations should be carried out to determine more accurately the *rôle* of syphilis in relation to epilepsy.

Toxic Factors.—Epilepsy may first show itself in children who are convalescing from an acute infectious fever. Such a cause as this has been noted under the heading of gross cerebral lesions, but many cases occur where no definite encephalitis has been discovered, and no special mental impairments noted. Among the fevers scarlatina seems to be the most frequent cause of producing epilepsy. It has been noticed that in about 50 per cent. of cases which develop epilepsy after an acute fever there is a strong neuropathic diathesis. It may here be noted that when epileptics develop an acute fever there is usually a subsidence or temporary remission of the fits.

Nocturnal Conditions.—The relationship of sleep to epilepsy calls for some comment. Many epileptics never have a fit while awake, but develop attacks during the night, or during the day if they fall asleep. The reason for this is as yet quite obscure. It has been suggested that cerebral anæmia, a diminished inhibitory control or variations in the alkalinity of the blood, may account for this state of affairs. There is no very definite proof in favour of any of these theories.

Traumatism.—Injury has already been noted as a cause of epilepsy producing some definite cerebral lesion, but cases occur from time to time where patients develop epileptic attacks after an injury to the head, and where no local symptoms or sign of brain lesion can be detected. The relationship between the fall and the development of epilepsy is often puzzling when the epilepsy comes on months or years after the injury. Aldren Turner points out that most of his cases of traumatic epilepsy without organic lesions arose two to three months after the injury, and he thinks that if more than a year elapses between the occurrence of the trauma and the fit it should be considered as due to some organic cerebral condition and not due to an idiopathic epilepsy brought about by the trauma.

Neurotic Constitution.—We find amongst children of a neurotic type that mental excitement, fright, mental strain at school, &c., may bring on an epileptic attack, which is the first sign of a definite epileptic mental state.

Reflex Influences.—The so-called reflex origin of epilepsy must be considered. In an article on epilepsy in childhood, J. H. Lloyd, of Philadelphia, writes thus: "We do not hear so much about the reflex origin of epilepsy as we once did. We are no longer refracting eyes, cutting off foreskins, casting out worms, and lancing gums with the assurance which once possessed us." This is very true, but we must examine all epileptics with care to remove any obvious cause of irritation, not, perhaps, to cure the epilepsy but to reduce peripheral irritation as much as possible, with a view to lessen irritation of the weakened cerebral tissue.

Masturbation and other evil practices of childhood have frequently been cited as causative factors in the production of epilepsy, but they should be regarded more as stigmata of an enfeebled nervous system which has a diminished power of control.

Stigmata of the Epileptic.—It may be well here to mention briefly the so-called "stigmata" of degeneration which should be looked for in cases of epilepsy. These stigmata may be classified according to Turner as (1) anatomical, (2) psychical.

Anatomical Stigmata.—The vault of the palate, the shape of the ears, facial deformity and asymmetry, dental abnormalities in the form of delayed or irregular eruption of second teeth, congenital cataracts, polydactyly, syndactyly, &c. In the cerebral cortex the microscope has revealed certain definite abnormalities in cells of mental defects, viz.: (1) A numerical deficiency of cells; (2) an irregular arrangement of cells; (3) an imperfect development of individual cells; (4) a neuroglial overgrowth.

Psychical Stigmata.—These are more difficult to appreciate, and are grouped under the heading of epileptic temperament, eccentricity, precociousness, and a feebleness of judgment amounting to a definite mental defect. Mild degrees of dream states may also be

observed in epileptics. They will be more fully considered under the pre-epileptic phenomena.

Pathological Considerations.

It is not necessary to deal with the various views as to the morbid anatomical changes in epileptic brains, as there is as yet no uniform pronouncement on the subject.

The actual fits seem to depend on some abnormal brain development with lack of co-ordinated control, because fits are so much more common in mentally defective people than in individuals who are mentally clear. Normally, as Gowers points out, our cerebral cortex is in a constant state of tension ready to respond to any stimulus at a moment's notice. This co-ordinated response depends on a definite balance of equilibrium in the brain. This balancing control must be of a specially fine adjustment, and it is easy to conceive that any little abnormal stimulus or sudden shock to a cerebral cortex which does not maintain a very stable equilibrium will give rise to a distorted and disorganized liberation of energy which manifests itself as an epileptic fit.

Symptomatology.

(1) *The Epileptic Temperament.*—Children who are mentally defective in addition to their epilepsy have usually definite characteristics of temperament. It has also been noticed that epileptics who have no obvious mental derangement show very frequently a curious mental obliquity long before they gradually develop into the state of epileptic dementia. The typical epileptic temperament shows itself in a variety of different ways. The child has little power of sustained effort or initiation, the memory for recent events is impaired, he is conceited and self-assertive, and may become abnormally pugnacious and self-willed. The temperament changes from a gay joyousness to a disinterested lethargy without apparent cause and sometimes at rapid intervals. As they grow older they may become deeply

interested in religion, specially if this subject is brought much before them; their ideas of right and wrong are feeble in the extreme, and their actions do not bear out their expressed religious views.

(2) *Early Symptoms of the Epileptic State.*—Farquhar Buzzard, in a plea for the more careful early diagnosis of epilepsy, has drawn attention to certain phenomena which may be noted in patients for some years before any definite epileptic seizure takes place. He considers such phenomena should be put down as signs of embryonic epilepsy. He cites the following examples of such phenomena: (1) A sensation rising from the stomach to the mouth; (2) sudden wakening in the night at regular intervals; (3) a sudden faint in church in a person who is in sound health; (4) attack of giddiness, &c.; (5) migraine, &c.

Such a diversity of attacks raises doubt and difficulty in one's mind as to the proper value to attach to them, but they must show the following important characteristics to suggest the idea of epilepsy in the mind of the physician. (1) Each attack is absolutely sudden in onset; (2) the attacks occur when the patient is feeling perfectly well; (3) in each individual each attack is identical in character to the last, this being the most important diagnostic point; (4) in most cases the recovery is sudden and complete.

There are many other curious attacks which may develop in children of a neuropathic diathesis and should be looked on as possible precursors of epilepsy. For example, such children tend to develop at times a "dreamy state" where there is often a feeling of unreality and the child is erroneously punished for inattention. Night terrors, short phases of mental blankness, self-abuse, and, as the child grows older and nears puberty, a certain amount of dulness, irritability, inattention, even stupidity and laziness, may develop. This is apt to be misunderstood by schoolmasters as signs of genuine idleness, and in consequence erroneous treatment is meted out on this assumption. It must, of course, be remembered that many a child becomes lazy, &c., without any neuropathic tendency, but it is difficult for the uninitiated to distinguish between the two types.

Such symptoms, including also causeless sudden faints, are frequently precursors of *petit mal,* or are merely the expressions of an exhausted cerebrum.

It may seem unnecessary to lay so much stress on these rather anomalous symptoms and signs, but when it is remembered how sadly deficient is our knowledge as to the pathogenesis of epilepsy, it is safer to emphasize than to minimize such points, in the hope that early treatment may ward off further more serious developments.

Minor Epilepsy.

From these pre-epileptic phenomena we pass naturally to the various types of aura or warnings—largely of a sensory nature—which precede the full-blown *grand mal* or *major* epilepsy.

Before passing to this type of epilepsy mention should here be made of the milder form of seizure known as *petit mal,* which usually occurs without aura and is relatively a rare condition by itself as it usually occurs in patients who are subject to *grand mal* seizures as well.

In the past it has been considered too much as a definite clinical entity by itself, but is now considered more in the nature of a phase or gradation in the epileptic state and in many instances simulating an abortive major seizure. It has for its chief, and in many instances only characteristic a sudden loss of consciousness, which is seldom preceded by an aura. Such cases occur when the patient is awake. It is, of course, impossible to tell whether patients suffer from such attacks during sleep.

Accompanying attacks of *petit mal* we may observe a sudden pallor of the face, twitchings of the lips, staring or blinking of the eyes. These patients do not usually pass urine nor do they bite their tongues during a fit.

Patients suffering from attacks of *petit mal* show more characteristically the epileptic temperament than those who are subject to attacks of *grand mal.* Patients, however, who suffer from the major type develop a greater degree of dementia.

Major Epilepsy.

For descriptive purposes an attack of epilepsy major may be divided into: (1) The aura; (2) the fit itself (complete or incomplete); (3) the after-effects.

(1) *The Aura.*—In children it is relatively rare to get a typical aura. When it does occur it may come a few hours to a few days before a fit begins, or it may only last a few seconds by way of warning of the fit proper. Many epileptics suffer from vertigo, fulness in the head, tremors, excessive nervousness, or twitching of muscles, some hours or even days before the attack comes on. A large number of epileptics develop an aura just before the fit commences. This warning may be motor, sensory, vasomotor, visceral, or psychical. (*a*) A motor aura may affect a limb or limbs by producing a cramp-like feeling in the muscles and twitching may take place, or it may take the form of a dysarthria. (*b*) The sensory warnings may come through any of the special sense organs or peripheral nerves. Some abnormal sensation of light, hearing, smell, touch, &c., is developed. (*c*) Vasomotor warnings take the form of flushings or pallor localized to the face or generalized throughout the body. (*d*) Various types of visceral sensations may be developed, such as a sinking feeling in the epigastrium, a jerking feeling in the abdomen, or even a cramp-like feeling of pain. (*e*) The psychical sensations vary considerably in each individual and have to some extent been described under pre-epileptic phenomena. The dreamy state is probably the most frequent type of such phenomena, and children who suffer from such sensations frequently complain of feelings of great dread or fear. They feel that something indescribable is going to happen. All the above-mentioned sensations described under the term aura may be present without the patient developing a full major attack. On the other hand, most epileptic children have no warning whatever, and the major fit develops at once with startling suddenness.

The Epileptic Attack.—It is not necessary to describe in detail the features of a full-blown epileptic fit. Suffice it to say that the patient suddenly loses consciousness

and his whole musculature is thrown into a tonic spasm. He may emit a cry. The face becomes livid, the chest is fixed, the corneal reflex is abolished, and he may pass urine or fæces. This state is maintained for about half a minute—sometimes longer—and then the clonic stage develops in which the body is shaken by severe generalized muscular spasms, as if a strong current of electricity was being suddenly passed into the body. During this stage the tongue may be bitten and bloody froth comes from the mouth. The spasms gradually become less frequent and less intense until they stop altogether. During the clonic stage the face returns to its normal colour, and breathing becomes quickly re-established. The patient frequently drops off to sleep without fully regaining consciousness, and finally awakes in a dazed and exhausted condition. Occasionally there may be definite weakness present in certain muscles.

It is of the utmost importance to grasp the significance of incomplete attacks, for their occurrence, as has already been pointed out, may be easily missed and treatment in consequence will be begun too late. Such incomplete attacks may show themselves by the patient developing a stuperose state for a few seconds, or complete muscular relaxation may take place causing him to drop things out of his hands, sudden falls with turning of the head to one side, but no convulsive movement may take place. Occasionally the patient may become violent for the moment.

Status Epilepticus and Post-epileptic State.

The type of epilepsy known as "status epilepticus" is the most severe form of the disease known. The essential feature of the condition is a series of severe convulsions occurring one after the other in such rapid succession that the patient does not return to consciousness between each attack. The exhaustion that follows is severe. The condition at times causes death.

The mental and physical state of a patient after an epileptic seizure varies enormously and depends in many instances on the character of the seizure.

Mental State.—After a typical fully developed seizure

the patient remains in an exhausted mental state for some time. Frequently, after minor attacks, there is present a dreamy state which exhibits itself by lack of power of concentration, impulsiveness, and frequently by silly and baby-like acts. It is always to be remembered that patients who suffer from these minor attacks show the epileptic temperament more markedly after the attack is over.

More severe mental abnormalities may develop which Turner classifies under four headings, viz.: (1) Acute epileptic dementia; (2) acute epileptic mania; (3) transitory delusional states; (4) post-paroxysmal automatism.

(1) *Acute Epileptic Dementia* develops most frequently after severe seizures or an attack of status epilepticus.

(2) *Acute Epileptic Mania* is of rarer occurrence and may show itself in various degrees of intensity from mere excess of mental activity up to wild excitement of a violent type. Patients who have *grand mal* seizures at long intervals seem to be more prone to such attacks.

(3) *Transitory Delusional States.*—A certain number of patients may develop slight temporary delusional states as to food, friends, &c. There may not even be delusions, but only a temporary weak-mindedness, where the patient shows obvious lack of cerebral control indicated by giggling and unfitness to resume work.

(4) *Automatism.*—After an attack patients may perform certain curious automatic actions, such as unbuttoning of clothes, &c., or the patient may go into a state of wandering.

Physical Signs.—Physical examination of the patient just after a major attack will show certain well-marked features, viz.: (1) Knee-jerks may be abolished after a severe fit with much coma. This is followed later by some increase in the jerks; (2) the plantar reflex varies according to the severity of the fit and the depth of the coma. After an attack of status epilepticus or severe major seizure Babinski's sign is present. It is also present in those cases of epilepsy due to some infantile cerebral lesion, and this fact may be of some diagnostic help in determining the presence or absence of an organic brain lesion in an epileptic. In such cases

abdominal and epigastric reflexes are abolished; (3) paralysis or weakness in certain muscles after a fit is over may have some localizing value if the case be one of Jacksonian epilepsy. Its diagnostic value in idiopathic epilepsy is doubtful. The eyes may be affected by showing motor paralysis or occasionally nystagmus. Amblyopia, particularly for certain colours, has been noted. Deafness, inability to smell and taste are mentioned amongst the rare after-effects of epilepsy.

Idiopathic epilepsy is considered to be a disease varying in degree rather than type, for we find patients who have had long remissions from major fits reporting themselves as cured when on a little investigation it is seen that they still have minor attacks of faints, or loss of memory, or intense headaches, or even a definite aura, which has gone no further. Such attacks are to be considered abortive epileptic attacks. Symptoms of an incomplete major attack without aura show considerable diversity of type. For example, the patient may perform some simple movement in a purely automatic manner quite oblivious of the fact himself.

Differential Diagnosis.

When a physician sees a typical seizure no difficulty in diagnosis need arise, but when he has only the friends' account of the attack to go by he usually is in a state of considerable dubiety as to the nature of the fit.

The following conditions may more or less simulate epilepsy: (1) *Simple syncope* may resemble some phases of epilepsy, but in such cases the attack comes on in a patient of feeble health where there is some exciting cause; he feels faint for some time, and this is associated with a feeble heart. Fainting fits come on more gradually than epileptic fits and a patient may partially recover from a faint to slip back again on sitting up. The corneal reflexes are not abolished and sphincter control is seldom lost. (2) *Aural vertigo* may be distinguished from epilepsy by noting that loss of consciousness is rare, that vomiting is common, and the vertigo persists after the fit is over. A change of the body or head aggravates aural vertigo. (3) *Hysterical fits* are fairly common about puberty and

may develop in epileptics. In such cases the treatment of the hysteria is to be ignored. Hysterical fits have a purposive like action totally different from the strong tonic spasm of epilepsy, they last longer, and are less intense, they show no strong deviation of eyes and head, there is no blood-stained froth at the lips, and the corneal reflexes are present. (4) *Simulation* of an epileptic attack may be practised, but the patient cannot produce such well-marked signs as immobility of the pupils, cyanosis, post-epileptic stupor, &c. (5) *Convulsive seizures* simulating epilepsy may be developed in the course of uræmia, lead poisoning, and other toxic states. They can easily be differentiated from epilepsy by remembering their possibility and examining for the disease itself.

Prognosis of Epilepsy.

This is a gloomy subject, because the greater proportion of child epileptics gradually develop into a state of dementia. Others, of course, who have some obvious mental defect gradually become weaker mentally, although the epilepsy may be ameliorated. It is said that in about 10 per cent. of epileptics a "cure" is effected. This leads us to consider what is meant by a cure. It would be better to say the disease had been "arrested" instead of cured. Aldren Turner says that it is "unsafe to regard as cured any case of epilepsy in which the seizures have been in abeyance for a period of less than nine years after the disease has been satisfactorily established." One is apt to think that cures in childhood are more frequent than is the case, because children are liable to remissions of seizures which may re-assert themselves towards puberty. A patient may show a definite cure as to fits but still possess some mental kink.

Prognosis is less favourable in children who show definite signs of the disease before the age of ten, in cases where treatment has been long delayed, and in cases suffering from minor attacks rather than major attacks. The severity of the attacks seems to bear no special reference to the prognosis. Children of markedly neurotic parents have a greater chance of becoming con-

firmed epileptics than those who have no neuropathic tendencies.

The mental outlook varies with the type of seizure. Many may have major seizures fairly frequently and yet remain clear, but most cases that develop minor seizures show some mental impairment. Long remissions from attacks may take place and may be looked on with favour. Diurnal fits are more amenable to treatment and give a larger number of arrests than nocturnal fits. Epileptics in whom the fits have been arrested are never secure from falling back to their previous state of recurring fits.

Treatment.

The treatment of epileptic children has been a puzzle to many generations of physicians. Types and causes of epilepsy vary so enormously that no two cases can be treated in exactly the same way. From the therapeutic point of view, we may class epileptics in two sections: First, those patients who are obviously mental defectives, imbeciles, or idiots; secondly, those children who have no very marked mental defect.

The treatment of the first class of case is along the usual lines of treatment for any amentia depending on the degree of the mental abnormality. Idiots who are epileptics are placed in idiot asylums where all effort at education and training is directed to teaching them how to attend to the calls of Nature, keep themselves clean, feed themselves, and signal for simple wants. Imbeciles can generally be trained to look after themselves in these elementary points, and further training may develop their brains sufficiently to make them do simple routine manual work.

In the case of "defectives" considerable progress can be made in the way of education. It must be remembered that such patients have very feeble, if any, power of initiation, and most effort has to be directed in trying to improve this power. This can best be attained by appealing to all their sensory functions as much as possible. In this way interest may be aroused and mental development take place slowly.

Many mentally defective epileptics are treated at

home, and it is essential that treatment should be commenced as early as the condition is diagnosed. In these modern days, when the laity know so much about medical matters, a physician is well advised in telling the truth completely to the parents of a "defective" child. In this way a much more systematized form of treatment can be carried out by the co-operation of the parents and the physician.

When it comes to school-training such children divide themselves up into two groups: one group, including the faciles, who lack initiative, the other, including the tricksters, who are excitable, impulsive, and full of mischief, but have no power of attention. The latter type more frequently suffer from epilepsy, and require bromides at times. The educational effort in the first group, speaking broadly, means a cheering-up process by means of romping games, music, physical exercises, &c.

The other group requires specially systematized movements, which can be derived from various types of kindergarten work. They require more individual attention.

Such, in brief, are some of the general principles laid down by Tredgold for the training of such children. In conversation with Dr. Clarkson, of Larbert, he remarked that little can be done for these epileptic children, because they gradually develop to an advanced stage of dementia, and the best treatment for them is undoubtedly fresh air, regular food, and training in kindergarten work, &c. In the excitable type much benefit may be got by a persistence for many years of small (10 gr.) doses of bromides.

We must now take up the treatment of the epileptic child who does not show any obvious mental defects apart from a degree of backwardness or stupidity at certain times.

Treatment of such cases will be discussed under the following headings:—

(1) *Neurotic Children.*—In neurotic children who show any hereditary tendency to fits of insanity great care should be taken to bring them up in regular habits with as little excitement as possible. The physician

must impress upon the parents and school teachers the necessity of not forcing the child at his lessons, and, of course, no corporal punishment of any kind should be administered. Light food, regular hours, plenty of outdoor exercise, with full hours for sleep, are essentials for such children.

(2) *The hygienic treatment* with its necessary regime is probably the most important item in the treatment of the epileptic child. A complete physical examination is essential so that any source of peripheral irritation may be removed. The child may be treated at home or in an epileptic colony. In pronounced cases the colony system is much the better. The hygienic advantages of such a system are obvious. The child gets a maximum of fresh air, exercise and work under the most careful supervision, and there is no competitive stimulus, which is so deleterious to such patients. It is clearly quite impossible to lay down definite rules as to regime, because patients differ so enormously. Regularity in everything is the keynote to successful treatment. The mind and body must be constantly occupied with appropriate exercise between the regulation resting time. The child must not be allowed to lie fallow.

(3) *The dietetic treatment* is intimately associated with the hygienic treatment. In epileptics we frequently find that when left to themselves they are very careless about their food. They eat too much, too rapidly. This produces intestinal irritation, and may set up auto-intoxication, which by many is considered to be a very potent cause of epilepsy. The patient must, therefore, eat nothing which will disturb the unstable equilibrium, and so arrange his diet that he requires to take a minimum of bromide. He must, therefore, take food free from purins, and restrict his intake of salt as much as possible. The following rules, given by Hunt, should be adhered to: (1) Eat slowly, and rise from table with an appetite; (2) the heaviest meal should be at noon, the lightest at night, nothing should be eaten between meals; (3) he must not eat anything fried, no indigestible dishes, no liver, sweetbreads, hotbreads, veal, pork, candy, cake, pastry, and

no fruits or vegetables containing indigestible seeds; (4) he must drink only milk and water. His diet must, therefore, consist of fish, eggs, milk, cereals, butter, bread, potato, fruit and other vegetables. The absence of salt can be compensated for by adding the bromide to the food, or putting in some vanilla flavouring. This line of treatment certainly reduces the frequency and severity of the major attacks, but does not affect to any marked extent minor seizures. The nutrition of the patient may suffer or bromism may develop. In such cases some salt must be allowed.

(4) *Drug Treatment.*—No drug is a specific for epilepsy. Most authorities believe that some salt of bromide has a beneficial effect on patients who suffer from major attacks, in the way of lessening the severity and frequency of the seizures. This is probably true in early cases which are put under a good *régime* at once. In confirmed cases of epilepsy no drug is of much value. Bromides are apt to set up symptoms of bromism, and may also cause mental disturbances, *e.g.*, loss of memory. It is generally admitted that smaller doses of bromide are more efficacious than the larger, and this is specially the case when the sodium chloride intake is restricted. A few practical points about the giving of bromides may be mentioned. Sodium bromide is probably the best salt to give and may be combined with the ammonium salt. The bromide should be given in relation to the fit, if possible. For example, if patients are liable to fits at night, they should take the dose in the evening. If fits are taken most frequently in the morning, then an evening and an early morning dose should be given. Another point of urgent importance in patients who are liable to frequent seizures is to persist for a long time with the bromides—years perhaps—because it has been noted that a sudden cessation of treatment may produce a status epilepticus and death. Sodium biborate may be combined with the bromides. A bromide rash may be prevented by adding a few minims of liquor arsenicalis to the bromide. Tincture of digitalis along with the bromide has been frequently used with considerable success to patients who suffered

from irregular or feeble hearts. Many epileptics are anæmic, and in such cases iron must be given. Zinc valerianate, belladonna, ergot, opium, have all been tried where bromides have failed. Patients who show any sign of thyroid insufficiency may show remarkable benefit by the administration of thyroid in some form. Within the last few years crotalin (a preparation of dried snake venom) has been used in 1/20 gr. to 1/200 gr. doses with varying results. It has been tried more in adults than in children, and opinions differ so widely as to its value that no opinion can as yet definitely be expressed. Spangler has published several series of cases which show that in the treatment of adult cases considerable benefit has been derived from the treatment.

(5) *Educational Treatment.*—This is a vital question in the treatment of epileptic children. As Turner points out, there are many degrees of epileptics. Very special care and attention must be directed to them according as their mental state is clear, hazy, or essentially heavy. The first essential, therefore, is to have a thoroughly trained teacher co-operating with a physician. Education authorities now fully realize the special needs in the training of epileptics and provide special teachers and classes for such cases. Secondly, the education should be very largely through all the special senses, and in this way the brain develops more steadily and mental training can be undertaken with greater success. Thirdly, in many epileptics it is quite unnecessary to give special attention to the education, provided the mental state between the fits remains clear. Such children, however, should not enter for any school examinations. Many epileptic children cannot be taught any intellectual work, and in such cases all efforts must be brought to bear on teaching them simple manual labour —preferably in the open air. If this is associated with due rest and play, much improvement can be hoped for and even unpromising cases may be taught elements of reading, &c. Fourthly, much benefit is to be got by giving a child change of work from time to time, especially when school work is alternated for outdoor interest and amusement. The child must do no

competitive work and must never receive corporal punishment.

Finally the teacher and the physician must remember that years of careful tuition may be wiped out by one or two severe fits and the work must be done all over again.

(6) *The surgical treatment* of epilepsy is too extensive a subject to be discussed here. It is now generally admitted that the hopes expressed at first as to its value have not been altogether realized. In cases where there is any obvious cerebral lesion causing the fits an operation may relieve the condition. If any operation be undertaken it should be followed by a careful and prolonged dietetic and medicinal treatment.

As to the treatment of the fit itself, it should be noted that some epileptics can arrest a fit when they get sufficient warning; for example, by rubbing a tingling limb, biting a finger, &c. Nitrite of amyl has been tried in patients who have a warning pointing to some circulatory abnormality. When a major fit has developed the physician's treatment may be summed up in two words —masterly inactivity. The patient is laid flat on the floor, any constriction around the neck is loosened, care is taken to prevent the patient injuring himself, and a piece of wood is put between the teeth to prevent him biting his tongue. If the fits occur during the night precautions must be taken to prevent the patient suffocating himself. If the patient develops symptoms pointing to status epilepticus the bromides should be increased, and, if the status epilepticus develops, chloroform and strychnine may be administered by inhalation and hypodermic injection respectively.

REFERENCES.

The following are the chief homes and colonies available at present for epileptic children :—

At the County of London Colony for Epileptics, Ewell, Surrey, patients are admitted under the Lunacy Act of 1890. Part of colony has been set aside for male private colonists above the age of 16. Terms for those claiming: County of London, 18s.; others, £1 1s. per week; application to be made to the Medical Superintendent.

The David Lewis Colony, Sandlebridge, Alderley Edge, Cheshire, has 200 beds, and a certain number of children and adolescents are admitted. For particulars apply Secretary, Barton Arcade, Manchester.

The Lingfield Epileptic Colony, Surrey, takes epileptics of both sexes between the ages of 7 and 12 years. Admission is through the Education Authorities and Boards of Guardians, at from 14s. a week, and private cases from 15s. a week. Particulars from the Medical Superintendent, The Homestead, Lingfield, Surrey.

At Margaret Manor, Sittingbourne, Kent, suitable cases of men, women, and children are admitted, from 17s. 6d., and are kept under a fruitarian diet.

The Meath Home of Comfort for Epileptics, Westbrook, Godalming, has 78 beds for women and girls. A limited number of members of Girls' Friendly Societies are admitted at 10s. 6d. per week. There are some beds for ladies, £1 1s. to £2 2s. per week.

The National Society of Epileptics, Chalfont Colony, Bucks, has 310 beds. Approved patients are received at charges of 14s. per week for children. Particulars can be obtained from the Secretary, at Denison House, Vauxhall Bridge Road, London, S.W.

St. Elizabeth's Roman Catholic School for Epileptics, Much Hadam, Herts, is certificated by the Board of Education, and admits boys and girls and female adults.

The Starnthwaite Epileptic School takes boys under 12. Particulars from the Secretary, Highgate, Kendal.

It should be noted that children who are epileptic as well as being mentally defective may be sent to the homes for the training of mentally defective children.

A list of Colonies and Homes for Epileptics will be found at the end of Dr. A. Hume Griffith's chapter on "The Epileptic" in "Human Derelicts." Edited by Dr. T. N. Kelynack. London: Charles H. Kelly. 1914. 5s. net.

The following works will be found of service for reference:—

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OPPENHEIM, H. : "Text Book on Nervous Diseases," vol. ii. Otto Schulze. £2 2s.

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The following articles in recently published journals will be of service for reference :—

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CLARK, L. P. : "The Prevention of Epilepsy." *New York Medical Journal*, December, 1912.

FRASER and WATSON : "The Rôle of Syphilis in Mental Deficiency and Epilepsy." A Review of 205 cases. *Journal of Mental Science*, October, 1913.

HUNT, E. L. : "The Treatment of Epilepsy." *New York Medical Record*, August, 1911.

LLOYD, J. H. : "Epilepsy in Childhood." *Archives of Pediatrics*, June, 1913.

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V

CRIMINAL CHILDREN.

BY

WILLIAM C. SULLIVAN, M.D.

Medical Superintendent of Rampton Criminal Lunatic Asylum, Lincoln; late Medical Officer H.M. Prison, Holloway; formerly Clinical Assistant Richmond Lunatic Asylum and Deputy Medical Officer H.M. Prisons at Liverpool, Parkhurst and Pentonville; author of "Alcoholism: A Chapter in Social Pathology."

In considering the relation of mental defect to anti-social conduct, it has first to be remarked that all conditions of arrested or perverted development of the brain, as interfering with the adaptation of the individual to his social environment, must involve some predisposition to criminal conduct, to the doing acts which the law forbids, or to leaving undone acts which the law enjoins. And it is, of course, well known that, as a matter of fact, weak-minded persons do very often commit more or less grave offences; simply because by reason of their inferiority of cerebral organization they fail to realize the full meaning and consequences of their actions; the idiot who sets fire to a hay-rick or a house, for the sake of seeing a big blaze, is a familiar instance of this sort of involuntary wrong-doing. In such cases there is gross and obvious defect in the intellectual sphere, which is sufficient to account for the disorder of conduct, without looking for any instinctive and emotional anomaly; and even when the criminal acts of such persons are prompted by vicious impulses, when, for instance, they are done for revenge, the intellectual deficiency is still so predominant over the affective disorder that no question arises of specifically anti-social tendencies. We do not therefore think or speak of these defectives as being distinctively criminal, and we do not need to give them separate consideration in dealing with the categories of the feeble-minded. In contrast with cases of this kind, where vicious conduct is a subordinate and occasional symptom in a condition of

pronounced intellectual weakness, we meet with other instances of mental deficiency where the congenital fault is shown predominantly in impulse and feeling, while there may be little or no obvious affection of thought. Individuals of this type usually reveal their vicious tendencies very early in life, and generally in a form which, at all events in well-marked cases, distinguishes them quite clearly, both from the ordinary imbecile and from the normal but undisciplined child. They are in a special sense criminal children, and in the mass of the weak-minded they form a distinct group, which, for practical reasons, it is customary and convenient to consider as a separate morbid variety.

Definition.

Criminal children, interpreting the term in the sense indicated in the foregoing remarks, may be defined as children who are congenitally deficient in the feelings and tendencies which in their aggregate constitute the so-called "moral sense," and who display this deficiency by incorrigibly vicious conduct. To use a term introduced by Grohmann,[1] and later in this country by Laycock,[2] they are moral imbeciles. "Associated with this defect there is frequently more or less intellectual deficiency, but not always; it sometimes happens there is a remarkably acute intellect with no trace of moral feeling" (Maudsley).[3]

Manifestations of Criminality.

When it is possible to trace back the history of the moral imbecile to early infancy, it is frequently found that signs of nervous abnormality were apparent even in the first few months of life. Thus such children are often characterized almost from birth by a morbidly irritable temper; frequently, for instance, they are persistent and frantic screamers; and they are apt to show very early a tendency to excessive emotional reaction, so

[1] Grohmann: Quoted in Nasse's *Zeitschrift für psychiatrische Aertze*, 1819.

[2] Laycock: Quoted in "The Criminal," by Havelock Ellis, p. 33. London: Walter Scott. 1890.

[3] Maudsley: "Responsibility in Mental Diseases," p. 58. London: H. K. Lewis. 1874.

that fear quickly passes into terror, and anger into rage, the paroxysm of either passion culminating not uncommonly in convulsions. These children are slow in acquiring inhibitory control; thus they are often much later than ordinary children in learning to delay the reflex response to the bladder stimulus, and many of them suffer from enuresis until adult life. Like other defectives, they may be backward in learning to speak and walk, but as a rule they do not show any departure from the normal in this respect.

As the child grows older and is brought into more complex relations with his surroundings, the deficiency in his emotional nature becomes more evident. He shows a gross moral insensibility; it is impossible to arouse in him any trace of gratitude, of pity, of affection; he is utterly indifferent to the feelings and to the opinions of those about him, and their disgust at his conduct fails to excite in him any sense of shame. An almost constant trait of the moral defective is his addiction to lying, and this is very often shown not only in telling falsehoods for intelligible ends, but also in the invention of perfectly gratuitous fables, in lying for its own sake. An incorrigible thieving proclivity is another early indication of defect, and in many instances it is manifested with characters similar to the pathological lying just referred to, so that it has the appearance of a distinct thieving impulse, a perverted form of the acquisitive instinct. Associated with this morbid tendency, or manifested independently, there is often a passion for wanton destructiveness, which may find expression, for instance, in acts of incendiarism. In some cases, again, the dominant characteristic is a love of cruelty, which is gratified by torturing animals, or bullying younger children. This morbid craving is sometimes developed in a monstrous degree, as in a case described by Sir J. Crichton-Browne, where a boy, the son of a man of high social position, "at his own earnest request was permitted to act as butcher to all the farmers on his father's estate; his favourite amusement was putting fowls and rabbits to the most cruel and agonizing deaths, and he gloried in gratuitously shooting the roes while with young."[4]

[4] CRICHTON-BROWNE, J.: "Psychical Diseases of Early Life," *Journal of Mental Science*, London, 1860.

In very many cases moral defectives show a remarkable precocity of the sexual appetite, contrasting in this respect, as Bourneville[5] has pointed out, with intellectual imbeciles, in whom sexual development is more usually retarded. The impulse is generally satisfied by masturbation, and cases have been recorded where this vice has been persistently practised by quite young children. Possibly the instinctive cruelty already described as occurring in many moral imbeciles may sometimes be connected with this early and abnormal awakening of sexual activity; there are certainly instances where the torturing and mutilation of animals by degenerates of this type appears to have a sadist origin.

With the advent of puberty the intellectual development of the moral imbecile, which up to then may have appeared fairly normal, seems in some cases to undergo an arrest or even an actual retrogression; and in such instances the emotional perversions may retain very much the same characters as have just been described, so that both conduct and thought have a stamp of infantilism. In those individuals, on the other hand, who represent the condition of moral deficiency in its purest form, the more primitive and crude expressions of morbid temper which were manifest during the years of childhood take on a somewhat different appearance in adolescence; there is more craftiness in the schemes for personal profit or revenge; malignity is gratified by more subtle methods, by methods that give moral instead of physical pain; the evil nature has not changed, but it works now through the medium of an intellect which has become capable of more complex adaptations. Of course, even in such cases, the intellect can hardly be regarded as quite normal, but the fault may be appreciable only in the lack of self-criticism and in the failure to recognize the folly and short-sightedness of conduct, which in the event must and does entail unpleasant consequences for the doer. A limited fault of this sort is perhaps to be looked on more as a reaction of the emotional defect on the intellect than as a real defect in the intellect itself, and would thus be comparable, as Maudsley[6] has pointed out,

[5] BOURNVILLE: "Encéphalites Chroniques," in Brouardel and Gilbert's "Traité de Médecine," vol. ix.

[6] MAUDSLEY, H.: "Responsibility in Mental Disease," p. 172. London: H. K. Lewis. 1874.

to the ordinary obscuring of the judgment by any intense passion. Sometimes this morbid egoism affects thought to such a degree that it leads to ideas of exaltation which amount almost to a sort of megalomania, or, again, by its clashing with the social environment it may give rise to more or less pronounced persecutory notions.

Of course, as the moral sense "is not a simple activity, but the sum of a set of tendencies" (Ribot), the character of the emotional deficiency may vary very widely in different cases, according as one or other of the constituent elements is lacking, or is imperfectly developed; and since, moreover, the form that the impulses eventually assume, and the ideas that become connected with them, are largely influenced by training and circumstance, it follows that the conduct in which moral imbecility expresses itself may exhibit much apparent diversity. In all cases, however, there is the common trait of insensibility in respect of the particular form of moral feeling involved, with an entire incapacity for experiencing shame or remorse. Individuals of this sort may be taught moral ideas, and in fact they are very ready with the names of the nobler emotions when it is to their interest to conceal their defect, but they are incapable of the feelings and impulses related to these ideas; their morality, as Schüle puts it, is purely theoretical.

The description which has been given in the foregoing remarks applies to the cases of pure moral imbecility; to complete it, it is necessary to say something of the other indications of nervous abnormality which are frequently associated with this emotional defect, and which by their special characters modify its clinical picture. Of these conditions *epilepsy* and *hysteria* are the most important. Epilepsy, indeed, figures so prominently in this connection that some authorities have maintained that moral imbecility is always of epileptic origin; and though this view does not command much support at present, the facts adduced by its defenders at all events justify the conclusion that in every case of moral deficiency careful search should be made for indications of the neurosis. Amongst these indications are to be noted, not only the occurrence of definite epileptic symptoms, such as *grand mal*, vertiginous attacks and absences, but also the existence of the epileptic temper,

characterized by sudden and extreme oscillations of humour [7] and by violent impulsiveness of a more or less distinctly periodic type. This temper may exist without other signs of epilepsy, as occurs, for instance, not infrequently in the children of the alcoholic; or its epileptic nature may be confirmed by the occurrence of ordinary convulsive attacks, which, however, in some cases may only come on when the moral and emotional perversion has lasted for years. In cases where the diagnosis has to be made solely from the character of the emotion anomaly, it will be observed, as Longard [8] has pointed out, that where there is no epileptic element the outbursts of violence that occur are not due to any abrupt and transitory change of temper, but indicate simply an exacerbation of a state of constant irritability; these outbursts, moreover, are not attended by any lapse of memory.

The association of moral imbecility with hysteria is also fairly common, and is shown, very much as we have seen to be the case with epilepsy, by the existence of a characteristic hysterical temper, as well as by the occurrence of what are generally regarded as ordinary hysterical symptoms, such, for instance, as convulsive attacks, choreic movements, and impairment of sensibility. Children whose moral deficiency is coloured by hysteria are as a rule less crudely and openly vicious than the ordinary moral imbecile; their egoism is less aggressively shown, and they are prone to the more subtle forms of malignity. Slander is their special weapon; and their fondness for it is often displayed at a very early age. One girl, for instance, whose criminal conduct brought her to prison soon after puberty, and who then had hysterical fits and distinct hemianalgesia, used when she was four years old to scratch and pinch herself until she was covered with bruises, so that she might be able to make up a plausible accusation against her nurse. In these children the tendency to pathological lying is generally very strongly marked, and is very precocious in its appearance; the elaborate and fantastic inventions of the infant will often foreshadow the frauds of the adult swindler. A proneness

[7] ASCHAFFENBERG: "Ueber die Stimmungschwankungen der Epileptik." Halle: 1906.

[8] LONGARD: "Ueber Moral Insanity," *Archiv f. Psychiatrie*, 1908.

to wandering fits, with or without alteration of personality, is also very common, and there is a notable tendency to spontaneous somnambulism. It is, of course, to be remembered that hysterical children may also present evidences of moral perversion as a transitory phase, especially in connection with disorders of the nutritive functions; in a remarkable case, for instance, of anorexia nervosa in a child seven and a half years old, reported by Sir W. J. Collins,[9] there was a development of morbid egoism, lying, deceitfulness and hypocrisy, with vicious habits, all of which symptoms disappeared when the patient's physical health was restored.

In another group of cases of moral imbecility the symptom of obsession is particularly prominent; the individuals of this class, who have what Maudsley has so aptly termed the spasmodic diathesis, are subject even in early youth to imperative ideas and impulses sometimes leading to criminal acts.

Nature and Relations of Criminality in Childhood.

From the clinical point of view the essential feature of moral imbecility is the innate deficiency or perversion of the emotional life. With this defect, as we remarked above, there may be, and generally is, some deficiency in the intellectual sphere, but this is by no means constant; on the contrary, the intelligence may be quite up to or above the average. Of course, the want of correspondence between the intellectual and the moral development, which is shown in these cases, is nowise exceptional; it is common enough to meet with clever knaves and with highly moral fools, and in contrast with the intelligent moral idiot it is quite possible to find instances of extreme intellectual weakness with a notable degree of ethical sensibility.[10] In moral imbecility, therefore, the emotional anomaly is the primary fact, and any intellectual defect that exists with it is either subordinate or is merely related by dependence on a common cause. And we must further recognize, in order to account

[9] Collins, W. J.: *Lancet*, January 27, 1894.

[10] Bucknill and Tuke: "Psychological Medicine," p. 163. London: J. and A. Churchill. 1879.

satisfactorily for the actively anti-social tendencies of these individuals, that the affective disorder involves more than a feebleness of control, that it involves also a departure from the normal, either quantitative or qualitative, or both, in the impulses that have to be controlled, and in the emotions that are associated with these impulses. In this fact we may see the intimate relation of moral imbecility to what Maudsley has termed the insane deformities of mind, to those conditions of degeneracy where innate fault of organization is expressed not only in the discord of the more complex intellectual combinations, but also, and perhaps more characteristically, in disorder of the processes that underlie the cœnæsthesis. This affinity, which, as we shall see later on, is also borne out by the etiology of the two conditions, is so fully accepted by Magnan [11] that he treats moral imbecility as merely a symptom-group in mental degeneracy. In confirmation of this view we may often observe cases where moral imbeciles present the obsessional symptoms of degeneracy, or where they develop transitory intellectual disorders of the same nature as those which occur characteristically in the degenerate.

Frequency of Juvenile Criminality.

While in this as in most other countries the amount of juvenile crime is very large, the proportion of it that can be attributed to moral imbecility in the offenders is probably very small. Statistical evidence bearing directly on this point is, unfortunately, not available; there is no accessible information relative to the mental condition of the children who come before the police courts; and, as the reformatory and industrial schools receive only juvenile offenders who are certified as mentally sound, figures dealing with the inmates of these institutions, if any such figures were forthcoming, would not be valid in this inquiry. But despite this difficulty there is quite enough evidence regarding the frequency of moral deficiency in the whole mass of the feeble-minded to warrant the conclusion that the children who can be denominated criminal in the sense in which the term

[11] Magnan: "Leçons cliniques sur les Maladies mentales," p. 71. 1897.

is used in this chapter are very few in number. Thus, Dr. Francis Warner, in his evidence before the Departmental Committee on Defective and Epileptic Children (1898), giving details of the examination of 45,925 boys and 41,453 girls in the public elementary schools of London, stated that amongst the children, 701 in number (370 boys and 331 girls), who needed special care on account of mental deficiency, 16 only—viz., 7 boys and 9 girls,—belonged to the class which he called "mentally exceptional children," including under this heading the morally imbecile. And the evidence taken before the Royal Commission on the Feeble-minded was to the same effect. Dr. Eichholz, for instance, H.M. Inspector of Special Schools in England and Wales, estimated the proportion of the vicious, immoral and anti-social amongst feeble-minded children as about 5 per cent.; and Dr. James Kerr, Medical Officer (Education) to the London County Council, similarly referred to them as forming a very small class; while Miss Mary Dendy expressed the opinion that not more than 10 per thousand of the feeble-minded were really moral defectives. And the statistics regarding cases of congenital mental deficiency admitted to lunatic asylums point in the same direction; thus, in the report of the Commissioners in Lunacy for 1909, in which for the first time a distinction is made in the tables of classification between moral and intellectual imbecility, the morally defective are shown as less than 4 per cent. of the total number of the congenitally weak-minded.

Even in prisons, where, of course, moral imbeciles are most likely to be met with, their number is, in the experience of the majority of observers, relatively small; more frequently, the mental deficiency which is found in a certain proportion of criminals is shown in their general mental incapacity, and is only an indirect cause of anti-social conduct. At the same time it is, of course, antecedently probable that amongst weak-minded criminals the ratio of moral defectives will be higher than amongst the weak-minded generally, and such evidence as is available supports this view; Mönksmöller,[12] for instance, in a careful investigation

[12] MÖNKSMÖLLER: "Psychiatrisches aus der Zwangerziehungs-Anstalt," *All. Zeitschrift f. Psychiatrie*, 1899.

regarding the mental state of 200 young offenders in the Lichtenberg reformatory, found that the moral imbeciles numbered 13 as against 104 feeble-minded of the ordinary type.

Causation of Criminality.

The causes of moral imbecility are to be sought in the same degenerative influences which are the common source of all forms of congenital deficiency. Their consideration, therefore, need not detain us further, as they have been already discussed in the earlier chapters of this work. It will only be necessary to add a few remarks with reference to some special features of the relation of these influences to moral defect.

From this point of view, we may first note that parental alcoholism appears to have an exceptional importance amongst the causes of this variety of innate deficiency: the latest authorities who have written on the question (for instance, Garnier,[13] Marro,[14] Bleuler,[15] Longard,[16] Maier [17]) are at one with the earlier observers in maintaining this opinion; and their views are undoubtedly shared by nearly all criminologists.

The fact that there is by no means the same agreement regarding the relation of alcoholic heredity to ordinary amentia may perhaps suggest the possibility that parental intoxications are apt to produce developmental anomalies in the emotional rather than in the intellectual sphere.

Another point of interest in the etiology of moral deficiency is the relatively large number of cases in which the causal agent appears to be some morbid influence operating during gestation. This is not uncommonly found when the moral imbecile belongs to an otherwise healthy family. In a recent personal observation, for instance, one girl out of a family of several children

[13] Garnier: "La Criminalité Juvénile," *Archives d'Anthropologie criminelle.* 1901.

[14] Marro: "I Caratteri dei Dilinquenti." 1887.

[15] Bleuler: "Ueber moralische Idiotie," *Vierteljahrschrift f. gerichtl. Medizin.* 1893.

[16] Longard: "Ueber moral Insanity." *Archiv f. Psychiatrie,* 1908.

[17] Maier: "Ueber moralische Idiotie," *Journal f. Psychologie und Neurologie,* 1908.

showed this state of moral defect in typical form; the other children were normal, and the stock was free from neurotic taint; the patient was the offspring of a twin pregnancy in which the mother aborted of the other fœtus at three months.

Diagnosis of Criminal Characteristics.

The chief problem in the diagnosis of moral imbecility is to distinguish the criminal tendencies which are the expression of a perverted or arrested development from those which are simply the result of an incomplete development. In making this distinction it is necessary to remember that we have to do with differences of degree rather than of kind; there is nothing specific about the impulses of the moral defective; they differ from the normal only in being distorted in form, and disordered and exaggerated in action. And, of course, the impulses of the ordinary child may show a wide range of irregularity and excess, without going beyond the limit of healthy variation. It is only when the vicious tendencies are notably distinct, when they are precocious in development, and are expressed in a variety of directions, and when they are unaffected by corrective influences, that we must suspect that they are due to congenital deficiency in the emotional sphere; and this suspicion will, of course, be strengthened if these impulses are marked by any morbid characteristics; if, for instance, the lying is of the pathological sort, or if the stealing is like that of the kleptomaniac. Further evidence may then be found in the intellectual development, which will usually show some degree of inferiority, at least in the power of judgment and criticism, and other nervous anomalies may be looked for, such as irregularities in the innervation of the facial muscles, choreiform movements, tremors of the limbs, squint, stammering and the like. And in all such cases we must scrutinize the history for indications of epilepsy or hysteria. Finally, we may take note of the presence or absence of physical anomalies, the so-called stigmata of degeneracy; the absolute value of these stigmata is small, but there are cases where their occurrence in marked degree and in large numbers may be allowed some weight as suggesting that emotional and impulsive disorders are due to defective organization,

rather than to temporary irregularity of development. All these points are, of course, of secondary importance to the direct evidence of morbidly vicious temper shown by the child in his home and school life, and in his relations with his playfellows and with animals, and to get that evidence satisfactorily we require, as the essential material for our diagnosis, a *complete* history of the patient from infancy.

Prophylaxis and Treatment.

More than any other class of the congenitally defective, moral imbeciles require to be dealt with by the methods so admirably summarized in Miss Dendy's epigrammatic phrase, "Detect early and protect always." They need early segregation, not only because they are likely to suffer and to deteriorate by contact with an environment for which they are unfitted, but also because they in their turn react injuriously on that environment, and are apt to become centres of corruption and disorder. And they will exercise this evil influence, of course, with even more effect on weak-minded than on normal children. On this account the institutions for the morally defective should be distinct from those for other degenerates; and this, it may be noted, was the view advocated by most of the witnesses who gave evidence on the matter before the Royal Commission on the Feeble-minded. Moreover, as the innate defect of character in these children precludes the possibility of their being turned into normally useful citizens, it is desirable that their education should be so directed that it may not at all events increase their capacity for being socially noxious; ordinary school instruction, it has been justly remarked, only makes individuals of this type more dangerous.

In some instances good results appear to have been obtained by hypnotic suggestion, at least to the extent of modifying the force and duration of vicious impulses.

From the point of view of prevention, the measures to be essayed are those which are likely to check the propagation of the congenitally defective of all classes. They have been discussed in previous chapters; amongst them the restraint of industrial alcoholism may be noted as being of special import in connection with moral imbecility.

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VI

PARALYTIC CRIPPLES.

BY

WALTER R. JORDAN, M.D.

Honorary Physician, Children's Hospital, Birmingham; late Visiting Physician, Birmingham Workhouse Infirmary.

PARALYTIC cripples are those whose disability is the result either of some lesion of the nervous motor tract or primarily of muscles. They present instances of deformity of every degree and of any distribution and of loss of power varying from a slight awkwardness of a single limb to absolute and bed-ridden helplessness.

GENERAL CONSIDERATIONS.

Numbers.—In Birmingham, in 1909, where the education authority had then to deal with some 98,000 children of school age, there were two schools for physically defective children, and at these were 232 children, of whom about 80 were paralytic. To these must be added at least 87 paralytic cripples who were attending ordinary schools, and a certain number of paralytic cripples, perhaps a dozen, who were also mentally defective and were to be found in the "special schools" of the authority, as well as some of the children who, from excessive physical or mental disability, could not be taken at any of the schools. The number of paralytic cases among these may be put down as 20, and the total estimated number of paralytic cripples thus reaches 199, bearing to the total number of children of school age very nearly the proportion of 1 to 500. There is no available material for estimating the number

of cripples among children of higher social grade. In 1911 a committee of inquiry concerning physically defective adults and children in Birmingham ascertained the existence of 728 (388 male, 340 female) cripples under 16 years of age, together with 80 more who were also mentally defective. Of 721 of these, where an exact diagnosis was made, 253 (156 males, 97 females) were found to be paralytic cripples, infantile paralysis accounting for 175 of the cases.

Types.—Among such a number of paralytic cripples, with such variety of disability and deformity, the eye soon recognizes certain types. Thus, in distribution, we have monoplegic, hemiplegic, paraplegic, and diplegic cases, while it is also obvious that some cases exhibit spasticity, some flaccidity, and some rigidity. It will be noticed, too, that spasticity is associated with definitely hemiplegic, paraplegic, or diplegic distribution, while flaccidity is more commonly found with affections of one limb or of irregular distribution; and that rigidity and contractures may be found in monoplegic, hemiplegic, or any other kind of case. Systematic clinical examination and patient investigation of the history of the cases show that the condition of the great majority of these paralytic cripples is the unredeemed or irredeemable result of certain accidents and diseases of intra-uterine life, birth, infancy, and childhood.

Lesion.—Pathologically we have to deal with lesions either in the upper segment of the motor path, the upper neuron, lesions of the lower neuron, or primary affections of the muscle fibres. Paralysis from lesion of the upper motor neuron has the distinctive features of spasticity, absence of muscular wasting, normal electrical reactions, and increase of superficial and tendon reflexes. Paralysis from lesion of the lower motor neuron has the distinctive features of flaccidity, muscular wasting, more or less complete reaction of degeneration, and loss of those reflexes whose paths are involved in the lesion. Paralysis from primary affections of muscle is characterized by flaccidity, atrophy or pseudo-hypertrophy, quantitative change in electrical reactions, and loss of those reflexes in which the affected muscles are involved.

Cerebral Spastic Paralysis.

All those conditions in which the upper neurons are the seat of disease, either as to their cell-bodies in the cerebral cortex or their axis-cylinders in the corona radiata, internal capsule, pons, or pyramidal tract, are commonly considered together under the head of Infantile Spastic Paralysis or Cerebral Palsy of Childhood. Such cases may, however, conveniently be divided into two groups: one, the birth-palsies, in which there is evidence of some degree of paralysis from the time of birth, and a second in which the paralysis is the result of some disease coming on during infancy or childhood.

Causation of Congenital Cases.—The causes which determine the initial lesion resulting in paralysis present at birth may be *pre-natal,* operating some time during gestation; or *natal,* operating during the process of birth.

Our knowledge of *pre-natal* causes of this, as of other diseases, is very limited. A certain, if infrequent, one is injury to the mother during pregnancy, which may actually injure the brain of the child. Developmental defects of the brain, themselves of unknown causation, may be associated with the condition—porencephaly, arrested development of cortical cells—and in this connection may be mentioned a hypothetical "arrested development of the pyramidal tracts." Repeated pregnancies, syphilis, specific fevers, convulsions in the mother are other assigned causes; in some cases the affection has been said to be distinctly hereditary.

The immediate cause of the strictly *natal* cases is injury to the brain during parturition. Cases of birth-palsy are often associated with premature birth. Prolonged and difficult labour was noticed as frequently occurring in the histories of such cases at the time attention was first directed to them by the well-known orthopædic surgeon, Little. In accord with this association are the established facts that birth-palsy occurs much more frequently in first-born children, that twice as many male children are affected as female, and that "the child of an elderly primipara is more liable to be

affected than is the first child of a younger woman."[1] In many of these difficult obstetric cases the use of instruments or other operative measures has been necessary, but the injury to the child's brain is to be ascribed to the abnormal conditions causing the difficult labour rather than to the measures used to overcome them. The child is often born in such cases in an asphyxiated condition, which involves further opportunity of damage. Abnormally quick labours have also seemed to be responsible for the condition.

Causation of Post-Natal Cases.—Of the causes of many of the post-natal cases we are without certain knowledge. Strümpell put forward a theory of an acute polio-encephalitis, an affection of the grey matter of the cortex analogous to that of the grey matter of the cord termed acute anterior poliomyelitis. Recent work has established the conception of an acute infective disease, which may be termed polio-encephalomyelitis, affecting the central nervous system, mainly as to its grey matter. In any one case the brain and cord may both be affected (polio-encephalomyelitis), the cord only (poliomyelitis), or the brain only (polio-encephalitis). Where the motor cortex is the area chiefly involved hemiplegia may result. While poliomyelitis and infantile hemiplegia have much the same age-incidence, a definite seasonal incidence and epidemic occurrence, which we find in poliomyelitis, have not been observed with regard to infantile hemiplegia, nor has infantile hemiplegia been found to be especially prevalent at the time of any epidemic of poliomyelitis. But the undoubted occurrence of cases of infantile hemiplegia from other causes than this acute infective disease would obscure these features. Vascular obstruction, in the veins of the surface, has also been suggested as a cause of infantile hemiplegia, but lacks positive confirmation. A certain number of cases of hemiplegia occurring in infancy and childhood is to be assigned to the same causes as adult hemiplegia—embolism, thrombosis, and hæmorrhage.

[1] TAYLOR, JAMES: "System of Medicine." Allbutt. Vol. vii. London: Macmillan and Co. 1899.

Morbid Anatomy.—It has been ascertained by *post-mortem* examination of cases dying at an early stage, and more lately by observations during surgical operations on new-born infants, that the condition which in a majority of cases of birth-palsy actually causes the paralysis is meningeal hæmorrhage due to rupture of cerebral veins from pressure on the fœtal head in difficult labours. The extent and the distribution of this hæmorrhage will determine the distribution and degree of the resulting paralysis. If it be limited to one side there will be hemiplegia; if to one side and the neighbourhood of the longitudinal fissure one leg alone might be affected, but in this position lesions are likely to be symmetrical, with resulting paraplegia. If the lesion be symmetrical and spreading diplegia will result. Advance of the hæmorrhage over the prefrontal area of the brain is a reasonable inference to explain the mental defect so frequently found associated with spastic paralysis, and more marked the wider the distribution of the paralysis.

If the case has survived some years it may be found that the blood has become altered and organized, the condition resembling pachymeningitis, or there may be porencephalus, "a loss of substance in the form of cavities or cysts, situated at the surface of the brain, either opening into or bounded by the arachnoid, and often passing deeply into the hemisphere, reaching even to the ventricle,"[2] or there may be sclerosis from compression. In cases of post-natal origin also porencephalus and sclerosis of convolutions have been found. Accounts of cases of recent origin are wanting.

Symptoms.—The essential symptoms of the cerebral palsies have already been stated. Of these the *paralysis* may vary in degree from a slight loss of power on one side as compared with the other to a condition of absolute powerlessness. The distribution may be hemiplegic, diplegic, paraplegic, or possibly monoplegic. Diplegia has been distinguished from bilateral hemiplegia; in diplegia, affection of all four limbs, rigidity is more

[2] OSLER: "The Cerebral Palsies of Children." London: H. K. Lewis. 1889.

marked than paralysis, the arm is not more affected than the leg, and the mental condition is commonly bad; in bilaterial spastic hemiplegia paralysis is more marked than rigidity, the arm is more affected than the leg, and the mental condition is not usually so bad. The lesion is superficial in the former, deep in the latter condition.

Tubby and Jones say that of 839 collected cases 510 were hemiplegic, 30 monoplegic, 142 paraplegic, 157 diplegic. They add that in their own experience they have seen a greater proportion of diplegic cases. Still[3] found in 100 consecutive cases of his own 51 infantile hemiplegia, 26 spastic paraplegia, 22 spastic diplegia, 1 spastic monoplegia.

The *spasm* like the paralysis varies greatly in degree: it is intensified by voluntary or passive movement, and in very slight cases is only to be noticed on movement. In the most severe cases there is constant rigid spasm, which prevents bending of the hips or knees, and the patient is perforce confined to bed. Where walking is possible spasm, if marked, gives rise to the typical "spastic gait," the patient walking on the toes, with the thighs adducted and knees pressing together, the body leaning forwards from the hips. In exaggerated cases we get the "scissors walk," or "crossed leg progression," in which one foot is brought in front of or right across the other before it is put to the ground. In the upper limb we get flexion of the elbow, wrist and fingers with pronation of the forearm and adduction of the thumb which is contracted across the palm.

The spasm disappears under an anæsthetic. After years of rigid spasm, unrelieved by treatment, the muscles become fixed in the contracted position and no longer relax under anæsthetic. This constitutes *contracture*.

Some cases, most frequently those of infantile hemiplegia, exhibit besides paralysis and spasm *involuntary movements*. The movement may be that known as *athetosis*, in which there is a slow, not extensive movement, often going through a set series of stages; or

[3] STILL: "Common Diseases and Disorders of Childhood." London: Henry Frowde and Hodder and Stoughton. 1912.

there may be a tremor, coarse, and even becoming violent, induced only by voluntary movement.

Of the *reflexes,* the knee-jerk is frequently exaggerated, though rigidity may occasion great difficulty in eliciting it. Ankle clonus is not often obtained. Babinski's sign (extensor plantar reflex) may sometimes be demonstrated, but it is to be remembered that this is physiological up to two years of age. There is no affection of the sphincters of the bladder and rectum, but the mental condition of the patient may delay or prevent the acquisition of normal control.

The *growth* of the paralysed limbs is often markedly affected, probably rather from disuse than from any actual atrophic influence. This is most easy to distinguish in hemiplegic cases, and is usually more marked in the arm than in the leg. The defective development affects not only the soft structures but the bones.

Convulsions shortly after birth are observed in some cases of birth-palsy, and may occasionally recur at intervals for some years or throughout life. Infantile hemiplegia, of post-natal origin, is commonly marked at the onset by a series of convulsions, and these frequently recur, presenting the general features of epilepsy.

Mental defect is found in many cases, both congenital and those which come on after birth. In diplegic cases there is usually considerable mental deficiency; in the paraplegic it is less common, and in the hemiplegic there is considerable variation. Although very extensive paralysis often coincides with marked mental defect, it is quite possible to have decided mental defect with even slight paralysis. In degree, the mental defect may vary from idiocy or imbecility with absent or imperfect power of speech to mere restlessness and mischievousness. Recurring fits still further retard or destroy mental development.

Infantile Paralysis.

Of conditions affecting the lower neuron which lead to crippling from paralysis, by far the most common is

that known as infantile paralysis, or acute anterior poliomyelitis, which is indeed the most common cause of paralytic crippling altogether. This disease is not unknown in adults, and in children is not even most common during the period of infancy, so that the familiar name is not a happy one; it is, however, firmly established.

General Features.—The onset of the disease is commonly acute, sometimes with convulsions. There is a short stage of fever, with more or less general disturbance, and perhaps pain. Within a few days paralysis of one or more limbs is observed. In some cases there are no general symptoms and the child is suddenly found to be paralysed. The paralysis continues after the general health is restored, and is permanent to some extent, but, as a rule, in some only of the originally affected muscles. Indeed it is possible for the whole of the paralysis to clear up. Muscles which remain paralysed waste. The growth of affected limbs is impaired, and they are commonly cold to the touch. It is always to be remembered that the disease may affect any muscle or group of muscles, and that the abdominal muscles and those of the spine may be affected, the latter condition accounting for many cases of spinal curvature.

Morbid Anatomy.—In cases of recent origin which have been examined *post mortem* there has been found marked hyperæmia of the anterior cornua, with thrombosis of blood-vessels and exudation of serum and leucocytes into the perivascular lymph spaces about the cells. Small hæmorrhages are found here and there. Degenerative changes in various stages are observed in the bodies of the neurons and their prolongations. It has been urged that the distribution of the changes corresponds with that of the central branches of the anterior spinal artery.

In cases of old standing the vascular changes are no longer observed: some normal and many degenerated cells are found, with possibly atrophy of the neuroglia. There is a shrinkage in size of the anterior horn and connected columns and nerve-roots.

An inflammatory process with secondary degeneration

of nerve-cells is the common explanation of the appearances, though some still hold by that of a primary cell degeneration. Hæmorrhages and thrombosis of branches of the anterior spinal artery have also been suggested to account for cases beginning suddenly without fever.

Causation.—The second year of life is that in which the greatest number of cases occur, and the frequency diminishes with each succeeding year, until after six it is of rare occurrence. There is a marked seasonal incidence, the great majority of cases occurring during the months of June, July, August and September. Many epidemics of the disease have been described, notably in Norway and Sweden in 1905, and in New York and Massachusetts in 1907 and 1909. In 1911 there were epidemics scattered about this country. The frequent occurrence of the disease with or subsequent to specific fevers has been alleged by many writers, but close investigation has failed to sustain the connection. Exposure to cold and prolonged exertion may be determining causes. Traumatism is an immediately preceding factor in some cases. The disease must now, however, be definitely classed as one of the acute specific fevers, having an incubation period of from four to seven days, and liable to be communicated from one person to another.

System diseases of the spinal cord in children are so rare that only a very occasional case of paralytic crippling will be found to depend on one of these. Friedreich's disease might furnish an example, and possibly disseminate sclerosis.

Diseases of Peripheral Nerves.

The causes which lead to multiple peripheral neuritis are not commonly operative in childhood, with the exception of diphtheria, and as post-diphtherial palsy, if a fatal issue be averted, ends in complete recovery, these forms of neuritis are not found to account for instances of cripples such as we are considering. A certain number of crippled children, however, owe their disability to injuries of the peripheral nerves, sustained either in the process of birth, or from accidents of after

life. Of birth-palsies of this nature the most common is Erb's paralysis, due to injury of the fifth, sixth and seventh cervical nerves from forcible stretching of the nerve roots in consequence of increase of the distance between the shoulder and head and neck produced during delivery.

Myopathies, or Muscular Dystrophies.

In these conditions no definite changes in the spinal cord or nerves have been ascertained, and they are at present regarded as due to congenital disorder of the muscles themselves. They are characterized by frequent occurrence in several members of one family, of the same or different generations. The muscular substance atrophies, the atrophy being either apparent or concealed by hypertrophy of the connective tissue.

The best known of these dystrophies is pseudo-hypertrophic paralysis, characterized by enlargement of certain muscles, and atrophy of others, with considerable and progressive paralysis, leading especially to difficulty in rising from a low seat or the ground and a peculiar waddling gait with lordosis. The disease advances more or less rapidly, and cases rarely pass the twentieth year.

The atrophic forms of Erb and Landouzy and Dejerine as a rule do not begin in early childhood, and their course is more slow and gradual.

Treatment of Paralytic Cripples.

Whatever the nature of the original disease the crippling in old-standing cases depends upon various combinations of the following conditions:—

(*a*) Loss of use, more or less complete, of paralysed muscles. (*b*) Loss of use of other muscles, not themselves paralysed, through inability to assume a position essential to their effective action. Retention of the finer movements of the wrists and fingers would, for example, be of little use to one who, through paralysis of shoulder and arm muscles, was unable to raise the shoulder or flex the elbow. (*c*) Assumption of abnormal positions from spasm, as in "crossed-leg progression." (*d*) Involuntary maintenance of abnormal positions through

inability of paralysed muscles to oppose the effects of gravity or body-weight or the contraction of unparalysed or less paralysed muscles: such a condition is exemplified in Erb's birth-palsy, and in some cases of lateral spinal curvature. (*e*) Contractures following (*c*) or (*d*). (*f*) Associated impairment of the growth of limbs or trunk, trophic or from disease, causing inequality of the two sides of the body.

These conditions of crippling must always be borne in mind in considering the treatment of a case, and an analysis of the present state from this point of view, with a consideration of the length of time that has elapsed since the occurrence of the original disease and of its general prognosis, will determine the limits of possible improvement by active interference. For these old-standing cases medical, as distinct from surgical, treatment has either already done the little that it could do, or will now come too late to achieve any improvement. There remains the possibility of counteracting the various elements of crippling by apparatus or surgical procedures, and recent years have witnessed great developments in the possibilities and achievements of orthopædic surgery. It is impossible here to go into the details of surgical operations, but we may indicate generally what may be done.

For a slight degree or limited distribution of paralysis, where considerable power of movement of a limb remains, a simple support may be enough to counteract the defect. An instance of this is found in the treatment of a slight talipes varus from peroneal paralysis by a rim of leather or iron on the outside of the sole of the boot, or of valgus by a rim on the inside. Another example is the application in cases either of poliomyelitis or infantile hemiplegia of a spinal support for scoliosis from unilateral paresis of spinal muscles to prevent the falling of the trunk towards the paralysed side. The simplest operative treatment for the relief of paralysed muscles is division, with or without lengthening, of the tendons of opposing sound muscles, which permits of the correction of the faulty position and the subsequent maintenance of a satisfactory position by apparatus. More elaborate, and in suitable cases more

satisfactory, is tendon-transplantation, by which a sound muscle whose unbalanced action is not only wasted but leading to actual deformity is by attaching its tendon wholly or in part to that of a paralysed one made to subserve the function of the latter. Many different methods of performing the operation have already been practised and described, and important variations are found in the artificial elongation of transplanted tendons by means of a number of strong silk threads, where they are not long enough to cover the required distance, and periosteal implantation of natural or artificial tendon where the tendons of the paralysed muscles are themselves very lax and easily stretched. By such means extensors have been made to serve as flexors, flexors as extensors, and pronators have been converted into supinators. The interesting question has been raised, What happens to the brain after such reversals of the effect of contraction of a muscle? The answer seems to be that the new use of the muscles has gradually to be learnt by the patient, until the discharge of nerve energy along the nerve fibres supplying the transplanted muscles becomes associated with the revived memory-image of the new position brought about by its contraction and dissociated from that of the former position. The stream of nerve energy has to flow to the same motor neurons, but from fresh sensory neurons.

Nerve-grafting has also been tried. This consists of the union of the distal portion of a divided degenerated nerve with a divided or longitudinally slit sound nerve trunk in its neighbourhood. Regeneration takes place in the distal portion of the paralysed nerve. This method is still very much in the experimental stage and is only applicable in a few cases.

Where there is more extensive paralysis with the production of flail-joints operations for the fixation of joints, arthrodesis, or excision, resulting in partial or complete ankylosis, may be performed. By arthrodesis is meant the denuding of a joint completely or in part of all its cartilages. The ankle and the knee are the joints on which these operations are commonly performed. The stiff straight limb which results is at any rate capable of supporting the body, and this, with the

independence of apparatus, outweighs the disadvantage of loss of the power of flexion. Arthrodesis need not be restricted to cases where all the muscles governing a joint are paralysed, but may be employed also where the paralysis is of certain muscles only. At the ankle the operation of excision of the astragalus may be found a useful alternative in some of these latter cases.

By means of fixation operations it is possible to secure greater use of unparalysed muscles which are debarred from use in the position of the limb imposed by the paralysis present. Thus the fixation of the elbow in a flexed position in cases where the arm hangs helpless but the muscles of the hand escape enables the latter to be used for feeding and other purposes. Tubby and Jones[4] prefer accomplishing this fixation by their own method of removing a diamond-shaped piece of skin from the front of the elbow and stitching the upper angle to the lower rather than by arthrodesis.

The rectification of faulty positions resulting from the unbalanced action of gravity, or body-weight, or from unilateral impairment of growth, will be met by supporting apparatus rather than by operative measures, but the deformities of spasm and contracture either from persistent spasm or long-continued unopposed contraction of sound muscles may be greatly benefited by surgical procedures. Thus, in a case of spastic paralysis with extension of the ankles and marked adduction and internal rotation of the hips, tenotomy of the adductors, with perhaps excision of an inch or so of the muscle, and division of the tendo achillis, may make it possible for a child to walk who has never before done so. Where the knees are flexed tenotomy of the hamstring muscles, with removal of a portion of tendon when it is not retracted freely, should be done by means of an open longitudinal incision; contracted bands of fascia should also be divided. The after-treatment of such cases requires great care, and abduction of the limbs by a suitable splint must be maintained for two months or longer and followed by graduated exercises

[4] TUBBY and JONES: "Surgery of Paralyses," p. 62. London: Macmillan and Co. 1903.

in the movements of the limbs, and, finally, walking with any apparatus found necessary to prevent a relapse into old faulty positions.

It has been observed that spastic cases with slight mental defect, treated by operative measures so that their power of walking has greatly improved, have frequently shown also a decided improvement in their mental condition, nor is it surprising that this should be so when we consider the extension of the field of observation and experience that follows the increased ability to move about from place to place, and the comparative freedom from peripheral irritation gained by the abolition of spasm and contractures.

Perhaps the most recent suggestion for the treatment of spastic paralysis is resection of posterior spinal nerve-roots. The theory underlying the operation is that disease of the pyramidal tract leads to increased reflex excitability, and that this reflex contraction may be obviated by interrupting the continuity of the reflex arc. In ordinary tenotomy the reflex arc is not really interfered with, but the final result of the contraction is prevented, and in this way the muscles given some rest. By the resection of posterior roots the reflex arc is divided on its sensory side and the stimuli which led to the spastic contraction no longer reach the motor neurons. A similar temporary abrogation of spasticity has been obtained by stovain injections into the cerebro-spinal fluid.[5] The operation of resection involves laminectomy and division of the nerve-roots between their ganglia and the cord. It is too early yet to say whether the results will justify so severe an operative interference.

Enough has been said to show that at the present day, by means of educative exercises, carefully adapted supporting apparatus, and the older and the more recently devised surgical operations, even severe and old-standing cases of crippling from paralysis may be afforded a considerable prospect of improvement, and that the hopeless views adopted by some surgeons and many physicians cannot be justified. There are, however,

[5] See *Archives of Pediatrics*, December, 1909, p. 931.

cases which are entirely unsuitable for operation, and these will be found mainly in the spastic group, where marked mental defect, recurring convulsions and involuntary movements contra-indicate active interference. Tubby and Jones regard also complete paralysis or continuous spasm of the hand and arm as against operation.

Preventive Treatment.

Except isolation of actual cases of poliomyelitis and antiseptic cleansing of the nasal passages and pharynx in cases and contacts, there are no known preventive measures that can be taken against poliomyelitis or any other of the diseases of the neuromuscular system which lead to paralytic crippling. It is conceivable that strict attention to general hygienic measures in infancy and childhood, and by women who are pregnant, might, by favouring general constitutional vigour, give greater resistance to the causes of some of these diseases, but immunity cannot be expected. Cases which are the result of lesions during the process of birth may be diminished in number by skilful obstetric assistance, particularly in the direction of prompt interference to shorten a labour that is becoming unduly protracted. For these natal cases a more definitely prophylactic proceeding has been practised by Harvey Cushing,[6] who operated on four infants, aged 3, 8, 9 and 3 days respectively, of whom the second and third survived. In each case bone flaps were raised, and on incision of the dura mater more or less extensive hæmorrhage was revealed, blood-clots being then removed by irrigation with warm saline solution. The indications for operation are found in the history of the labour, with the degree of *post-mortem* asphyxiation: a bulging fontanelle, perhaps so tight as to show no pulsation; convulsions, possibly unilateral in character; starting or twitching in response to any sensory stimulus; ocular palsies or unequal pupils; and in severe cases abnormality of the cardiac and respiratory rhythm. Unfortunately, such signs are often not present, and

[6] Cushing, H.: *American Journal of the Medical Sciences*, October, 1905.

their presence, the recognition of their import and the accessibility of a surgeon prepared to do a severe operation on a new-born infant must be rather a rare conjunction of events. Such operation, however, is the only active method open to us of preventing the development of spastic paralysis and amentia from intracranial hæmorrhage in the new-born.

Otherwise the preventive treatment of paralytic crippling is just the continuous and skilful treatment of a case of paralysis from the first onset of symptoms. Unfortunately, this is what such cases rarely get; some are simply neglected by parents, others are by over-anxious parents continually transferred from the supervision of one doctor to that of another, with interludes, it may be, of bone-setters and "magnetic" healers. Some practitioners, again, are frankly pessimistic, and others lack at least enthusiasm for these tedious and often disappointing cases. Yet the case which comes early and remains faithfully under the care of an understanding and active practitioner may be saved much disability and practically all real deformity.

In those conditions which have a sudden development —anterior poliomyelitis and infantile hemiplegia—the earliest indication is rest in bed and treatment for any febrile condition that may be present. In cases of infantile paralysis the objects to be attained by treatment are (*a*) the recovery of every possible muscle or portion of muscle originally paralysed, and (*b*) the prevention of deformity. For the former, after the initial period of complete rest, massage, at first general, later special to the affected muscles, and exercises for the development and control of all the unparalysed muscular tissue are our most valuable methods. Electricity is not only painful but less effective than the practice of voluntary movements. For the prevention of deformity we have to rely on apparatus, as light as possible, applied to counteract the loss of the action of the paralysed muscles and to prevent that overstretching of them which is the great obstacle to their recovery. If in spite of such correction deformities develop, or if extensive paralysis persist, the operative measures already mentioned will come under consideration.

For spastic cases, congenital or post-natal, neither massage nor electricity is needed, but passive movements to prevent contraction should be assiduously practised. Improvement will sometimes follow the wearing of apparatus to maintain the position of abduction of the lower limbs, but early operative interference is generally required, with the most careful and prolonged after-treatment, to prevent the recurrence of spasm and contracture.

For the traumatic birth-palsy of Erb the earliest treatment in cases where there is evidence of traumatic neuritis is complete immobilization in a favourable position until the neuritis has subsided. Thereafter, and in cases with no such evidence, the nutrition of the muscles must be maintained and nerve regeneration promoted by massage, hot and cold douches, and electricity, while the development of deformity must be prevented by passive movements and possibly supporting apparatus. If by the end of a year complete recovery has not taken place under palliative treatment, excision of the damaged nerve-tissue and nerve-suture may be attempted. Measures to prevent contractures and deformities and maintain the tone of the paralysed muscle must still be employed as after-treatment.

For the other occasional causes of paralytic crippling neither very special nor very promising treatment is available in the earlier stages; if contractures or deformities develop they may be treated surgically where the general condition of the patient and the ultimate prognosis of the disease seem to justify interference.

The Education of Paralytic Children.

The education of crippled children becomes a very serious problem through their often general debility, through the difficulty they find in getting to school, in moving from place to place at school, and perhaps in using pens and the like, and in many of the spastic cases through the element of mental defect. Only those with a slight amount of crippling can join with advantage the classes of an ordinary school, and this results among the poorer classes in such children being exempted from school attendance and getting no systematic education at

all. The more progressive education authorities have, however, established special schools for defective children. In Birmingham, for example, there are two schools for physically defective children, with accommodation for 200, to and from which the pupils are conveyed in vehicles by the education authority, and at which, through a scheme which is self-supporting, they get a mid-day meal. The hours are from 10 to 3 o'clock, with an interval of 1½ hours. The education given is adapted to the special disabilities of the children and departs widely from the curriculum of an ordinary school, though the attempt to teach reading and writing is always made. A school nurse attends during the hours of school and accompanies the children in the vehicles. Such schools should come into existence throughout the country, and must, obviously, in some districts be boarding schools.

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VII

TUBERCULOUS CRIPPLES.

BY

H. J. GAUVAIN, M.A., B.C.CAMB.

Medical Superintendent, Lord Mayor Treloar Cripples' Hospital, Alton, Hants.

By the term "tuberculous cripple" is implied a person suffering from arthritis or osteitis due to infection by the bacillus of Koch. Such patients form an important and exceedingly interesting group of defective children. In perhaps no class of defective children is early recognition of disease and its immediate, prolonged and adequate treatment of such importance as in this, and certainly in none is effective treatment attended with such happy results.

Tuberculous disease may, excessively rarely, be congenital. It has been experimentally shown that it can be produced through the semen, as well as through the placental circulation, but such modes of infection, according to current opinion, may be regarded as so uncommon as to be of little practical importance.

NATURE AND CHANNELS OF INFECTION.

The common channel of infection is by way of the respiratory or alimentary tracts. Much evidence has been adduced that infection, through ulcerated tonsils and thence into the cervical lymphatics, is common. Carious teeth and septic conditions of the mouth generally, by forming a suitable nidus for the growth of tubercle bacilli, and lowering the general resistance, afford easy means of entry. Infection through the

respiratory tract, especially after it has been damaged by catarrhal conditions, is common.

It is not improbable, however, that in tuberculous arthritis, infection through the alimentary canal is very common also. Such infection may, and commonly does, occur without any demonstrable lesion in the intestinal mucous membrane. The mesenteric lymphatics become involved and the infection spreads to the retro-peritoneal, posterior mediastinal, bronchial and anterior mediastinal glands. Consideration of these facts at once suggests appropriate prophylactic measures.

Infection producing crippling is usually hæmatogenous in origin, and the primary local lesion may occur in almost any part of the bone or joint, but there are certain so well-defined points of election that attack elsewhere constitutes surgical rarities. In joint infections the tuberculous process may be primarily synovial, and the disease may be limited to the synovial membrane, but probably the initial lesion, in the joints connected with the long bones, is more commonly of the nature of a tuberculous epiphysitis. In the extremities of these bones end-arteries exist and favour the deposit of bacteria in the vessel walls from whence they spread to the perivascular lymph spaces.

In the vertebræ central or sub-epiphysial origin is frequent in children; in adults sub-periosteal origin is more common. In the short long bones, such as the phalanges, metacarpal and metatarsal bones, infection in the centre, in the form of a tuberculous osteomyelitis is the rule.

The tuberculous infection may be due to invasion by either the human or bovine type of tubercle bacillus. By many the bovine is thought to be the commoner organism in surgical tuberculous lesions, and this view is supported by the researches of the Edinburgh school.[1] It is not improbable, however, that the type of bacillus varies considerably in different localities, and the pus in a large number of cases investigated at Alton appears

[1] See recent work of such investigators as Stiles, Fraser and Mitchell. Full references in "Year Book of Open-air Schools and Children's Sanatoria," edited by Dr. T. N. Kelynack. London: John Bale, Sons and Danielsson, Ltd., 83-91, Great Tichfield Street, Oxford Street, W. 1915.

to show a marked preponderance of the human bacillus. This investigation is, however, not yet completed.

Slight local injury is frequently cited as a predisposing cause of infection, the injury not being sufficient to provoke effective reaction to attack, and such attack is especially favoured if the general health of the patient is indifferent. In this way is explained the frequency of infection in ill-nourished children, living under unhygienic conditions, who offer little resistance to invasion.

The Tuberculously Disposed Child.

The influence of heredity is especially marked in many cases. The offspring of families subject to tuberculosis are undoubtedly more easily and more seriously infected than children derived from healthy stock. There is no question that the "soil" of the patient has a definite bearing on infection, and a clear recognition of this fact is of especial importance in preventive treatment. The "tuberculous diathesis" is a vague expression used to express such a tendency to infection. It is at present not capable of clear definition, but that such a condition does certainly exist cannot be doubted. How and why the "soil" lends itself so easily to infection, and in what way it may be so altered that infection may be successfully resisted, is a matter of importance which demands more careful investigation. A concrete example may make this clearer. While statistical evidence cannot be produced to support such a statement, there is little doubt that a red-haired, freckled child is less likely to resist infection than the ordinary child undistinguished by such marked physical attributes, and particularly if such a child has a bad tuberculous family history. Moreover, in such a child, infection is more severe and likely to be more easily disseminated. This has been very clearly recognized by us in our work at Alton. A child of such a type, attacked by, say, tuberculous disease of one hip-joint, is exceedingly likely to develop a similar condition in the other hip. The disease in such a subject is more severe, longer in duration, and more thorough treatment is required to effect its arrest.

Allied to the question of the tuberculous diathesis is the recognition of the pre-tuberculous state and its treatment.[2] A clear conception of this is also wanting. By some it is regarded as much the same as the tuberculous diathesis. To others it implies tuberculous infection distinguished either by no local lesion, or by minor manifestations such as chronic blepharitis and rhinitis, phlyctenular conjunctivitis, scrofulous skin and scalp eruptions, recurring attacks of glandular enlargement and constitutional symptoms, cachexia, malaise, languor, undue susceptibility to minor ailments and general but ill-defined signs of ill-health. These patients often react positively to tuberculin. Such children may be regarded as potentially tuberculous, and for these the adoption of effective measures to improve the general health, and thereby increase the resistance, is called for. In the children of the rich this is easily effected and the onset of definite tuberculous lesions may thereby be often prevented. In the poor, unhappily, adequate prophylactic treatment is generally unattainable, and hence the higher incidence of tuberculous crippling amongst the lower classes. The treatment to be undertaken should ensure ample rest for the child under the best hygienic conditions obtainable. He should spend as much time as possible in the open air, in the sun, and should not be allowed to get tired. His room should be well ventilated and clean. Cold douching followed by brisk towelling should be prescribed as soon as his condition permits. The clothes worn should be light but warm. The meals should be regular; the diet ample but plain, wholesome, easily assimilable, and in it milk, meat and new-laid eggs should occupy a properly proportioned part. The greatest care should be taken to prevent the onset of catarrhal conditions of the mucous membranes. A slight bronchitis, or gastro-enteritis, by lowering the resistance of the part affected, affords easy means of ingress of the tubercle bacillus. The bowels should act regularly and naturally and means taken to secure this.

[2] CORNET, G.: "Tuberculosis in Childhood (Scrofulosis)." Translated from the Second German Edition by Dr. J. E. Bullock. London: John Bale, Sons and Danielsson, Ltd., 83-91, Great Titchfield Street, Oxford Street, W. 1914.

The child should be carefully examined for any indication which might favour attack, dental caries guarded against, tonsils and adenoids removed if necessary, and the conditions already alluded to suggestive of the pre-tuberculous state treated by appropriate remedies. Such patients are often highly strung and nervous, or languid and irritable; these should not attend school or be subjected to mental effort. Where obtainable the advantages of a change of climate should be considered and a suitable country or seaside resort in a dry, sunny and sheltered locality selected. A chalky district with a hard drinking-water supply is frequently advantageous.

General Characters of Tuberculous Disease of the Joints.

The disease is usually insidious in onset. The general symptoms are commonly indefinite, and comprise cachexia, malaise, and slight evening rise of temperature. Locally the pain is not often acute and may be referred. If the bone is primarily affected the pain is usually intermittent and of a boring or aching character, sometimes worse at night. Occasionally, however, it is early intense. In joint tubercle there is early limitation of movement. If a limb articulation is involved the limb is held in the position of greatest comfort, is moved carefully and jarring avoided. In a lower limb a limp, at first often transient, becomes apparent. There is generally some swelling and tenderness at the site of the lesion. The swelling of the affected joint is enhanced by the atrophy of the neighbouring muscles, which comes on rapidly, and is often very marked. Muscular spasm is, in the majority of cases, a marked and suggestive feature. It naturally secures fixation of the joint attacked, usually in a position of flexion. It should be emphasized that, while the above description is correct for the majority of cases, it is subject to considerable variations.

The following table indicates the situations attacked in 1,000 consecutive tuberculous cripples, under the age of 12 years, admitted to the Treloar Cripples' Hospital at Alton. The lesions were as follows:—

Seat of Tuberculous Disease	Number of Cases
Of the spine	416
,, hip	328
,, knee	146
,, ankle	39
Mutiple tubercle	17
Tuberculous disease of other bones of joints...	54
	1,000

It should be mentioned that the patients are classified according to their principal lesions. A very large number have multiple lesions, but these are called " multiple tubercle " only when occurring simply in the smaller joints, and not affecting spine, hip or knee. For example, a patient with tuberculous disease of the spine, hip and knee would be entered as tuberculous disease of the spine. These children came from all parts of the South of England and South Wales, and the situations of the various lesions probably represent with considerable accuracy the relative incidence of the lesions of tuberculous cripples generally who are sufficiently ill to require hospital treatment.

The correct direct mortality from tuberculous arthritis is almost unascertainable. Estimates given by various authorities vary widely, and are of little value. Under any conditions natural cure will occur in some cases. Under the best conditions, with properly conducted conservative treatment, the mortality should not exceed 2 per cent., and might even be reduced, if patients who had not been previously operated upon could be excluded. If radical treatment is undertaken the mortality at once increases enormously and seems to vary greatly with various surgeons—from 10 per cent. (Stiles) to as much as 50 per cent. or even higher. French authorities estimate a mortality of 75 per cent. in cases of spinal caries with infected sinuses. Undoubtedly spinal caries is the most serious form of bone and joint tuberculosis, and next in fatality is tuberculous disease of the hip joint.

The commonest cause of death is sepsis following sinus formation, which may be almost entirely eliminated if radical methods of treatment are abandoned and conservative alone employed. Next to

sepsis, tuberculous meningitis and general miliary tubercle or associated phthisis are most likely to cause a fatal termination. Tuberculous meningitis, or general dissemination of tubercle, is very much commoner after operative than after conservative treatment. Death due to uncomplicated tuberculous arthritis or osteitis remaining localized is extremely rare.

General Principles of Management.[3]

At this stage it may be well to discuss on general lines the treatment of tuberculous cripples. There are two main schools—the radical and the conservative. By conservative treatment in surgical tuberculosis[4] is meant the adoption of methods which tend to preserve and restore parts affected, in contradistinction to radical treatment, which aims at the cure of the disease by the removal of the lesion. The rationale of radical treatment is based on the old neoplasmic theory, which assumed that the infection was of the nature of a tuberculome, and, as such, could be completely extirpated. This practice, which still has many adherents, while possible and often efficacious with small tuberculous foci, exposes the patient to serious risk when applied to extensive bony lesions. The difficulties of complete extirpation, the very grave risks of subsequent added infection, or of widespread dissemination of the tuberculous infection, the high mortality, and the extensive mutilation too often accompanied by bad orthopædic results, have brought radical treatment into a disrepute which is not altogether undeserved.

Conservative treatment must not, as it too commonly

[3] In this short chapter the writer has thought it best to limit remarks on treatment almost entirely to those methods which have proved of the greatest value in actual practice. For this reason other methods receive the briefest notice, and frequent reference is made to papers already published on the methods employed at Alton, and which describe these in fuller detail.

[4] Gauvain, H. J. : " Conservative Methods in the Treatment of Tuberculous Diseases of the Bones and Joints." " The Tuberculosis Year Book and Sanatoria Annual, 1913-14." London : John Bale, Sons and Danielsson, Ltd. 1913.

is, be confounded with convalescent treatment. Conservative treatment may, and, indeed, usually should, be applied when the patient is first attacked. Convalescent treatment embraces the period of recovery. It, therefore, occupies a period in the disease of the patient who has been treated conservatively, just as it does in a patient who has been treated radically. Moreover, it must be emphasized that conservative treatment does not simply comprise leaving the case to itself, or in other words, absence of treatment. On the contrary, it involves the adoption of all measures which will reinforce and strengthen the natural defences of the patient, and aid in the repair of the damages inflicted by the attacking agent, the tubercle bacillus.

Surgical tuberculosis should no longer be considered merely a local infection.[5] It may rather be regarded as a general disease, of which the bony, articular, lympha tic, or other lesions are local manifestations. This involves the necessity of treatment being undertaken on two lines—general and local. General treatment may be applied by utilizing such factors as suitable climate, diet, hygiene, drugs, and employing such measures as heliotherapy, balneotherapy, vaccine therapy, chemiotherapy, &c. Such treatment may be considered in brief detail.

Climatic.—Treatment in this country is best undertaken either at the seaside or in the country. Sheltered situations are not necessary, and wind is no disadvantage, but the district should be sunny, the rainfall not excessive, and the soil a porous one which quickly dries after rain. The patient should therefore not be in the neighbourhood of a river or in a swampy district where the air is excessively humid. A chalky subsoil is an advantage. Sudden extremes of temperature are undesirable. If a marine climate is indicated, it is of great importance that a town be not selected—particularly a seaside pleasure resort, because the presence of excursionists and others robs the patient of what, at the seaside, is a prime necessity—untrammelled use of the beach. The

[5] GAUVAIN, H. J.: "Surgical Tuberculosis: its Needs and Treatment," *Lancet*, August 10, 1912.

marine hospital should abut on the sea, and face the sun and prevailing wind to derive the maximum benefit from all three. There should be an extensive beach of sand on which patients may walk or be wheeled unhindered. A low, exposed littoral is to be preferred to a tree-covered sheltered one, and there should in addition be an extensive area of foreshore over which the tide advances and recedes within wide limits. The prevailing winds blowing over such a beach becomes charged with substances which exercise a markedly stimulating effect upon the patient. Country treatment is, speaking generally, better for the early, and marine for the more advanced or chronic cases, including those with old sinuses, but no definite rule can be laid down in this respect, and probably the greatest benefit would be derived by giving the patient, where feasible, the advantages of both alternately. It goes without saying that the district selected should be one where tuberculous disease is relatively infrequent. Country or marine breezes, in sunny districts, exercise a marked effect in improving the appetite and general condition of immobile and recumbent patients.

Dietetic.—Speaking generally, a liberal, plain, easily assimilable, varied diet suited to the somewhat capricious appetite of the tuberculous should be prescribed, and in this diet milk and meat should hold a proper proportionate part. Some diets of special therapeutic value have been prescribed; of these allusion might be made to that advocated by Ferrier, who has endeavoured to secure calcification of tuberculous lesions by prescribing an acid-free diet simultaneously with the administration of lime salts, and for such a diet he claims considerable benefits.

Hygiene.—This comprises the recognition of the value of abundant fresh air—a necessity now so well recognized that it need not be laboured. The patient should, as far as possible, almost live in the open air, but yet remain sheltered from rain and snow. The greatest care should be given to that bodily attention of the patient which can only be obtained by the best nursing. In few patients is that extreme personal attention more necessary—which may be summed up under

the heading " Personal Hygiene "—as in those attacked by surgical tuberculosis.

Drugs.—Many drugs have been extolled. Their use may be classified under the headings " General " and " Specific." Of general drugs the most important are suitable aperients, where necessary. The anæmia sometimes associated with tuberculosis may be treated by arsenic and iron, but until the disease is well under control, shows little response. Cod-liver oil is extolled by many. Drugs alleged to be specific are numerous, and under this heading may be included vaccines and serums. Much controversy has raged about the value of tuberculin. On this question each practitioner should endeavour to clearly formulate his own views. Speaking dogmatically, it may be said that, in our experience, it is better not to employ tuberculin as a routine treatment, and, indeed, there are very few cases in which its use, even though carefully administered, is likely to be of any real and permanent benefit. There is, also, always to be borne in mind the danger that the administration of tuberculin will assist in the dissemination of the disease, and we must confess to a suspicion that after tuberculin treatment the liability to recurrence is increased. Speaking generally, better results can be obtained without its employment than with, and, without going further into the reasons for abandoning the use of tuberculin, it may be said generally that in the majority of cases its use is not indicated. Serum-therapy in tuberculosis has been equally disappointing. Hopes are now raised as to the value of chemio-therapeutic measures, the investigation of which has received great stimulus by the work of Ehrlich. Experimental observations have been made in the use of copper salts, lecithin and methylene blue, but it is yet too early to speak with certainty as to their value. Further research in this branch of treatment is awaited with interest.

Discipline.—In institutions devoted to the care of tuberculous cripples, discipline must of necessity occupy a part, and involves the exercise of tactful handling. Occupations suited to the limitations of patients are eminently desirable. Left without occupation there is a tendency for such patients to become discontented and

degenerate. Children should be suitably educated, adolescents trained, and adults occupied according to their limitations and capabilities.

Heliotherapy.—This method of treatment has come into some prominence lately, notably through the work of Rollier of Leysin,[6] but, as in most other forms of treatment, it is likely that too much will be expected of insolation, and that other means may be somewhat neglected if the value of heliotherapeutic treatment is unduly exaggerated. That insolation, properly carried out and carefully applied, is of value is undoubted. Heliotherapy is by no means the simple treatment imagined by many, but should be applied with due care and precaution. With the onset of pigmentation there is usually noted considerable progress on the part of the patient. Certain patients, however, will not pigment satisfactorily, and it is possible that such absence of pigmenting power is associated in some way with tuberculous toxæmia. The difficulty of obtaining adequate pigmentation is especially noticeable during the activity of the tuberculous processes, and is often indicative of the onset of abscess formation. After the formation of the abscess, and its proper treatment, satisfactory pigmentation usually follows. Insolation is claimed to be of particular benefit in restoring function to the joints affected with tuberculous arthritis, and it is certainly helpful, in many cases, in the healing of infected sinuses, particularly if associated with balneotherapeutic measures.

X-rays.—The work of Isselin, of Basle, has called attention to the value of X-ray treatment in tuberculous arthritis. For its employment skill and care is essential, and, given skilful employment, X-ray treatment is often of considerable value, though complications, till recently unsuspected, may be undesirable sequelæ. In

[6] GAUVAIN, H. J., and DE VOSS, E. K.: "Heliotherapy in Surgical Tuberculosis," *British Journal of Tuberculosis*, April, 1914. London: Baillière, Tindall and Cox. See also "The Sun Cure in Children with Surgical Tuberculosis," in "Year Book of Open-air Schools and Children's Sanatoria." London: John Bale, Sons and Danielsson, Ltd., 83-91, Great Titchfield Street, Oxford Street, W. 1915.

some cases lack of skill in X-ray therapy leads to further dissemination of the disease, or to increased activity of the local tuberculous processes; in other cases it may lead to permanent atrophy, the onset of which is not marked till some two years after the application of these measures of cure. However, if these possible complications are borne in mind and guarded against, it is certainly of considerable utility in the treatment of many patients.

Artificial Congestion.—Amongst other forms of adjuvant treatment may be instanced the methods initiated by Bier, in producing artificial congestion of the part attacked, either active or passive, and this again is helpful in properly selected cases. For indications for its use reference should be made elsewhere.

In all forms of tuberculous arthritis the importance of early diagnosis and prompt and long-continued treatment cannot be over-estimated. Moreover, after active treatment is completed, it is desirable that reasonable precautions should be observed. Where possible, the patient should be kept under occasional observation for a very prolonged period after the disease appears to be arrested.

Local Treatment.—Local treatment is of the most extreme importance, both for the cure of the local lesion, the prevention or correction of deformity, and the management of complications, such as abscesses and sinuses. Speaking generally, for the more severe local lesions, it may be said that there are three stages of treatment depending upon the progress of the disease, viz.: (1) Acute, commencing and progressive disease, requiring rest in a recumbent position, with immobility of the part attacked, combined with the adoption of special means to correct or prevent deformity, and abolish muscular spasm. The length of this stage of treatment will vary with the nature of the case, the resisting and reparative powers of the patient (which general measures will improve), the virulence of the infection, the "soil" of the patient, the site and extent of the lesion, the presence or absence of other lesions, the age of the patient, &c. Only prolonged experience and considerable judgment can tell when this stage may be

abandoned. The time required will vary within very wide limits. (2) The chronic or subacute stage. Here recumbency is, as a rule, not necessary, but very complete immobilization of the part attacked is essential for a double purpose—(*a*) to allow repair to take place, (*b*) to prevent the occurrence or increase of deformity. (3) The stage of convalescence. Now, complete immobility is not essential, but protection or support, which may be given by light, accurately fitted removable splints, is usually sufficient. These may usually be discarded while the patient is at rest, but should be worn at other times.

These periods of treatment are mentioned as general guides. They apply especially to the two commonest forms of bone and joint tuberculosis—spinal caries and hip disease. The length of time required in each stage of treatment will vary within very wide limits, and the decision as to when one may be abandoned and the next undertaken requires careful consideration. The problem with regard to adults differs to some extent from that of children.

Treatment of the Commoner Complications.

Tuberculous Abscesses.—The treatment of these varies with the surgeon's conception of their nature.[7] Till recently they were most commonly incised and evacuated. By some the incision was kept patent and the abscess drained. Others closed the wound, reopening the abscess if necessary, through re-collection of pus. A tuberculous abscess of bony origin is the result of the primary infection succeeded by a subsequent excentric destruction of tissues by tuberculous elements advancing much as does a neoplasm. If the whole of the area attacked can be completely and successfully removed without further infection of the surrounding tissues, such a course is commendable, but it is rarely practicable. Mere incision of the abscess, followed by curetting its walls or simple evacuation of the con-

[7] Calvé and Gauvain: "The Treatment of Tuberculous Abscesses of Bony Origin by Conservative Measures," *Lancet*, March 5, 1910.

tained pus, cannot be expected, except in those cases where the abscess is residual, to effect its cure. Moreover, the abscess wall, the very barrier made by Nature to retard the spread of the abscess, is itself divided, and the primary lesion, the cause of the abscess, commonly owing to its inaccessibility, left unattacked. The pus often reforms, the cycle of the history of the abscess recommences, and, not uncommonly, the severed tissues break down and sinus formation follows. Under certain circumstances, tuberculous abscesses left to themselves spontaneously absorb. Such a termination cannot, however, be always confidently predicted, and generally it is unwise to defer more active treatment while awaiting spontaneous resolution, unless the situation of the abscess is such that attempts to deal with it are fraught with danger. Speaking generally, evacuation of abscesses by aspiration is recommended. The abscess should be aspirated through as much healthy tissue as possible, the trocar should enter, where possible, on that side of the abscess where it is least likely to extend. Should the pus be fluid, the contents of the abscess can usually be evacuated at one aspiration. Should it recollect, the process must be repeated. The reactionary barrier which the abscess has itself provoked is preserved and danger of extension diminished. As the abscess gets smaller, and its investing walls more resistant, the area involved becomes more and more circumscribed and danger of extension more remote. Eventually the abscess wall approximates to the primary and causative lesion, centripetal healing has occurred, and all that is left is a calcified core surrounded by protective fibrous tissue which marks the spot formerly the site of an acute tuberculous process.

This method is diametrically different to the process of healing which occurs after incision. In such a case healing tends to be centrifugal : the primary lesion must heal before the abscess effectively disappears.

Aspiration of tuberculous abscesses is often aided by injection of these abscesses with suitable so-called "modifying fluids." The importance of three of these is such that they may be here considered. Where the pus is caseous, and, for this reason, difficult to evacuate

through the minute trocar, it may be liquefied *in situ*. Caseous pus consists of necrosed tissue and lymphocytes. The advent of polymorphonuclear leucocytes with their contained ferment digests the caseous matter, and so dissolves it. Injection of certain irritants will cause their entry, and for this purpose a dose of 2 c.c. of the following may be advantageously employed :—

Thymol	1 part.
Camphor	2 parts.
Sulphuric ether	3 ,,

Should the pus be " creamy " in nature and the abscess walls infiltrated, the tuberculous process not being sufficiently limited by efficient reaction, compound iodoform emulsion of this formula is of very great value :—

Sterile iodoform	5 grm.
Sulphuric ether	10 ,,
Creosote	
Guaiacol ... ... āā	2 ,,
Sterilized olive oil	100 c.c.

Dose, 5 to 10 c.c.

In thin-walled abscesses with clear fluid pus, injection of small amounts (5 to 10 c.c.) of a 10 per cent. solution of sterile iodoform in ether, after the evacuation of the pus, is of service. The ether must be allowed to escape from the abscess cavity before withdrawing the trocar. The freshly precipitated iodoform exerts a marked drying and sclerosing effect on the abscess walls. By these means, then, tuberculous abscesses may be safely evacuated, and the healing of the primary lesion facilitated with little danger of sinus formation.

Tuberculous sinuses form, unhappily, a grave but common complication in untreated or badly treated cases of tuberculous arthritis. They represent a permanent communication between a tuberculous abscess and the exterior, and, sooner or later, almost invariably become infected with pyogenic organisms. All recognized surgical methods of promoting their healing may be employed, particular attention being given to facilitating the discharge of the contained infected pus, or, where practicable, removal of a sequestrum. Lavage or syringing with antiseptic solutions is usually likely to

do more harm than good. The use of autogenous vaccines in newly infected cases is often of the greatest help, but is commonly of little value in old and chronic sinuses. In all, heliotherapeutic measures are of great value.

Prominent amongst recent measures introduced for their cure is the employment of Beck's bismuth paste. Pure sterile bismuth sub-nitrate, mixed with two parts of sterile vaseline, when injected into sinuses, especially in old and chronic cases, has frequently a remarkable effect in procuring speedy closure. Careful radiographic examination of a number of such cases at Alton has shown us that the bismuth is of especial therapeutic value in those cases where the bone lesion is healed but the sinus from such a lesion persists. Where there is active bony disease at the bottom of the sinus, little help can be expected from this method of treatment.

Special Forms of Tuberculous Crippling.

Spinal Caries.—It will now be necessary to consider briefly certain of the more important forms of local tuberculous disease producing crippling. The synonyms for spinal caries are Pott's disease, angular curvature, and tuberculous disease of the spine. This is both the most serious and the most common form of crippling due to surgical tuberculosis. As in all forms of tuberculosis it most commonly occurs in the first and second decades in life. It may attack patients of any age, and it is rather more frequent in males than in females. The body of the vertebra is attacked, and the primary lesion may be, as already mentioned, either central, sub-epiphysial, or periosteal, the latter more common in adults. Dorso-lumbar caries is commonest—disease in the upper dorsal spine causes the most pronounced deformity, and infection of the opposite ends of the spine, cervical caries or sacro-iliac disease most dangerous. The onset is usually insidious, the patient commonly refrains from undue movement, and prefers to rest in a recumbent position. Its onset may be often first suspected by the attitude in which the patient holds himself, or by the difficulty with which some movement is undertaken. For example, a patient may be unable to

bend comfortably to put on his boots. Pain of an aching character is usually complained of in the neighbourhood of the lesion, and is also frequently referred. On examination careful palpation will usually reveal some local tenderness. Pressure on the transverse processes of the vertebræ will elicit this more readily than palpation or percussion of the spine, and involuntary movement or jarring will aggravate the local pain. In early diagnosis by far the most valuable clinical sign is the manifestation of muscular spasm, secondary to the inflammatory processes, which produces characteristic spinal rigidity, notable both in the gait and in the movements of the patient. The patient cannot bend his back in the region attacked, and, in picking up an object from the floor, will bend his knee to keep the back stiff and rigid. When the patient is ventrally recumbent, the localized rigidity may be demonstrated by making him raise himself on his elbows, or by endeavouring to dorsi-flex the legs. If the disease attacks the neighbourhood of the insertion of the psoas muscle some psoas spasm is commonly early noticeable, and is usually more intense on one side than on the other. A carefully taken X-ray photograph is very frequently of value in early diagnosis, but the skiagram should be taken with the patient lying on his side rather than on his back. Such a lateral skiagram will show quite early in the commencing disease crushing in of the attacked vertebra, which becomes wedge-shaped, and is associated with thinning of the adjacent intervertebral disc. This may be seen in a skiagram before any deformity is noticeable. Later on the onset of deformity makes diagnosis much easier. The deformity is usually of the nature of an angular curvature, which is more and more marked as the local destruction increases. Some slight lateral curvature is sometimes associated with this angular curvature, but is frequently absent. It should be observed that in early caries there may not only be no angular curvature, but, indeed, the reverse. Early lumbar caries is associated with an increasing lordosis, due to the spasm of the psoas muscles. The cause of the angular curvature is : (1) Destruction of the attacked bone; (2) the effect of gravity acting upon a weakened

spine; (3) muscular spasm, secondary to the inflammatory processes, and (4) alteration in the intermuscular balance. The effects of muscular spasm are more pronounced owing to the natural curves of the vertebral column which allow the investing spinal muscles to act to greater mechanical advantage. Abscess formation may conceivably sometimes assist in the production of deformity. Secondary deformity occurs especially in the dorsal region. It is the result of the displacement produced by the angular curvature. The ribs become crowded together in the proximity of the lesion and the sternum, especially in mid-dorsal caries, tends to become carinate. The viscera in both thorax and abdomen become correspondingly displaced and their functions may be interfered with. Respiration may be impeded and becomes hurried and grunting in character. Other secondary deformities not infrequently noticed in corresponding regions of the spine are torticollis, hunching of the shoulders, and flexion of the hip. The latter is the result of psoas spasm in lumbar caries or sacro-iliac disease, and may increase the difficulties in diagnosis.

Abscess Formation.—In a considerable percentage of cases an abscess forms secondary to the spinal infection. Such an abscess tends sooner or later to point superficially, unless spontaneously absorbed or calcified, or else its pressure internally may give rise to symptoms which betray its presence. In the upper dorsal region the presence of an abscess may be especially difficult to detect, but here a good skiagram reveals its situation. The commonest abscesses are naturally associated with the commonest lesion—dorso-lumbar caries—and these usually appear in children in the iliac-fossæ; in adults more commonly in the lumbar region. The so-called psoas abscess may extend a considerable distance, and instances are on record where it has reached almost to the foot. Such extensive abscesses are now very rarely seen, though not infrequently they are found in the thigh. Gluteal abscesses are also frequently observed. In some cases the abscess may proceed backwards into the spinal cord, producing spinal pachy-meningitis. This occurs especially in caries of the cervical and cervico-

dorsal region, and results in spastic paraplegia with, in some cases, loss of sensation and incontinence of urine.

The local treatment of spinal caries resolves itself into the healing of the lesion, and the prevention or correction of deformity while the disease is active. With active caries the patient must be treated recumbently; and not only should the patient be recumbent, but he should be immobilized, and to prevent or correct deformity extension or hyper-extension of the spine is indispensable. Spinal hyper-extension will abolish muscular spasm and prevent the onset of deformity. It will also often correct angular curvature which has already been produced, provided the deformity is of not too extensive a character.

As soon as the disease is diagnosed,[8] and at the earliest possible moment when a patient with active spinal caries comes under treatment, the patient should be fixed on some such support as the spinal board used at the Cripples' Hospital at Alton, which is a modification of the board used at the Hôpital Maritime, Berck-sur-Mer. It consists of a wooden tray about 18 in. longer than the patient and 8 in. wider than his greatest width—the sides are raised to a height of 4 in., except at the foot end, where a height of 16 in. is attained. The raised foot of the board is designed to prevent the weight of the bedclothes resting on the patient's feet. A hard, smooth, pliable mattress fits into the board, and on this the patient rests, and is fixed by means of a jean jacket. This jacket is buckled over the front of the patient, and is attached to the sides of the board by pieces of webbing let into the back of the jacket in the form of a St. Andrew's cross. The mattress is raised underneath the patient in the region of the deformity or lesion to the necessary degree of hyper-extension which the case demands. Such a board is exceedingly useful in the treatment of these patients. It is simple and efficient. The patient is maintained recumbent, immobilized and hyper-extended—the three essential requirements. The nursing of such a patient is very easy. The bed-pan is

[8] GAUVAIN, H. J.: "The Mechanical Treatment of Spinal Caries," *Lancet*, March 4, 1911.

easily administered, and the patient's back can receive the necessary attention by simply unbuckling the jacket, rolling the patient on his side, and using appropriate measures. A night-shirt split down the back is recommended to facilitate nursing.

Should the lesion be in the cervical or upper dorsal region, immobilization of the head will probably be required. For that purpose a box head-splint is used, the sides of which grip the head and prevent all movement. Through slits cut into the board above the head elastic or other extension can be applied if required. Elastic extension to the head is advocated when the cervical disease is acute or when there is much muscular spasm. It is very easily applied, and the degree of tension on the head is regulated according to the requirements of the case and the comfort of the patient. The jean jacket already alluded to acts as an efficient counter-extension. The cervical spine may be slightly hyper-extended, if required, by the insertion underneath the mattress of a transverse bar of wood at the site of the disease.

In dorsal or dorso-lumbar caries, associated with much spasm of the psoas muscles, or with psoas abscess, a different sort of splint is advocated. The one employed at Alton is known as the "wheelbarrow." Briefly, it consists of a splint, padded appropriately with animal wool, which is the exact size of the patient, and on which he can recline in a hyper-extended position. The part underneath the deformity is movable and adjustable without the patient being disturbed. The legs are bound down on leg-pieces joined to the main part of the splint, in the situation of the great trochanter, and in such a manner that the legs may be abducted or adducted at will, kept hyper-extended but cannot be flexed. In this way the psoas muscle is kept on the stretch and the spasm is speedily completely relieved.

Where there is a psoas abscess, the necessity of keeping the psoas muscles at rest is important, and such fixation not uncommonly results in its absorption. A footpiece is provided at the termination of the leg-pieces, the object of which is to prevent foot-drop. Head and pelvic extension may be used simultaneously with the splint, but this is rarely required.

Where there is little psoas spasm a modification of the above splint is valuable. It is known as the "swinging back-door" splint, and on it the patient reclines horizontally suspended. The weight of the head and legs alone forms an efficient means of counter-extension and is an important factor in tending to correct deformity, provided that deformity is not of too great extent.

By such contrivances it is very easy to prevent the onset of any deformity, or to correct the greater part of minor deformities occurring in the spine. When there is extreme angular curvature which has become ankylosed, correction becomes a matter of excessive difficulty and is often an impossibility, particularly if the deformity is of long duration. Should it be desired to correct or diminish extreme deformity, a mechanically correct way is suggested by straightening the compensatory curves and leaving only the primary angular deformity on which to act. Thus, suppose there be an acute and extreme angular deformity in the mid-dorsal region. This is accompanied by an extensive compensatory curve above and below the lesion. The resulting lordosis may be overcome by flexing the spine on the deformity until the vertebræ extend in a straight line from the angular curvature to sacrum. It will be found then that the legs are considerably flexed because the lordosis has resulted in considerable shortening of the psoas muscles.

The spine above the lesion is similarly flexed and straightened. The patient then is supported in this position; extension is made in the line of the spine upon the head, and in the line of the spine upon the pelvis. Extension is also made on both legs to lengthen the psoas muscles.

If pressure is now exerted upon the deformity, it will be observed that these combined forces will tend to straighten out the spine efficiently. Such a method of mechanical treatment should only be employed with very great care, as in unskilful hands it might lead to the breaking down of the lesion, and dissemination of the disease, resulting in abscess formation and, perhaps, miliary tuberculosis. With due care, however, a certain

amount of deformity may, even in advanced cases, be corrected by the method just outlined, and indeed this has been done successfully in many cases at Alton.

The appliances outlined above are those used at the Alton Hospital, but many others have been described. The Phelps Box is often used, but cannot be regarded as very efficient. Some surgeons are in the habit of employing a special modification of the double Thomas' Hip Splint. The Bradford frame is very much more efficacious, but is somewhat troublesome in use. Indeed, there is an infinite variety of appliances for the treatment of different types of cases of acute spinal caries, but the main principles of treatment being grasped, it cannot be too strongly emphasized that each case should be individually studied, and that treatment appropriate to the special needs of each be designed. Only in this way can good results of treatment be obtained.

When the disease becomes quiescent, there is absence of spasm, the maximum amount of correction has been made of existing deformity, there is no evidence of abscess, the general condition of the patient approximates to normal, and the appearance of the patient suggests that he is no longer the subject of tuberculous toxæmia; the second stage of treatment may be commenced. At Alton this consists in persistent efficient immobilization of the lesion in the best obtainable attitude, but abandonment of continuous recumbency. During this stage no mechanical support is of greater value than a properly applied plaster of Paris jacket.[9] The disrepute which has followed the employment of plaster of Paris in spinal caries is largely due to the lack of skill and experience of many who have endeavoured to use this invaluable aid to treatment. In skilful hands no method of treatment has greater value in properly selected cases at that period of the disease when its use is indicated.

Speaking generally, plaster of Paris should be used after the acute symptoms have abated, and during that

[9] GAUVAIN, H. J.: "The Use of Plaster of Paris in the Mechanical Treatment of Tuberculous Disease of the Spine," *Practitioner*, January, 1913.

period when it may be presumed that the lesion is becoming consolidated. In other words, it should be used during the early stages of repair. Many methods of application of the plaster have been devised. As a rule, the patient should be suspended in the most favourable attitude prior to and during the application of the plaster. The patient should previously have been tilted daily for a period of at least a fortnight, so that when he is suspended he will not suffer from that giddiness and syncope which is so distressing to the patient and disconcerting to the surgeon. When such a precaution has been taken the patient should be carefully prepared previous to the application of plaster. No food likely to cause distension should have been partaken for the preceding two days, and such articles of diet as milk and green vegetables should be forbidden. The bowels should be well cleared and the skin carefully washed and powdered. A close-fitting vest should encircle the patient's trunk from below the pubis to well above the situation of the lesion. If the disease occurs in the cervical or upper dorsal region of the spine, the plaster should extend to and support the head. The patient is suspended from the gallows by a specially applied bridle arranged appropriately for each individual case, so that the spine occupies the best possible position.

The plaster is applied from below upwards. Wide plaster bandages are used, which are placed in cold water before their application, as the resulting set of plaster, after it has been immersed in cold water, is stronger than after it has been immersed in hot, though not quite so rapid. No plaster bandage should completely encircle the trunk without a pleat being made during its application. This ensures that, when set, the plaster shall occupy the maximum dimensions of the trunk, and there shall be no danger of constriction. The jacket must be very carefully moulded around the whole of the pelvic brim before it sets, for it is from the pelvic brim that the jacket takes its bearing. Counter moulding must be made around the clavicles, and the shoulders should be well depressed. The object of a plaster of Paris jacket is not so much to support the

spine as to maintain it at rest in a correct position and to prevent any possible flexion, or increase of deformity. For that purpose it must be obvious that the jacket must be carefully moulded about the clavicles and pubes, so that no flexion can occur between these two points.

Should a high jacket be necessary, it must in addition be most carefully moulded about the occiput and the mastoid processes. In this case the head is supported by the apparatus and its weight taken off the subjacent lesion. To maintain the head in position, the jacket may either have purchase on the chin (the "Minerva" of the French surgeons) or else the plaster must encircle the frontal region in the form of a "fillet," as now used extensively at Alton. The latter, while equally efficient, is the more comfortable. After the jacket has been applied, a large ventral window should be cut out, as this, while not interfering with the support and protection given to the spine, allows ample room for the necessary processes of respiration and digestion, and adds in a very considerable degree to the patient's comfort.

It is perhaps desirable again to emphasize that the plaster jacket should not be applied until it has been definitely ascertained that the patient is ready for such an apparatus. Numerous instances have come to our notice where a jacket has been applied at an unsuitable time, and, not infrequently, with disastrous results. Such accidents should, of course, be always avoided. In a properly applied plaster jacket a patient may remain with comfort and safety for from three to six months, the time varying according to circumstances.

Some surgeons (notably Calot) endeavour to obtain further correction of deformity while the patient is immobilized in plaster. Calot endeavours to secure this correction by cutting a window over the deformity and pressing in the angular curvature with pads of cotton-wool, but such a method is not commended. We feel that it is infinitely better to secure maximum correction while the patient is recumbent, and to maintain correction by the use of the plaster jacket afterwards. In our opinion, the period during which plaster should be employed is largely limited to the stage of the disease

when the tuberculous process is no longer actively progressive, but when consolidation and repair is taking place. During this time efficient immobilization is of the greatest value, and a properly applied plaster jacket prevents increase of deformity. With a plaster jacket as described it is usually our practice to allow patients to get up, and that may be done safely and with advantage. The general health of the patient is improved by his added freedom and repair takes place more rapidly.

A removable jacket is not applied until convalescence is reached, and then the apparatus recommended is usually one made of non-inflammable celluloid. Celluloid is used for the purposes of splint manufacture by being dissolved in acetone, and, to the gelatinous substance thus produced, is added a supersaturated solution of calcium chloride dissolved in hot water. The calcium chloride denitrates the celluloid, and converts it into a substance which, while retaining most of the physical properties of ordinary celluloid, is, nevertheless, non-inflammable, and, therefore, may be safely used for surgical purposes.

To make a celluloid spinal jacket a cast is taken of the trunk, and on to the positive obtained from the cast a celluloid jacket is manufactured. Details of its manufacture will be found fully described elsewhere.[10] The use of such an apparatus is recommended for from two to three years at least, after all signs of activity of the lesion have disappeared. The chances of recurrence will be thereby reduced to a minimum and increase of deformity guarded against. A celluloid jacket properly made is so comfortable that its use is tolerated admirably by the patient, and causes him little or no inconvenience.

The Radical Treatment of Spinal Caries.

The scope of radical treatment is exceedingly limited and is usually very unsatisfactory. In cases where the

[10] Gauvain, H. J.: "The Use of Celluloid in the Treatment of Tuberculous Disease of the Spine," *British Medical Journal*, June 7, 1913.

tuberculous processes have extended into the spinal canal, and the presence either of a tuberculous pachymeningitis, a tuberculous abscess, or a sequestrum has caused pressure on the cord, and resulted in paraplegia and incontinence, laminectomy is sometimes advised. It should rarely be attempted until prolonged recumbent treatment has been employed. Alternatively, an operation which has been advocated, and which, indeed, is usually to be preferred to laminectomy, is costo-transversectomy. This operation enables the lesion to be attacked from in front of the vertebræ. Neither of these operations should, however, be attempted if there is any possibility of obtaining a cure without their aid.

A somewhat dramatic operation which has found favour, especially with American surgeons, has been recently introduced and advocated, particularly by Albee. Albee's operation is really in the nature of a conservative measure, and consists in fixing the spinous processes of the vertebræ from a point above the lesion to a point below by the insertion of a graft from the patient's own tibia. It is affirmed that such a graft will hold the lesion immobile, will speedily render the use of a spinal jacket unnecessary, and that it will shorten the length of treatment. The evidence as to its efficacy, which has hitherto been forthcoming, has been somewhat disappointing. In our own opinion such an operation is, as a rule, not to be commended, and certainly not if adequate conservative treatment can be given in favourable surroundings. Unfortunate complications as sequelæ to this operation have already been reported. Evacuation of tuberculous abscesses in connection with spinal lesions by incision of these abscesses is open to such grave objections and dangers that this method of treatment will not be discussed here. Spinal abscesses should, where possible, be aspirated, as described above.

Tuberculous Hip Disease.

Tuberculous disease of the hip-joint is usually slow in onset. Commonly only slight pain is complained of, not infrequently referred to the knee, but occasionally the pain is early severe in character. The patient walks

carefully with a slight limp, and avoids jarring. At this stage recumbency for a few days will often cause both limp and pain to disappear. The diversity of the early symptoms, and their very varying degrees of intensity, is largely explained by the different situations about the hip-joint first attacked. A common situation is at the inferior junction of the head and neck, at first entirely osseous, and only later extending into the joint. A primary lesion here often produces only the slightest symptoms until the joint is invaded. Primary acetabular invasion is commoner than was formerly supposed, and is often associated with considerable pain and extensive destruction of the joint surfaces. Slight local antecedent injury, insufficient to provoke efficient reaction, is often cited as a predisposing cause of attack. As infection becomes more pronounced, starting cries at night, which do not awaken the patient, are common, and the onset of deformity, due to a slight extent sometimes to distension of the joint with fluid, but especially to spasm of the muscles about the inflamed joint, is manifested. The deformity is first flexion with eversion and abduction with apparent lengthening of the affected limb. This apparent lengthening is due to the abduction of the leg, causing a downward tilting of the pelvis. Later, adduction replaces abduction, and apparent shortening, due to corresponding upward tilting of the pelvis on the affected side, follows.

The muscular spasm causes increase of intra-articular pressure, and that is followed by more or less marked intra-articular destruction, rendered the more pronounced if the patient is still ambulant. The upper portion of the joint is especially affected by the mechanical forces acting on it, and the acetabulum in this region shows progressive upward destruction, the condition being sometimes called "travelling acetabulum." The psoas muscle on the affected side shares, with the other muscles about the joint, in the spasm which is so characteristic. The lumbar spine is consequently drawn forward and well-marked lordosis ensues. Simultaneously, all the joint muscles show marked atrophy, and muscular wasting, sometimes very considerable in degree, is an early and pronounced sign, especially

noticeable in the gluteal muscles, and resulting in flattening of the buttock on the affected side.

Meanwhile, abscess formation is common. If the abscess is intra-articular, the excessive tension on the capsular ligament is associated with considerable pain, relieved to some extent when the abscess escapes, and emerges into the tissues of the thigh. Sooner or later such an abscess tends to appear at the surface, and if left untreated breaks through the skin. Sinus formation ensues, and almost inevitably the sinus becomes infected with pyogenic organisms, and a septic arthritis is the consequence. Occasionally the intra-articular abscess bursts through the acetabulum and becomes intra-pelvic, pointing either in the iliac fossa on the affected side or bulging into, and later bursting into, the rectum.

With the onset of sepsis the patient's condition may become desperate. Septic exhaustion, added to tuberculous toxæmia, plays havoc with the general health, and the prognosis becomes exceedingly grave. Prolonged sepsis frequently results in amyloid disease, and with the onset of this complication prospects of cure are remote, and general dissemination, if the patient survives sufficiently long, is common. As in all tuberculous affections the earlier efficient treatment, under suitable climatic and hygienic conditions, can be undertaken, the better the prospect of speedy recovery with good functional results.

In the acute stage absolute recumbency on a firm, straight mattress is essential. Extension should be applied to the affected femur, and in applying such extension the following rule should be borne in mind. First raise the affected limb until the lordosis has been corrected and the spine is flat on the bed. Then, with the two anterior superior iliac spines on the same horizontal plane, the affected limb must be abducted or adducted until the straight line joining these two points is at right angles to the long axis of the trunk.

Extension to the femur, applied in the direction the diseased limb now occupies, will act mechanically correctly and gradually, and all deformity may be corrected. Later, when the acute symptoms have subsided, and

spasm has been relieved, a carefully applied and efficiently moulded plaster of Paris splint will hold the limb in the corrected position and enable healing to take place. The position of choice is one of very slight hyper-extension of the limb combined with slight abduction and slight inversion of the foot.[11] The period during which extension should be continued, or the plaster splint kept applied, will vary within very wide limits, and experience alone will be the guide for each successive stage of mechanical treatment.

Finally, when convalescence is attained, a cast of the diseased hip should be taken from knee to nipple, and a celluloid hip splint manufactured and employed. The patient is now allowed to get up, but crutches with a patten on the sound foot should be used in conjunction with the celluloid splint for, usually, a further period of a year at least.

The measures just outlined represent those usually employed with success at Alton. Numerous other mechanical methods might be described, but, in our experience, would not be so efficacious. The Thomas's hip-splint, so commonly used, is not recommended.

Should the patient have arrived for treatment with the joint already ankylosed in a bad position, the deformity may require correction by surgical means, and in this case sub-trochanteric osteotomy is the operation of choice. Before such an operation is undertaken, careful skiagrams are desirable to make sure that no tuberculous process exists in the bone about to be severed, as in this case union after the osteotomy is unlikely to occur.

Given early and adequate treatment, a good result may be confidently anticipated. If ankylosis occurs, the limb will be in good position, but if immobilization is maintained long enough, a good range of movement commonly follows and a useful limb, with little shortening, may be expected.

Excision of the hip-joint is now rarely necessary. Amputation at the hip-joint is an operation which may

[11] GAUVAIN, H. J. : "Observations on the Prevention or Correction of Deformity in Tuberculous Disease of the Spine and Hip." *St. Bartholomew's Hospital Journal*, April, 1911.

be reserved solely for those septic cases where a fatal termination is unavoidable, unless heroic measures are attempted.

The treatment of complicating abscesses is described above.

Sacro-iliac Disease.

Sacro-iliac disease, comparatively rare in children, occurs with at least equal frequency in adults. The symptoms are pain, local tenderness increased by jarring, limp, and often some change in attitude. Care must be taken not to mistake this condition for either lumbar caries or hip disease, but careful examination makes diagnosis easy. Abscess formation is common, the abscess being either intra- or extra-pelvic, the former being more frequent. "Starting pains" in this condition are occasionally very acute, especially in adults.

Conservative treatment is here especially valuable. The patient should be fixed on a spinal board and the pelvis strapped firmly. Plaster of Paris is of value when the acute stage has passed. Abscesses should be carefully aspirated. Sinus formation renders prognosis especially serious in adults and is with the greatest difficulty treated. If radical measures are employed, the area infected must be completely extirpated. Mere incision and drainage is not only inadequate but extremely dangerous.

Tuberculous Affection of the Knee.

Tuberculous disease of the knee is primarily either synovial or osteal, the former being almost confined to children and not uncommon in these. The onset is commonly manifested by a subacute synovitis with effusion, accompanied by muscular spasm and pain. The patient walks with a limp and some flexion is usually early noticed. Later, flexion becomes more marked, accompanied by eversion of the foot and subluxation of the tibia, forming the triple displacement so marked in untreated cases. There is, in the osteal form, usually well-marked local tenderness on pressure.

At first rest in bed with extension is generally required to abolish muscular spasm, counter-extension

on the femur being often indicated. Until the limb is straight the femur should be sufficiently flexed to allow the tibia to lie parallel to the trunk. Repeated applications of plaster of Paris with slight correction at each application is often of value in the correction of deformity. When correction is obtained, a long plaster splint is valuable, followed during convalescence by a similar celluloid apparatus.

Abscesses, as a rule, should be aspirated. In adults, with a small, well-localized lesion, where the joint itself is not infected, complete removal of the lesion by operation may shorten treatment, but the risk of possible sinus formation must not be overlooked and should be guarded against.

Erasion is not commended and excision of the joint should always be avoided in children as subsequently flexion with ankylosis is excessively common and seriously interferes with the value of the limb. If ankylosis follows conservative treatment, a very slight degree of flexion is advantageous.

Tuberculous Disease of other Parts.

Tuberculous disease of the ankle may be either synovial or osseous, in the latter case the astragalus being most commonly attacked. Scraping operations should be most carefully avoided. Astragelectomy, in early involvement of the astragalus, is one of the best operations which have been designed for the relief of tuberculous joints. In other cases, plaster fixation, followed by celluloid splinting, is advocated.

For the diagnosis and treatment of tuberculous disease in other joints, the reader is referred to the standard surgical text-books. The joints of the upper limb are comparatively rarely attacked, though dactylitis associated with other lesions is not uncommon.

The after-care of tuberculous cripples is a matter of such extreme importance that some allusion to this is necessary here. It is exceedingly desirable that on the discharge of a patient the fullest possible directions be given for his future guidance. It is of equal importance to keep the patient under regular observation to be sure that the directions given are followed.

Frequently the surgeon, if interested in the after-care of these cases, is able to be of invaluable assistance. He alone is fully competent to give the best advice and is often, by reason of his knowledge of the case and his acquaintance with the capabilities and limitations of his patient, able to warn him of threatened dangers and teach him how these may be avoided. He can instruct him what occupation he may safely follow, and his work is crowned and completed if by wise care and help he has the satisfaction of seeing his former patient safely following a useful and remunerative occupation and taking his rightful place as a citizen and wage-earner.

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VIII

DEFECTS OF VISION.

BY

N. BISHOP HARMAN, M.A., M.B., F.R.C.S.

Vice-Dean and Lecturer in Ophthalmology to the West London Post-graduate College; Ophthalmic Surgeon, West London Hospital; Oculist to the London County Council Blind Schools; author of "Preventable Blindness," &c.

THE sense organ on which a normally constituted man relies most to judge of his relation to things material is the eye. The whole tendency of the evolution of the physical characteristics of man has been to improve his capacity for an exact judgment of the character and position of objects by the use of his eyes. His erect position increases the range of his vision, the development of the yellow spot in the retina is correlated with a special power for exact vision, and the flattening of the face and the bringing of the eyes from the sides of the head to the front enables the two eyes to act as one, with the result that binocular or stereoscopic vision, that master-key of visual powers, is possible. Without such a development of visual powers as these the position of man in the scale of animal life as we know it would have been impossible; for the development of the highest cerebral faculties are so intimately connected with the inter-working of hand and eye that, without this master-key, stereoscopic vision, we can hardly conceive of the development of that cunning of craftsmanship which makes man what he is.

SIGHT AND A CHILD'S EVOLUTION.

Man now lives by his eyes; he relies upon his sight more than upon any other of his senses. The form, the colour, the size, and the distance of objects are all measures that he is constantly taking by means of his

eyes. He fills his memory with living pictures; remembrance is the revivifying of pictures once seen by his eyes, or the pictures conceived by an imagination fed upon visual impressions.

If the evolution of man has been so profoundly influenced by the growth of the visual faculty, and since we are now so completely dependent upon this sense for the knowledge of our relations to the outer world, how great must be the effect of the loss of sight on the growth of a child, and in its degree the handicap which is presented by some defect of vision? Anyone familiar with the blind will know how profoundly their whole mentality is altered by the absence of sight, and how the retention of even a bare perception of light will differentiate such an one from a totally blind person, blind from birth. And it is a matter of common observation that an ordinary remedial error of refraction will, when it is neglected, change the whole character of a child, the short-sighted boy becomes a smug, a book-reading recluse, just because the pleasure of games has gone from him with his inability to see, but the pleasure of reading and the inevitable self-communion remain and are fostered. The advantage of perfect sight is acknowledged; the grievous handicap of loss of sight obvious. It follows that every sort of defect of vision presents a disadvantage and handicap; according to the degree of that defect so will be the handicap.

During the past ten years I have had exceptional opportunity of studying the conditions of children in public and elementary schools. The various defects of vision and the possible measures for their remedy have been correlated in school and hospital work. The article that follows will be a summary of my observations, and seeing that the bulk of the child population, at any rate so far as London is concerned, attends public elementary schools, most of my data will be that obtained from these schools. This will not militate against their applicability to the child-life of the country, for, although social status is found to have its influence on some ordinary eye conditions, yet these effects are most marked as we descend, and not as we go up in the scale of social status.

In one particular investigation 22,000 children were examined in the East-end of London. The eye conditions found were classified. There were two groups of conditions that affect the eyes. (1) External diseases of the eyes; (2) functional disorders, whether due to permanent or temporary conditions. Of these two groups the second is by far the larger, for it includes the effects of all kinds of errors of refraction. The former group is comparatively small, and it is rapidly diminishing as the knowledge of hygiene and common cleanliness is spread among the population, for this group is made up for the greater part of dirt diseases, conditions that more than any other are ameliorable and preventable. It is in this group that there are differences in the incidence of the conditions according to the social status of the subjects examined.

Diseases of the External Organs of Vision.

About 2 per cent. of the children examined suffered from some eye disease. Of these the bulk, or 75 per cent., were cases of blepharitis, or sore eyelids, an indication of dirty hands and unwashed faces, possibly associated with some visual trouble, for tired eyes are rubbed more than usual. Phlyctenular conjunctivitis came next in order of frequency, accounting for 15 per cent. of the cases; the seriousness of this form of inflammation will appear later. Acute contagious forms of conjunctivitis accounted for 10 per cent. of the cases; but this proportion will necessarily vary according as at the time of the examination there happens to be an epidemic or not. Trachoma, that destroyer of vision in Eastern countries, was extremely rare; only two cases were found, or less than 1 per cent. of the diseased conditions. For the rest interstitial keratitis due to congenital syphilis, abscesses of the tear ducts or sacs, eyes lost by earlier accident or disease, and congenital anomalies of not sufficiently serious an order to require education in a blind school, accounted for 8 per cent., whilst there were five children with eyes damaged from ophthalmia neonatorum, or about 1·5 per cent. of the diseased conditions. It must be borne in mind that the blind and partially blind children are

withdrawn from the elementary schools to special schools.

Cases of Blepharitis.

Blepharitis is one of the commonest of eye disease amongst children. Of 351 cases of eye disease in the group of children before mentioned no less than 270 suffered from this condition. It is particularly a disease of childhood. The ratio of cases seen at the hospital clinic demonstrates this: Infancy (to three years), 300; school age, 259; young adults, 45; adults, 10; elders, 2. After school years there were few cases, and those few which were seen in the adult and elder groups were old and chronic cases. Reference to the cases at the Belgrave Hospital for Children shows that the incidence of the cases is greatest at the time the children first join school. Only one case was noted in the first year of life during a period of ten years. Cases began to appear with frequency at the age of 3; they attain a maximum at the age of 4 years. It is to be noted that at the age of 3 and 4 years the children of the district from which these little patients came joined the infant classes of the elementary schools. Community of subjects, with the ready transference of micro-organisms allowed by it, is probably the determining cause of this age incidence. Perhaps eye-strain induced by the first attempts at kindergarten work may be an adjuvant, since infants tend to hold their work at a very short distance, and rub their eyes with their fists with great vigour and frequency when tired. The suggestion may appear to be borne out by a second rise in incidence at the age of 8 years, the time at which most of the children are passed from the infants' department to the upper schools, then their eye work is increased and there is a simultaneous increase in the refraction cases. (These figures were taken before the days of school inspection, so the cases were obtained by natural selection.)

Table indicating the Age-incidence of Blepharitis.

Age	1	2	3	4	5	6	7	8	9	10	11 years
Refraction and other cases	5	12	36	36	33	30	45	23	36	50	45
Blepharitis ...	1	7	20	40	25	12	8	16	12	8	5

Anatomically the eyelid is a fold of skin the structure of which has been adapted for special purposes. The hair is strengthened and set in rows as the outer guard of the conjunctiva. The sebaceous glands are enlarged, and similarly set in a row to discharge the secretion on the very margin of the lid, so as to protect by a natural unguent surfaces that are being continually brought into contact, and by a natural waterproofing to form a boundary which shall prevent the overflow of tears on to the face. The health of these marginal structures and the tissue about them is affected with the health of the skin of the lids and the conjunctiva. In general, the margins recover from inflammations almost as speedily as do these contiguous structures. There are, however, a numerous class of cases in which the lid margins suffer a chronic inflammation of a peculiarly unsightly nature, and ultimately of a very destructive character.

The acute form of blepharitis is almost always the result of inflammations of the skin or conjunctiva—the former in exanthemata, erysipelas, abscesses, and the like; the latter in conjunction with the skin conditions or in inflammations of the conjunctiva alone. The changes in the margins in these acute conditions are distinctive.

In the chronic form of blepharitis the onset may have a definite association with an acute attack, but by no means infrequently—indeed, probably in the majority of the cases—the commencement is so quiet and insidious that it is not noticed by the parent. Only when it is advanced does the instinct of human nature to discover an understandable cause lead them to attach it to some remote illness.

In examining children it is possible to demonstrate every stage of the disease in a single large school. In the earliest stage there is only a little dry, white, bran-like material fixed on to the lashes, just like papers on a file. If these cases be seen late in the day, after much reading, and particularly after doing fine needlework, the margins of the lids will be pink in hue instead of the normal yellowish white. Later the injection of the margins, "the weakness of the eyes," is noticed all day long. There is redness, swelling and tenderness of the

margins, the lashes are crusted with dried secretion, *débris* of cells and foreign matter. There is an alteration in the secretion of the meibomian glands, so that the edges of the lids are not efficiently greased, and this, with the excessive lachrymation produced by the local conjunctivitis, allows an overflow of tears. As the crusts accumulate on the margins there succeeds an ulceration of the surface beneath them, disease of the hair follicles, with loss of cilia and a chronic irritation of the meibomian glands, followed by their ultimate destruction. The excoriation of the skin of the lids on the one side, and of the conjunctiva on the other, enhance the ever-present liability to an outbreak of a general conjunctivitis on even slight provocation.

The chronicity may be such as to reduce the lid to a lashless state, with a complete atrophy of the glands, so that the lid margin is lost, and the conjunctiva passes into the skin by imperceptible gradations of epithelial thinning. The condition is unsightly in the extreme, for the lid has a red pouting lip to it that is always wet and sore-looking.

In studying cases of blepharitis there are to be noted three outstanding features :—

(1) The subjects of the affection are most frequently possessed of skin and hair which are both thick and coarse. They are liable to "black heads," pustules, acne and seborrhœa. There is a susceptible *soil*.

(2) The subjects of the affection will, on the objective examination of their refraction, most commonly be found to show an error of refraction generally of an astigmatic variety. There is in this factor a *preparation* of the soil.

(3) Lastly, there is the never-failing presence, in even the cleanliest of persons, of pyogenic organisms about the lid margins, always the *Staphylococcus pyogenes albus*, very often the *Staphylococcus pyogenes aureus*, and not infrequently other organisms in addition. In twenty children with healthy eyelid margins bacteriological examination demonstrated large numbers of organisms in each case. There is then plenty of *seed* ready to hand for sowing.

It is not difficult to link into a connected story the

relations between the susceptible soil, the preparation of the soil and the seed. The determining factor probably lies in the preparation of the soil. The defect in vision may be slight, but when the child is put to close work, especially when from unhealthy general conditions of life fatigue is readily induced, the tiring of the eyes, and the suffusion of tears, cause repeated blinking, so that the margins of the lids tap, tap, tap against each other with far greater frequency than is normal. The soil, naturally susceptible, is slightly irritated by the mechanical stimulation and prepared for the reception of the seed, which probably makes its first implantation in the hair follicles. The seed will flourish in direct proportion to its plentifulness, that is, in proportion to the dirtiness of the child's surroundings and person. This is well shown by the following comparison.

When this examination of school children had been made it occurred to me to re-group the schools in which they had been seen according to the general conditions, cleanliness, and so forth of the districts in which they were situated, and ascertain what, if any, differences were exhibited in the schools so grouped. In thirteen schools the children were classed as of fair average cleanliness, three above average, and fourteen below. The proportion of eye cases were as follows :—

TABLE INDICATING THE RELATION OF CLEANLINESS TO BLEPHARITIS.

Cleanliness	Cases of disease	Percentage
Above average	10 in 2,174 ...	0·873
Average	134 in 9,463 ...	1·416
Below average	197 in 10,256 ...	1·92
Total ...	350 in 21,893 ...	1·608

Cases of disease were more than twice as frequent in the dirty schools as in the clean.

Similarly, examination of the frequency of these cases amongst the native and alien patients at an eye hospital were made. The results were equally striking. The ratio of attendance of natives to alien was as 3·5 to 1. But the cases of this disease among the poor, ill-kept alien, mostly recent immigrants, were actually one-third more numerous than amongst the greatly superior

number of natives, or in a ratio of 5 to 4. In subjects better circumstanced there may be both the susceptible soil and the preparation of the soil, but their greater cleanliness so reduces the seed that the occurrence of blepharitis amongst them is rare, and when found is of but slight degree.

The treatment of such a condition as blepharitis is pretty clear from the knowledge of its causation. It is not enough to direct the attention merely to the cleansing of the lids, and the most admirable of antiseptic precautions will fail unless at the same time we reduce the liability to irritation which the possible presence of an error of refraction may present. The examination of the eyes of these children demands a very nice appreciation of the objective methods of examination, for it is obvious that children with irritable weeping eyes cannot be relied upon to give any satisfactory response to a subjective test. Retinoscopy under a quickly acting midriatic (for they rarely can tolerate atropine) is the only satisfactory mode of dealing with these cases. Retinoscopy is in many cases by no means easy owing to the crinkling of the cornea caused by the spasm of the lids. It is, therefore, advisable in every case to re-examine the refraction of the child at a comparatively short interval with the purpose of more exactly correcting the refraction under the conditions of improvement that will have followed the first correction. In some cases it is extraordinary how successful such treatment can be. Lids that seemed almost lashless, so thin and feeble were the degenerated cilia, will become cleaner, whiter, and show a respectable crop of lashes. The trouble is well repaid in the improved appearance of the child.

Phlyctenular Conjunctivitis and Keratitis.

These diseases come next in order of frequency as the cause of eye trouble in children. Of all the eye affections they accounted for 15 per cent. There are no diseases which are responsible for more damaged eyesight. Purulent inflammation in the new-born or in the adult, and the suppurative processes of severe exanthemata, are responsible for the total destruction

of eyes; but phlyctenular conjunctivitis and keratitis under present-day conditions at home account for by far the greater number of damaged eyes. Even should the injury to the cornea be relatively small the reduction in visual acuity is considerable, and presents a serious handicap to the patient in the struggle for a livelihood. Mackenzie, writing with the remembrance of the terrible epidemics of Egyptian ophthalmia fresh in his mind, says of this disease: "Neglected or mistreated, it becomes the frequent source of permanent impaired vision, or even of entire loss of sight." If he could, in times when purulent ophthalmia was rife, use such emphatic language, how much more can we nowadays! The ravages of purulent ophthalmia are restricted, but the slower, less disgusting damages of phlyctenulæ are not stayed. Nothing is more heartrending than, when such cases in after years are passed into the dark room for the objective determination of "error of refraction," to discover by the flash of a mirror a mottled cornea due to an almost forgotten inflammation of no great severity. The severity of the injury done to the eyes by this disease can be judged by the fact that of 300 cases of children referred to me on account of defect of vision not amounting to blindness, but of such severeness as to prevent their following the curriculum of an elementary school no less than 50, or 17 per cent., were due to this one cause.

It is *a disease of the poor and of young children.*

Cases are rare in the first year of life, and most common from 4 to 6 years of age, when the milk teeth are decaying. The children very commonly suffer from chronic coryza, have sores about the nostrils and lips, eczema of the face, perhaps discharging ears. The children are ill-fed. The disease is much less frequent amongst Jewish children than native. Jews feed their children well, and use much oil in cooking. We may note here that cod-liver oil is the best medicine for the disease.

The symptoms that mark the disease are very definite. No condition is more easy to diagnose. Photophobia and blepharospasm, small efflorescences at the limbus, and subsequent ulceration are the characteristics. Photo-

phobia is so marked a symptom that, should a child of 4 or 5 years be brought for examination with the eyelids tightly screwed up and red with tears, the diagnosis of phlyctenule is almost sure. When the cornea is exposed—by no means an easy performance—one or more small whitish elevations will be seen about the limbus heading a leash of vessels which point towards the centre of the cornea. Photophobia and lachrymation are the first symptoms, so a case may be seen before the actual pimple has developed. Later the pimple collapses, leaving an ulcer which tends to spread towards the centre of the cornea with its leash of vessels.

Of ten years' cases seen at the Belgrave Hospital it was found that 70 per cent. began at the limbus in the temporo-malar quadrant, on that part supplied by the orbital branch of the second division of the fifth nerve; of these 29 per cent. spread to the centre of the cornea. The significance of the "seat of election" of this lesion lies in the fact that this same nerve branch supplies the teeth in the upper jaw, and, as has been noted, the lesion has its maximum incidence between the ages of 4 and 6 years, the time of decay of the first dentition.

The earliest observers considered phlyctenules were minute blisters, hence the name. Later, sections were made showing solid elevations of leucocytes between the epithelium and basement membrane about the ending of a nerve. Sections of my own showed fibrin between the leucocytes, and von Michel has found cavities in some cases. Therefore it is likely the original observation of the nature of the lesion was correct. The seat of election, the age-incidence, and the character of the lesion, all go to suggest that it is a herpetiform eruption, caused by peripheral irritation of collateral branches of the second division of the fifth cranial nerve in ill-nourished children.

Many working at the bacteriology of phlyctenular conjunctivitis have sought to discover a specific organism. None are in agreement. In early cases examined by myself at the outset of the disease it was found that (*a*) the conjunctiva was freer from microbes than normally owing to the wash of the tears; (*b*) the contents of unbroken phlyctenules were sterile. Exam-

ination at later stage, when the phlyctenule had broken down to form an ulcer, gave a different result; then many varieties of the common staphylococcus were found.

Attempts have been made to show that the lesions have a definite association with tuberculosis, "caused by tubercle toxins circulating in the blood." The idea is in reality a resuscitation of the older "strumous" explanation. The evidence for an actual tuberculous association is singularly feeble. Crops of phlyctenules have been seen to occur after injections of tuberculin, and it is argued that they were the products of the irritation effect of the specific injection, but it is equally true that they occur in crops in several acute conjunctival inflammations, and even after the use of atropine in debilitated children. The opsonic index has been investigated without supporting the suggestion. Examination of the time that cases were under treatment brings out an interesting observation in this connection. Of all the cases seen at the Belgrave Hospital during ten years one-half the total number were cured in one week, a fourth in two weeks, an eighth in three weeks, a sixteenth in one month. There only remained the fractional one-sixteenth of the total, and it is these that have given the "strumous" designation to the condition, for they developed a severe, relapsing and chronic keratitis which dragged on for months, even to a year. But a condition that can be cured in a week in the half of the cases cannot be in any real sense a tuberculous, or "para-tuberculous" lesion; but without doubt it is as likely, indeed more likely, to occur in tuberculous children as in other weakly, ill-fed children.

The prominent symptoms of blepharospasm and lachrymation are equally explained by the nerve connection. In severe irritation of the fifth nerve there is a reflex through the seventh nerve, causing spasm of the orbicularis palpebrarum. The symptom is sometimes so severe that an anæsthetic is required before the lids can be opened and the cornea examined. A small branch of the lachrymal branch of the first division of the fifth nerve unites with the orbital branch of the

second division in the supply of the seat of election—hence these tears.

The treatment is of three parts: (1) The improvement of the health; (2) the relief of local irritation; (3) the treatment of the eye condition. For the first, good food and cleanliness are requisite. Cod-liver oil, plenty of fat food—milk, cream and butter—are wanted. In the hot summer months the oil is better replaced by the syrup of the phosphate of iron in small doses. For the second, it is essential to clean the mouth and teeth, and any sores on the nose and face. If there is chronic nasal trouble or adenoids they must be attended to at the earliest possible date. It is impossible to secure the eyes from the relapsing ulcers unless the primary cause of the irritation be done away with. It should always be borne in mind in this connection that phlyctenules are practically never seen in the children of the better off. These are properly fed, and their mouths are kept clean, teeth are repaired, and throats attended to. Lastly, there is the eye treatment. An ointment of atropine and yellow oxide of mercury, 1 per cent. of each, is, without doubt, the best of applications. The vaseline and lanoline base forms a warm, soothing covering to the conjunctiva; the atropine quiets the ciliary muscle and iris. The child should be provided with a large pent-roof shade to shelter both eyes from the light. It should never be allowed to wear the close-fitting celluloid abominations that are now on sale; these act like sweating chambers and incubators, and aggravate the sodden condition of the skin.

In the later stages of the chronic relapsing forms of phlyctenular ulcers it is necessary to attempt some more vigorous form of local treatment. The condition seems to become indolent, the ingrowth of vessels into the cornea keeps the ulcer in a sodden state that prevents repair of the epithelium. In such conditions the insufflation of calomel will often act as a stimulant and secure rapid healing; but care must be taken that no iodide is being administered internally. The substitution of eserine for atropine will frequently present the required stimulus for healing. Best of all in my experience is the stoppage of the vessels that pass over

the limbus to reach the ulcer. This can be done by just touching the vessel or vessels at a point just before the limbus is crossed with a hot wire or galvano-cautery. The least touch is alone required so as to produce a minute white burn. The ulcers, even though of months' standing, will be healed, and the eye quiet in a day or two.

Epidemic Conjunctivitis.

With the exception of certain grave forms of conjunctivitis, such as trachoma, the ordinary and epidemic forms of conjunctivitis rarely result in the production of permanent defects of vision. For the time of their existence they have a serious effect on the attendance roll of the school, and not infrequently the teachers themselves become infected; but in this country it is rare to find ulceration of the cornea, or perforating ulcers, such as so frequently marks the same types of conjunctivitis in the Orient.

Muco-purulent conjunctivitis is the most common form of contagious catarrh. It is very commonly seen in epidemics often widely spread through a whole town or district. If one member of a household is attacked all the members are likely to be affected. The symptoms show all the classical signs of inflammation. The conjunctiva is red on account of the engorgement of the vessels and the small hæmorrhages that occur under the membrane. It is hot because of the hyperæmia, so that body temperature may be recorded instead of the usual 3° to 4° below normal. Swelling is present, and varies according to the severity of the attack; even the lid may be glassy-looking owing to œdema. The pain is characteristic of conjunctivitis; the patient feels as if sand or grit were in the eye or under the eyelids, sometimes even a "feeling as if broken pieces of glass were rolling under the lids." Further, there will be seen in the lower fornix and the lacus lacrimalis pale, greyish, yellow pellets of muco-pus, and if these are examined microscopically they will be found crowded with organisms. The palpebral conjunctiva early assumes a velvety appearance owing to the swelling of the rugæ, and the lymph follicles of the lower fornix are swollen, and appear as raised pinkish-grey bodies about 0·5 to

1 mm. in diameter. Commonly the attack begins in one eye, and then affects the other. The pre-auricular gland may be enlarged.

When the muco-purulent discharge is examined microscopically in a film preparation and stained with Loeffler's methylene blue a delicate rod-shaped organism can be found—the Koch-Weeks bacillus, or *Bacillus ægypticus*. It was discovered by Koch in Egyptian ophthalmia, and studied by Weeks, of New York. It is very small, measuring about 1·5 microns in length, and 1/10 to 1/12 its length in breadth. It is frequently nipped in or unstained at its middle. It stains with aniline dyes, but not by Gram's method. It can be grown upon serum slants when the discharge is mixed with blood. The colonies are exactly like dewdrops. In most of its features it is like the bacillus of influenza; in fact, some workers have sought to prove that the organisms are one and the same.

The importance of the prompt recognition of the onset of one of these forms of epidemic conjunctivitis in a school, and particularly in a residential school, cannot be overestimated. The disorganization produced in the school is great, and it is obviously impossible to teach children who are suffering from an acute eye condition. Further, the organism has peculiar powers of retaining its hold upon the affected tissues, for it is to some extent intercellular and intracellular, facts which account for the frequent relapses which follow the introduction of the disease into a community, and these keep up a state of irritability of the eyes which in some cases is possibly responsible for the grafting on to the original condition of graver forms of conjunctivitis, even perhaps of trachoma.

The first thing to do on the appearance of an epidemic in a school is to protect the non-affected children from the spread of the contagion. The most fruitful cause of the spread of the disease is the common use of towels. In a day school towels should immediately be withdrawn from use. Children who come to school with unwashed hands and faces should be sent home to wash. It is better for the good governance of day schools in this regard to prohibit the use of towels for face washing at any time. The widespread occurrence in a

residential school of such an epidemic is a serious reflection on the sanitary management of the school. In every boarding school there should be a strict superintendence of the washing arrangement. Every scholar should have his or her own towel, toothbrush and sponge, or its equivalent. No exception must be taken to this rule. And if none is made an epidemic is little likely to spread, and sporadic cases are easily checked by the segregation and treatment of the affected children. It may be thought that there is little need of insisting on toilet precautions in better class schools, but the spread of impetigo or "scrum pox" through some of these is evidence that the warning is needed.

Angular Conjunctivitis.

This is a form of inflammation due to a specific organism, the bacillus of Morax-Axenfeld. It is rather chronic in its effects, and more frequent in adults and women than in children. But it may occur in children, and on occasions I have isolated the organism from the conjunctiva of children apparently healthy. The form of the inflammation gives the name "angular" to the disease; for the angles of the lid show a distinct redness, the skin is soppy just as the fingers of a charwoman. Blinking and screwing up of the lids is characteristic, and this action squeezes out the discharge with the organism so that the skin is attacked.

All forms of conjunctivitis are more frequent in the months of March, April and May than at any period of the year, for then the dry, gusty winds scatter the dirt of the streets broadcast. Also all forms of conjunctivitis are more common amongst dirty, ill-kept folk than amongst those of cleanly habits.

Proof of this latter statement has already been given from the statistics of the examination of school and hospital cases.

The influence of seasonal effects can be shown by the following table giving case incidence :—

Table indicating the Seasonal Incidence of Conjunctival Disease.

Seasonal Influence	Quarter of the Year				
	1st	2nd	3rd	4th	Period
Belgrave Hospital (children) ...	225	325	275	210	10 year
Eye Hospital (all ages)	52	67	45	50	1 year

Again, evidence of the effects of dirt can be obtained by a bacteriological examination of the flora of the conjunctiva. In 100 children 50 were clean and 50 dirty. Of the clean children 40 per cent. had sterile conjunctivæ; of the dirty only 6 per cent. Observations on aliens and natives at hospital give similar evidence, the proportion of affected aliens was 471, as against 100 natives; both groups came from the same districts, but the conditions of the two as regards cleanliness and housing were very different.

School Ophthalmia.

There are certain forms of conjunctivitis which are of a very chronic type, and to these reference must be made. Follicular conjunctivitis—often called "school ophthalmia"—trachoma and spring catarrh. The first is exceedingly common, the last two are rare in this country, and particularly the last.

School ophthalmia is a term that was in very common use not many years ago, but it is now being succeeded by the term "follicular conjunctivitis." Probably both terms are equally good or bad, for if the reading of the condition that will be given here is correct, the condition is neither an ophthalmia nor a conjunctivitis, but something essentially different to these.

Scattered over many parts of the conjunctiva, immediately beneath the epithelial covering, are numerous collections of lymph cells. Their distribution varies. They are fairly plentiful in the lower lid, in large numbers in the retrotarsal folds, very sparsely scattered in the tarsal conjunctiva of the upper lid but fairly numerous at the angles; they are absent over the ocular conjunctiva. In structure they do not differ from the many other solitary follicles scattered throughout the mucous membranes of the body; in fact, the discoverer of them likened them to the Peyer's patches about which he was writing, "Identical structures existing in the under eyelid of the ox" (Brush). There is a supporting network of endothelial tissue made up of cells with fairly large oval nuclei, and many branching protoplasmic processes by which cell holds on to cell. Packed within this sponge of tissue are

innumerable lymph cells; they are developed in areas which form follicles; at the centre the cells are loosely packed and show mitotic figures, they are packed closely in the periphery of the follicle; thence they pass into the loose connective tissue spaces of the membrane, and some apparently into the conjunctival sac itself even in health. When these follicles are visible to the naked eye they appear as minute round elevations bulging from beneath the membrane, they catch the light so that each is touched with a point of light. When they are evident and numerous, it is common to say that the child has follicular conjunctivitis. The frequency of the condition among resident school children has given occasion for the name school ophthalmia.

To obtain some idea of the frequency of the condition in apparently normal children I examined every child in a large day elementary school of good class. Over 1,000 were examined. Each was seen in good daylight. The lids were everted, and the conjunctiva examined with the naked eye. Almost every state of follicle could be found from forms only just visible as minute elevations touched with a point of light, up to forms which could only be considered as a state of hypertrophy. Yet none of these children showed the slightest trace of any inflammatory reaction.

TABLE INDICATING PREVALENCE OF CONJUNCTIVAL FOLLICLES.

Department	Ages	Numbers examined	Number with visible follicles	Number with hypertrophied follicles
Infants (mixed) ...	3 to 6	342	144 = 42 per cent.	1 only
Girls	7 to 13	328	232 = 77·3 ,,	4 ,,
Boys	7 to 13	341	178 = 52·2 ,,	4 ,,
Totals		1,011	554 = 58 ,,	9 ,,

There is a considerable difference between the incidence of the follicles in the boys and girls. Delbés found a similar difference, 49 per cent. in boys and 52 per cent. in girls. When the children examined by myself were considered in each age-year it was found that there was no real difference between the sexes until the age of 10 was reached, then the incidence in the girls exceeded that in the boys by 30 per cent., and so

continued. There are many possible explanations of this phenomenon. Puberty was considered and excluded. The most evident point for correlation was cleanliness. Simultaneously with the examination of the eyes I had noted the conditions of the hair of the girls as an indication of cleanliness. On examining these returns for each age-year there was found a sharp rise in the incidence of nits in the girls' hair at the tenth year exactly corresponding to the rise in follicular incidence. The two things are not related as cause and effect in any sense, but both are probable indicators of "condition," and condition dependent largely on care of the person. In the particular group of girls examined it was ascertained that at 10 years their mothers, mostly working women, expected the girls to look after themselves; the result appeared in hair and eyes.

The enlargement of the follicles is more evident in debilitated, pasty-faced children, and the eye condition may be associated with a similar enlargement of the tonsils and with adenoids. Such children are more liable than well-kept children to conjunctivitis, due to any invading organism. The treatment is obvious. Improve the health and environment, and prevent the onset of the condition by cleanliness and plenty of outdoor life. Locally, benefit may result from use of astringents.

Trachoma.

Trachoma is often spoken of as "granular lids," since the inflammation involves chiefly the palpebral conjunctiva. It is a very chronic disease, lasting one or more years, causing much hypertrophy and scarring of the conjunctiva and injury to the cornea, with reduction or loss of sight. It is chiefly seen amongst the poor, dirty, and those who live in overcrowded quarters of cities. It is exceedingly common in Egypt (hence the name "Egyptian ophthalmia"), where MacCallan found it present in 51 per cent. of school children. It is common in Eastern Europe; it was exceedingly common amongst the poor Jews who flocked westward during the Russo-Japanese war. It is not common in England, certainly not amongst the native population.

Of 70,000 London school children whose eyes I examined myself only five were found affected with the disease. Poor Law schools used to be hotbeds of the disease, but nowadays special care is taken to segregate and treat any children that show signs of conjunctivitis of any sort; so that the stigma is removed from this sort of school. Convent orphan schools in Ireland, and some of the same sort of schools in England, are reported to be undesirable from this point of view.

In considering the symptoms of trachoma, and in examining school children to ascertain the presence or absence of the disease amongst them, it is important to bear in mind that subjective symptoms may be entirely absent. The presence of the disease may be unsuspected until the lids, and particularly the upper lids, are everted. Usually there is more or less photophobia with lachrymation on exposure to light, and some discharge. There is very frequently slight ptosis, and the edges of the lids may be thickened and discoloured. When the lids are everted, the upper tarsal surface is found to be chiefly affected. The papillæ are exaggerated, so that they look like plush pile (papillary form). In others the lymph follicles are particularly prominent (granular form), so as to suggest sago grains or frog's spawn. Both features may be equally marked in the same case (mixed form). The discharge is intermittent and contagious; it is rarely great in quantity. One of the prominent features, and the one to which the loss of vision is due, is the production of pannus of the cornea. This is the result of the irritation of the cornea by the rough lids; there is a growth of new vessels and soft connective tissue between Bowman's membrane and the epithelium. It usually affects the upper part of the cornea in a wedge-shaped patch, apex downwards; ulcers frequently form at the apex. The pannus obscures the sight, and since the ingrowth of vessels is permanent, and a scar once produced never entirely regresses, sight is seriously affected; sometimes the sufferers are rendered nearly blind.

Sections of the conjunctiva in cases of trachoma show, in addition to enlarged papillæ, leucocytosis, and massive

follicles, a marked exaggeration of the endothelial stroma, with formation of giant endothelial cells (multinucleated). The stroma tends to envelop the follicle in a capsule, and cure only results when the stroma has shrunken into scar tissue. As to the ætiology of trachoma, we are ignorant of any one and certain cause. The contagiousness would suggest a specific microbe. Koch and other workers found in Egyptian cases the gonococcus, Koch-Weeks' bacillus, Morax-Axenfeld bacillus, pneumococcus, and other cocci. In cases seen in England all these have been found except the gonococcus. Many attempts have been made to establish some particular organism as the prime cause but without success. Recently Halberstädter and v. Prowazek have published accounts of certain cell inclusions which they have termed "trachoma bodies", these, when treated by Giemsa method of staining, appear red in a blue field. The bodies have been recognized by other workers in fresh untreated trachoma, but similar bodies have been found in other conditions, and it is held by many that they are the granules of broken-down leucocytes. It is quite possible that the disease is a chain of pathological events produced by the irritation of one or more of several organisms in subjects who are habitually ill-conditioned. It is on this account that the presence of "school ophthalmia" in a large aggregation of children, such as in Poor Law schools, is a condition that must never be neglected. The latter condition is merely a hypertrophy of the normal anatomical features of the mucosa, but it may provide the particular soil on which the serious condition of trachoma can be easily grafted. It is evidently so viewed by the American emigration authorities, for I have seen not a few emigrants who have been refused admission to the States on account of hypertrophy of the conjunctival follicles.

A detailed account of treatment is no part of a work such as this. But one point may be mentioned. Too vigorous and energetic treatment has been found to produce so severe a scarring of the tarsus that the ensuing entropion has caused a state of affairs worse

than the original disease. The motto should be *festina lente*. The disease cannot be cured once it is definitely established in less than three to six months of constant assiduous treatment, and the best results are obtained by stimulating those processes of fibrosis of the stroma which strangle both the follicles and the endothelial cells which appear to be the essential histological features of the disease. An effective scheme of treatment is outlined in my little book "Aids to Ophthalmology," pp. 31-33.

Spring Catarrh.

Spring catarrh is a condition so rare that it scarcely merits attention here, except only to notice that in some of the objective features it may be mistaken for trachoma, in which case the state will be aggravated should it receive the treatment appropriate for trachoma. Each spring the patient suffers an attack of acute conjunctivitis, which lasts through the hot dry weather. The membrane is seen to be thickened; that of the lower lid looks milky; that of the upper lid, owing to the enlargement of and flattening of the papillæ, looks like a mosaic. Occasionally small nodular thickenings with small vesicles appear at the limbus. The fluid of these vesicles is rich in eosinophil cells. Sections of the conjunctiva show exaggeration of the fibrous elements of the subepithelial tissue, particularly in a small spindle-celled formation, the epithelium is thicker than normal. The condition is probably a keloid scarring of the conjunctiva.

Purulent and Membranous Inflammations.

Besides the forms of conjunctivitis which have been mentioned there are certain acute and severe forms which are responsible for a very large proportion of the blindness found amongst children.

Purulent conjunctivitis is most often seen as the ophthalmia of the new born, but it may occur later as a complication of one of the exanthemata. Membranous conjunctivitis is due to infection with the diphtheria bacillus or the streptococcus; the latter is particularly

a disastrous form of inflammation, so intense and so rapid in its severity that remedial measures are rarely of use. These cases and the defects resultant therefrom are dealt with under the section "The Care of Blind Children" (p. 194).

Defective Vision arising from Errors of Refraction.

Disorders of vision from errors of refraction are by far the most frequent source of trouble amongst school children. The report of every medical officer throughout this and every country where school examinations are made confirms this statement. Of 30,000 London school children who were specially examined, 26 per cent. were found to have defective vision, *i.e.*, over one in four could not read 6/9 on Snellen's test card. The returns were worse in the poorer overcrowded districts, for there 30 per cent. failed, and amongst the alien Jews of the East-end 36 per cent. were defective. Again, girls have worse vision on the average than boys. In one good class school I found 18 per cent. of the boys defective, and 26 per cent. of the girls.

Some correlation of social environment and of sex with conditions of vision is evident from these returns. Which is cause and which effect is not possible to determine. There is evidence to suggest that those with defective vision are handicapped to such a degree that they tend to fall back in the race and gravitate into the poorer quarters, where they breed and reproduce their kind. On the other hand it is equally true that an organ that does not get fair play, proper exercise, and sufficient nutrition, will not come to a satisfactory maturity. The early onset of catarrhal diseases of the throat and adenoids have great influence in the development of the face and also of the eyes. Racial or social segregation will scarcely account for the higher frequency of bad vision in the girls, but it can be explained when we take into account the early age at which poor children, and especially girls, are set to work at home, before and after school hours.

In testing the vision of children it is always necessary to take into account the fact that most of our tests are

tests of wit as well as of sight. To get a good vision test the play of wits should be reduced to a minimum. It would be well if all tests for school purposes were made with the "E" test, the children being drilled to turn their extended fingers into the position of the E shown. This method of examination has been proved by tests with mentally defective children to require the smallest degree of mental work. No recognition of an arbitrary character, or naming of a sign, is required, only the minimal capability of imitation, and the power to put the fingers into the position of the sign shown. No words are required, only the motion of the hand. This test has been developed in the author's "signal" test (Curry and Paxton).

Children over 10 years of age who cannot read 6/9, and those under 10 who cannot read 6/12 should have their eyes examined. The difference in the standard is alone necessary when the letters of the alphabet are the basis of the test. When the "E" card is used one standard does for all, the ability to read 6/9 with each eye should be demanded.

When the ordinary Snellen's types are used for testing vision the failure of a child to read 6/6 does not necessarily imply poor vision; the child may not be sufficiently familiar with the letters to recognize them easily at a distance, or in these days of pseudo-phonetic alphabetical expressions the examiner and child may fail to understand each other!

The Determination of Errors of Refraction in Children and their Correction.

The examination of the eyes of children needs a thorough, indeed an expert knowledge, of the objective methods of examination. Children are too young to warrant any stress being laid on the results of subjective examination; indeed, many of the cases are in children of so tender an age that such tests cannot be made at all. The testing of the vision by the use of test-cards is merely an interesting indication of the capability of the child for recognizing certain signs. The failure by no means indicates that the child cannot see. Conversely there are many children who can see well when

reading print at the distance that they chose as most convenient to themselves, but who need examination of their eyes and the correction of errors of refraction by the provision of suitable glasses.

The doctor who essays to treat school children must of necessity be such a master of the art of retinoscopy that he is able to determine the refraction of the eye to a nicety; and he must be so sure of his work, by the frequent and repeated checking of his objective results against the subjective results obtained in the examination of patients of riper years and of keen judgment, that he can in the case of children order glasses directly from the results of his retinoscopy. Unless he is able to do this his work will be an unutterable source of weariness to him, he will feel a constant anxiety about the correctness of his work and prescriptions, and without doubt his work will be doubled by the many "returns" of unhappy nature that he gets at his clinic.

Retinoscopy is really a fine art. It is also highly scientific. It is quite within the compass of those who will take the pains to master its principles, and practise it until perfection comes to them. Granted there are some whose capabilities do not run to the making of exact measurements, and who cannot even measure a yard of tape correctly, but these could scarcely have succeeded in passing the many gates that lead to the realms of the qualified doctor. Refraction work is referred to by many as the utmost limit of boredom and monotony in work. It is never this to those who appreciate the finesse of exactitude, but it may be all this and more to those who fail to gain confidence in their own skill.

This work is no place in which to set out the principles of retinoscopy; I would refer the reader who needs guidance in this matter to a little book that has been written and rewritten with an eye to the needs of the post-graduate. In the "Aids to Ophthalmology" he will find seven chapters on refraction, and if he will study these, and practise all the directions on the living subject, experience leads me to foretell that work which was formerly tiring to the last degree will become interesting and a source of satisfaction.

One point must, however, be referred to here. That is the use of mydriatics. Without their aid it is next to impossible to arrive at any true determination of the error of refraction of a child. In the school age the accommodation is at its best. Its range is fullest. The mere stimulus of the light projected from the retinoscopy mirror is sufficient to set up an action in the accommodation muscles, and may be a spasm in susceptible subjects. It is therefore worse than useless to attempt the correction of errors of refraction without the use of efficient cyclopegia. Atropine is by far the most efficient of our mydriatics, provided it be satisfactorily used. It is best made up as an ointment of 1 per cent. with equal parts of lanoline and vaseline. This should be used two or three times a day for three or four days. It is little use ordering this ointment for home use unless at the same time there are given proper instructions for its usage, otherwise children will come up to the clinic again and again showing no effects of its action. It is better for the nurse in charge to insert the first portion of the ointment between the lids of the child that has to be examined in the presence of the mother, then there can be no doubt as to the mother understanding the method of use. After atropine the most useful of drugs is homatropine; indeed, when effectively used this can rival atropine, if not in superior effectiveness at least in superior handiness. I am accustomed to use it largely in the examination of children, and with the methods employed it is rare to find any failure in the efficiency of the drug. Homatropine will be a good servant on which you can rely, or an annoying, uncertain servant, just as it is used. If it be used in the usual watery solutions it will never be certain; if it be used dissolved in castor oil one speedily learns that it is reliable.

The best preparation is a 2 per cent. solution of the pure alkaloids of homatropine and cocaine in castor oil; they dissolve by gently heating over a water-bath for six hours. The solution is permanent, it never goes bad, and a very little goes a long way. With a glass rod the size of a wax match one drop should be placed in the lower fornix of each eye; the eyes should be

anointed quickly one after the other without letting the first anointed lid close, then the smarting is not felt before the operation is completed. Then the child should sit with the eyes closed, or bandaged if very young, for a whole hour. The effectiveness of the oil is due to the fact that the minute drop spreads at once over the whole conjunctiva, the tears cannot wash it off, and it is absorbed at all points. The only criticism that can be made of this manner of using the oily preparation is that it smarts a little on introduction; it feels like soap getting into the eyes. For this reason only it is not completely satisfactory for routine use in children, for if one child in a clinic starts screaming, all may be upset, and the work of the day be spoiled. Much will depend upon the manner of the surgeon or nurse who uses the drug. Recently I used it on 1,100 children, every child in a large London school, from the infants up to the oldest; a little cajolery, talk of the "tickle," did it, and the results were perfect.

Nature of Errors of Refraction found in Children.

The nature of the defects of vision for which school children are referred for treatment can best be understood by taking the returns of some school clinic. I have made two such investigations. In 1909 I examined the returns of the children attending two hospitals at which I worked to the number of 1,100. Last year I examined all the case papers of the children attending the school clinic working at the Belgrave Hospital for Children. The nature of the material of these two groups of children differs slightly. In 1909 there was no routine examination of the vision of the children in the districts served by the hospitals, so the cases came by natural selection; they could not see or had headaches, so their parents brought them. The children seen at the Belgrave clinic came because their eyes had been examined at school and were found to fall short of the standard.

At the Belgrave clinic the eye cases numbered 1,910; of these 1,721 were available for tabulation. The

children seen were with rare exceptions British, and natives of the district. Socially they are the children of good average class workers: artisans, transport workers, and motor drivers. Very few of the ill-kempt, thriftless poor were seen. The neighbourhood is open and healthy.

The following is a fair summary of the returns obtained at the latter examination. They do not differ materially from the earlier finding, as will be seen when the salient figures are examined at the end.

Sex Distribution.—Of those examined 771 were boys and 889 girls, or 46·9 and 53·1 per cent. respectively. The greater incidence of eye defects amongst the girls extends to nearly all varieties of conditions found. The preponderance of girls is not uniform in all the age groups, but for the ages of 10 to 13, the eleventh year presenting the maximum difference.

Age Incidence.—This is unequal, consequent upon the arrangements for medical inspection at the schools. For the ages of 4, 5, and 6 only such children are sent for examination as have obvious defects of the eyes, such as squints and surface diseases. In the subsequent years there are two peaks of high attendance, the eighth year, and the eleventh and twelfth years; these correspond to the two medical inspections of the children at school after they have left the infant department.

Variety of Eye Conditions.—Of the 1,670 cases analysed no less than 1,420 were found to be in difficulties on account of "errors of refraction" without other defect. The balance of 250, or 19·17 per cent., were found to be suffering from a large variety of diseased or abnormal conditions as the following list indicates:—

	Boys	Girls	Totals
Surface diseases:			
Blepharitis	44	38	
Conjunctivitis	23	27	
Trachoma	1	0	
Xerosis	0	1	
Corneal ulcers	24	33	
Herpes ophthalmicus	1	1	
	93	100	193
Injuries	5	3	8

	Boys	Girls	To
Congenital defects:			
Dermoids	2	3	
Defects of lids and muscles	2	2	
,, of iris	1	1	
,, of macula (and congenital nystagmus) ...	3	0	
Albinism	1	2	
Lens opacities and cataract	6	4	
Dislocated lenses	0	1	
	15	13	28
Effects of ophthalmia neonatorum (not bad enough for blind school)	2	2	4
General disease, interstitial keratitis, iritis and disseminated choroiditis (congenital syphilis)	6	2	
Optic atrophy	1	0	
	7	2	9
Retinitis pigmentosa	1	3	4
Of these one only had a bad pedigree.			
Habit spasm, blinking, &c., without determinable defect	4	0	4

250 = 19·17 per cent.

Squinters.—199 cases of squint were seen, or 14 per cent. of the refraction cases, no inconsiderable proportion. In the first few years of age incidence they form the whole of these cases.

Age ...	4	5	6	7	8	9	10	11	12	13	14 years
Percentage ...	100	100	63·2	32	7·6	17·7	5·5	5·2	7·5	2·7	5·4

The varieties of squint were as follows:—

Convergent	166	
,, alternating	16	
,, associated with scarred corneæ	6	
,, fundus disease	1	
,, congenital defect	1	
,, hydrocephalus	1	191
Divergent		8
		199

199 = 14 per cent.

Errors of Refraction (including those found in the

squint cases) numbered 1,420. The character of the conditions found is best seen when presented in tabular form :—

Variety	Number	Per cent.
Emmetropic	44 ...	3·09
Hypermetropic	349 ...	24·5
Compound hypermetropic astigmatism ...	458 ...	32·25
Hypermetropic astigmatism	87 ...	6·12
Mixed astigmatism	110 ...	7·74
Myopia	167 ...	11·7
,, with astigmatism	177 ...	12·4
Odd eyes	28 ...	1·9
	1,420	100·00

Of the eight classes the first includes a few cases referred for some failure to attain the visual standard in which no defect of the eyes could be found at the clinic. In a few there was a history of temporary indisposition or mild conjunctivitis. In some the failure arose from misunderstanding. A few were children with mental defect. A very few were apparently children who were interested in the possibilities of a visit to hospital.

Of the other classes only the last needs explanation : "Odd eyes." The term does not connote "anisometropia," of which there were very many cases ; it includes only those cases where one eye was found to be hypermetropic and the other myopic in any degree or meridian.

These eight groups may be considered as forming parts of two main groups : hypermetropia and myopia. Ranged thus it is easy to compare the findings of the examinations made in 1909 and 1913. It will be found that they are very similar, the slight difference in the figures being of little consideration when the difference of the manner in which the children came under observation is remembered.

Date	Hypermetropic group	Myopic group
1913	66	34 per cent.
1909	71	29 ,,

Age Incidence of the Defects.—A very instructive lesson can be deduced from the examination of the age

incidence of the various forms of defect, hypermetropia, hypermetropic astigmatism and myopia.

It will be found that the cases of hypermetropia form a fair average of about 35 per cent. from the age of 4 years to 14; there are fluctuations, but these are casual, and suggest nothing to which weight may be attached. It is quite otherwise with the percentages of hypermetropic astigmatism and of myopia. There is a most striking variation in the incidence for every year of age. In the youngest years the cases of hypermetropic astigmatism are plentiful, in the last years they are few. The reverse holds good for the cases of myopia: they are few in the earlier years, they are plentiful in the later. In fact the percentages are reversed. It may be noted that the figures of both examinations, 1909 and 1913, agree:—

Age in years	4	5	6	7	8	9	10	11	12	13	14
Hypermetropia	35	33	35	48	49	41	41	29	40	32	25
,, with astigmatism	65	65	56	40	36	30	22	26	16	14	8
Myopia	—	2	8	12	20	24	33	40	49	52	65

Ophthalmic surgeons are not in complete agreement regarding the primary cause or causes of myopia, but these figures suggest an association between astigmatism and the tendency to myopia. Given poor vision due to an astigmatic error there is an excessive liability to fatigue, an habitual shortening of the working distance, and with the young soft eye of the child it is a short step to a permanent lengthening of the focal axis of the globe. This matter will be referred to under the section on myopia.

The Incidence of Serious Cases of Error of Refraction.—An error of refraction of 5 dioptres or more, whatever the nature of the error, is beyond all question a distinct handicap, and in many cases necessitates special educational treatment. With such a degree of error it is common to find that vision cannot be brought up to the normal standard even with the most accurately arranged correcting glasses. The disability is more pronounced when the error is partly or wholly astigmatism. In the Belgrave clinic they were found to make up 16·21 per cent. of the whole number of

refraction cases, 231 cases in 1,420; their character was as follows:—

Error 5 D. and over	Boys	Girls	Totals
Hypermetropia	35	33	68
,, with astigmatism	47	44	91
Mixed astigmatism	1	1	2
Myopia	8	7	15
,, with astigmatism ...	17	37	54
Odd eyes	0	1	1
	108	123	231

The Management of Squint Cases.

Squinting is a fairly common disorder of the eyes, and is one that is deserving of special attention. There is no doubt about the deformity caused by the defect, and that alone is sufficient to warrant care. But the deformity is not the only drawback produced by the defect, there is with the onset of the squint a total loss of that most perfect and valuable of all the functions of the human eyes, binocular or stereoscopic vision.

Monocular vision is the common state of the lower vertebrates, *e.g.*, the fishes; the eyes are lateral in position and they work independently of each other; they seem to serve more as alarums than as organs of perception. The same holds good for the lower mammalia, *e.g.*, the rabbits. In these animals it is obvious that so fine a faculty as binocular vision would be totally wasted, for their visual perception is practically limited to moving objects; at the least sign of movement in the surrounding objects they are alert and run, whereas if a man will remain quite motionless the rabbit will be all unconscious of his near presence, provided the wind be favourable.

There appear to be attempts at binocular vision in some of the higher hunting mammalia; the domestic cat would seem to have some traces of the power, for it is noticeable that the eyes work together in examining near objects, and that the cat is able to "handle" an object with great nicety. This is correlated with a large increase in the area of the visual centres in the cortex.

In man the development is complete. The whole of his face and position of body has been remodelled to

secure this great object. He stands erect to the view, and his face is flattened so that the eyes are well in front and near together. They work on parallel axes, and can converge to examine a near object. There is constant binocular vision, and with that the ability to determine the size and the distance of any object. This judgment is effected by an unconscious, but trained, perception of the nerve impulses required by the extra-ocular muscles in moving the eyes.

With the facial and ocular developments there must needs be a special development of the cortical centres that control and correlate the movements of the two eyes, and in man the visual cortical centres attain to a huge development. Binocular vision depends upon brain control for its maintenance. And that control we know by the name of the "fusion faculty," that is, the faculty or power of the brain to fuse into one satisfactory picture the two divers images seen by the eyes. This faculty is not present, or rather, not manifest, at birth; but it appears to come into play as early as the third or fourth week of life; even then it can be upset by a very little irritation; a pin prick will cause a baby to squint. The observation of the appearance of the faculty after birth is a very old one. It was recorded by Pepys in his famous "Diary." Like most laymen he was fond of doctors' stories, and he placed on record one that he had heard. "At supper the three doctors of physic again in my cabin, when I put Dr. Scarborough in mind of what I heard him say: that children do, in every day's experience, look several ways with both eyes, till custom teaches them otherwise; and that we do now see but with one eye, our eyes looking in parallel lines."

Once binocular vision is well established it is rarely disturbed; but should the brain control be weak, a very little irregularity of one or both eyes will cause a squint to appear.

The case may be illustrated by a simile. The relation of the two eyes, the muscles, the nerves, and the brain is very like that of the horses, the traces, the reins, and the driver of a four-in-hand. A good driver will master a bad team, so a good fusion faculty will maintain

binocular vision with unequal eyes, or even with an ill-adjusted muscle; but there will be strain on the driver and fatigue of the brain, for both will be doing abnormal work. But if the driver be bad, although the team be perfectly matched and thoroughly trained, and the equipment all that could be desired, the fool of a driver will surely run the coach into the ditch at the first bad turn of the road. So with the eyes. Each may be perfect in focus, there may be perfect nerves and muscles, but if there be little or no fusion faculty, a mild fever or the first turn of work at school will set up a squint that can scarcely be corrected by the most careful measures. It is this last state that accounts for many cases of alternating squint in eyes that are emmetropic; there is no fusion faculty, and although it is possible by operative measures to adjust the eyes to a satisfactory appearance, yet by no means can binocular vision be developed where there is a cerebral deficiency. There is in this a correspondence with the defects known as colour-blindness, word-blindness, and tone-deafness. All these are due to cerebral defects, and they cannot be corrected in the real sense of the word.

In ordinary cases of squint there is a poor fusion faculty, so poor that it is easily disordered by undue strain. It is therefore the province of the doctor to find out wherein lies this excessive strain, so that it may be relieved and the fusion faculty once more given the chance of controlling the eyes.

If the case be neglected the squinting eye may become completely blind for all qualitative vision by disuse; even the power of fixation may be lost. The images of the squinting eyes are suppressed by the brain to get rid of the annoyance of the diplopia, hence the urgency of treatment for the relief of the squint. Vision can be recovered if it be not too far gone or lost for too long a time.

Causes of Squint.—The primary cause is the weak fusion faculty. Secondary to this may be a great variety of exciting causes. The most common are:—

(1) Hypermetropia. Convergence and accommodation normally go together. In hypermetropia accommodation has to be effected without a corresponding

convergence. This effort is too great to be maintained indefinitely if the mastery of the brain be poor, so one eye turns in and converges for both.

(2) Inequality of the eyes in refraction or in muscle control.

(3) Corneal opacities following ulcers of the cornea from purulent inflammation or phlyctenules.

(4) Fevers or accidents. The disturbance of an acute fever, measles or whooping cough, or a fall may determine the onset of the squint.

(5) High myopia tends to cause divergent squint.

Treatment of Squint.—The first step is the correction of any error of refraction that may be present. As will be seen from the foregoing, when one is present there is a good prognosis; if there be no error of refraction the case presents much difficulty.

Next, exercises must be directed to the recovery of the diminished visual acuity of the squinting eye. The good eye, that is, the normally fixing eye, should be occluded for three or four weeks on end, so as to compel the squinting eye to exertion. Later the same process may be kept up by keeping the accommodation of the fixing eyes paralysed by atropine, so as to compel the use of the squinting eye in near vision. Under no circumstances should both eyes of the child be kept under the influence of atropine for long periods together, for this tends to intensify the degree of the squint, for the ineffectual effort to enervate the paralysed ciliary muscle is reflected in an overaction of the muscles concerned in convergence.

If there be a satisfactory response to this line of treatment and good recovery of the vision of the squinting eye, and yet a persistence of the squint, then there are good grounds for putting the eyes straight by operative measures. And under these circumstances the chances of success are far better than when the case has been allowed to drift on for years and the vision of the squinting eye is lost, for then there is no attempt on the part of the eye to keep straight, even when by a successful operation it has been put straight.

This is no place to discuss methods of operation, yet I may be allowed to give a warning against the old

practice of complete tenotomy of the converging muscle. It is bad practice, for by so doing we destroy the proper power of convergence, so that ultimately the eye will diverge, and a squint of another variety succeeds. The proper mode of operating is to copy the method of Nature. In a long-standing squint the character of the muscles is altered. In convergence the external rectus is lengthened; the internal rectus is thickened. We must reverse this condition, and it can be done. In the operation of "subconjunctival reefing and advancement" of the external rectus and the simultaneous partial tenotomy or "jigsaw" operation of the internal tendon there is a conjoined method of nicety and precision that in skilled hands may be relied upon to give uniformly successful results.

An account of the operative procedure and the results of the first hundred operations will be found in the Reports of the Seventeenth International Congress of Medicine.[1]

Word-blindness and Colour-blindness.

These two defects are of great interest. They are, happily, not very common; the former is even rare. They are not defects of the eyes at all, but are really mental defects. But that does not mean to suggest that the subjects of these peculiarities are "mentally deficient"; indeed, the reverse is often the more true. Certainly this is so in the case of the subjects of colour-blindness. Some of the affected are brilliant members of society, and the discoverer of this particular defect, Dalton, the great scientist, was himself colour-blind.

Colour-blindness occurs in about 3 to 4 per cent. of males, and in distinctly a smaller number of females. It is frequently hereditary, and the manner in which it is handed down from generation to generation is peculiar. The males suffer from the defect, but the females carry it on. A mother may have good colour vision, but if she comes of an affected family her sons

[1] Harman: "Transactions of the Seventeenth International Congress of Medicine," Section IX, Ophthalmology, part ii, p. 313. London, 1913.

may be colour-blind, though her daughters will not be, yet these girls may have the defect latent within their germ plasm, for their sons may be colour-blind.

There is no defect in the eyes, although there have been theories of colour vision that were based on the supposition that the defect was ocular. It is without doubt a defect in the registering apparatus in the brain.

It is really a lack of development of a faculty of mental judgment, and in some sort a reversion to a primitive condition. It is incurable. Yet many colour-blind persons are able, by a carefully trained judgment of light and shade, to detect the differences between coloured objects and correctly name those differences. They have not learned the colours, but they have learned the differences in light reflected from these colours, and given the possibility of comparison they may answer tests correctly. Ask these same persons the name of one distinctive colour, and their incapacity may be disclosed at once. So far as school work is concerned the disability is of little moment, except in the teaching of water-colour drawing, which is so popular nowadays, and deservedly so. But it is of importance to recognize the defect early, and to turn the attention of the defective pupil into some direction of work in which his task will present no handicap to his career when the time for the labour of life comes. Such children should early learn there is no work for them at sea or on the railway.

Word-blindness is a much more serious defect, for it cuts off those marked by it from a proper or ready appreciation of the ordinary means of communication by print. They see correctly. Tested with the E "Signal" test they can readily pass the full standard. But the letters of the alphabet when strung together to form words convey no meaning to them. The defect is due to a want of association of the brain centres. Reading after the western method is a performance that requires a high degree of cerebral association. The eyes see, first letters, then combinations of letters. The vision is translated into sensible ideas by the correlation of the visual centres with the educated memory centres. In the ordinary subject the association has become by

training so natural as to be almost automatic. A similar defect is sometimes produced in adults by a cerebral hæmorrhage, the lesion disconnects the two centres, so that, although there is the power to see letters and words, there is no power to associate the signs seen with the ideas that they should convey to the intelligence. The defect as a congenital occurrence is rare. It is usually mistaken at first to indicate some visual incapacity, but the examination of the eyes readily leads to their exoneration. It is noteworthy that these same children may show considerable facility in reading figures, even money sums. In this work the association is much less extended, the symbols are shorter for the idea that they are intended to convey. This gives the clue to the best mode of teaching these children. They must be taught on the plan of the Chinese. The Chinese script is a sign script; each word or idea has its own symbol; the idea is not conveyed by a string of letters in combination, but by one particular sign. A certain mark conveys to the taught child the idea of a house, just as does a picture, or as the symbol *1* the idea of unity or one. To teach these children reading we must fall back on this plan. The word "cat" must be taken as a whole, not as *c a t = cat,* but the whole thing is the sign for cat. The method is known as the "look and say" plan, and when carried out by a teacher of intelligence and with great patience it is possible to teach the child to read. In such cases it is obvious that individual teaching is necessary to secure any effective progress.

The Management of Myopes.

Myopia is no mere error of refraction. It is a disease, and one which merits special consideration. Defect in distant vision is the commonest symptom, and if the short-sight be more than of very moderate degree, it will be found that the child holds his books nearer to the eye than is usual. It is this sign that most frequently calls the attention of the parents or teachers to the defect in the child; unless there be a systematic examination of the vision of the children, then the defect in distant vision will be discovered.

Myopia is due to the stretching of the globe, and the effects of the stretching may be seen in the production of a myopic crescent or staphyloma at the disc. This is produced by a bulging of the sclera at the posterior pole of the eye, the bulging is accompanied by an atrophy of the choroid covering it, and with the ophthalmoscope a whitish crescent, circle, or large irregular patch will be seen; the atrophy is usually seen at the outer side of the disc. The choroid is generally thinned and its vessels more conspicuous than usual, and in some cases patches of choroidal atrophy are present in the yellow spot region, but these last changes are rare in children unless there is some congenital diathesis associated with the myopia. It is possible that the increase of the myopia may be caused by the pressure of the recti muscles upon the globe during excessive convergence required by the short focus of these eyes, for that reason glasses to reduce convergence are a necessity. Maddox suggests that the serious factor is the downward turning of the eyes in near vision, for in that position he states the oblique muscles girdle the eye and compress it. Levinsohn has even suggested that the weight of the eyes in downward vision causes them to hang on the optic nerve and so pull out the hinder part of the globe!

There are two sorts of myopia, and it is of use to recognize the distinction between them for school purposes. But it must be understood that the distinction is more or less arbitrary, seeing that there is no sharp cleavage between the two groups of cases. There is first a large group of cases of low or moderate degree myopia. These may be called the school myopes. They are probably the astigmatic children who, by reason of excessive work, or work under bad conditions, have become myopic; the coats of their eyes have stretched so that they have attained a permanent focus for near vision, and lost the capability of seeing well in the distance unless glasses be provided. These cases are many, but the degree of myopia marking them is low, 5 D. is probably the maximum they attain to. The myopia usually ceases to progress when they arrive at the age of puberty, and vision may remain satisfactory

and be free from complication to the end of their days. This class of case is a reflection on the methods of education in vogue, and also on the current print of school books. The high incidence of myopia noted in German schools is probably in large part accounted for by this class of case. The children, either by Nature or by rule, are excessively studious, and they are set to read a script and print that would fatigue the eyes of an eagle! Gothic type may be picturesque, but it is sorry reading.

The other class of case is numerically small, but the degree of myopia the individual cases attain to may be high, or very high. In this group are most of the hereditary cases, children of myopic families, and those cases where there has been injury or damage to the eye by inflammation with the subsequent onset of myopia. These are the dangerous cases. For amongst them we are likely to find sooner or later some tendency to complications which may endanger sight. Opacities of the vitreous, "mucæ volitantes," or floating spots of irregular shape, are very common occurrences. Small floaters may be present in even low degrees of myopia and in quite young children; but spots so large that they may be seen by the surgeon with the ophthalmoscope are ominous. The stretched eyes are more delicate than ordinary, so that relatively slight injuries may produce hæmorrhage into the vitreous, or detachment of the retina, with further secondary changes.

The subjects of myopia of any degree are more liable to asthenopia than ordinary children, and they are also liable to "weak" eyes, that is, slight blepharitis and conjunctivitis. These are the outward signs of the asthenopia.

The Treatment of Myopia.—Bearing in mind that excessive convergence is particularly bad for these children, we must prevent this first by prescribing suitable glasses; secondly, by adjusting their work to fit their condition. Glasses should accurately correct any astigmatism that may be present, and these children are more frequently astigmatic than their fellows. Next the myopia must be corrected. To-day most surgeons agree in prescribing glasses that provide a "full correction"

of the myopia. This is a good rule with certain limitations. It may be taken as the rule for all degrees of myopia under 6 or 7 D.; beyond that degree it will be found that the wearing of fully correcting glasses so diminishes the size of the image of objects seen, that most myopes prefer a glass that is a little weaker, so that they get a larger, albeit a less distinct image. These are matters which can only be determined by the nature of each individual case, and of that the experience of the surgeon will be the best judge.

The Education of High Myopes.

Recently there has been a very satisfactory endeavour to grapple with the problem presented by the myopes. Formerly, if a case was too bad to be safely allowed in the ordinary schools, or a cautious surgeon inhibited reading and writing, it was customary to enter them at the schools for the blind and partially blind. This was not in the interest of the children, for the myopes are mostly of good or even superior intelligence, and they are not blind. In London there have been established several special classes for the myopes, and although the reader must turn to the original papers for a detailed account of them and of their work, the outlines of the scheme may be given here.

Myopes should be classified according to their degree of defect, and their work arranged accordingly. In London the experience of three years classification has led to the following arrangements:—

Some are returned to the ordinary school as capable of receiving the regular education. Others are graded for various degrees of exemption, or for special treatment up to the admission to the blind schools:—

(1) Elementary school for easy treatment as regards eye work.

(2) Elementary school for oral teaching only.

(3) Myope class.

(4) School for the blind and partially blind.

(5) Invalided temporarily or permanently.

Up to the end of 1912, 313 children had been entered on the roll of the myopes, but as there was only room

for 100 in the new classes, the remainder had to be accommodated in the ordinary schools but under special conditions; they were admitted for oral teaching only.

To make clear the nature of the defect of the eyes of these children and the limitation of the education they will receive, the matter is explained personally to the parent of the child, and an explanatory notice is issued. It is equally necessary that the teachers to whose care these children are committed should be clear as to the necessity for closely watching and limiting their work, and to this end a circular letter is sent to the head teacher of the school to which any such child is admitted.

The 313 children examined up to the end of 1912 were suffering from the following defects:—

Cause of Defective Vision	Boys	Girls	Total
Myopia	93	103	199
Superficial keratitis	16	34	50
Interstitial ,,	7	17	24
Disseminated choroiditis	2	6	8
Cerebral defect	3	1	4
Albinism	2	1	3
Purulent conjunctivitis after exanthemata	1	3	4
Ophthalmia neonatorum	3	6	9
Cataract	4	2	6
Coloboma uveæ	2	1	3
Aniridia	1	—	1
Buphthalmia	1	—	1
Dislocated lenses	1	—	1
Extreme hypermetropia	2	—	2
Muscle defect	—	1	1
Totals	138	175	313

The Necessary Standard of Visual Acuity.—For the successful working of myope classes it is obviously necessary that children for whom this mode of education is proposed must have a reasonable degree of visual acuity. In practice it has been found that it is desirable that the standard should be $\frac{6}{18}$. When the vision is less than this it is very difficult to prevent the children from peering and groping at their work, and the bad habits of a few will be copied by the many. Children when first admitted almost invariably have the bad habit of getting very close to their work, and the first lesson that has to be learned, and one that has to be the subject

of constant reminders, is the necessity of doing all their writing and manual work at full arm's-length. It follows from such a standard of visual acuity that all myopes must have satisfactory correcting glasses. Children for whom it is deemed undesirable to prescribe glasses have no place in these classes, but are fit subjects for the schools for the blind and partially blind. At the present time a number of children who have only $\frac{6}{24}$ vision with their glasses are being tried, and it is possible that a fair proportion will be found suitable pupils when their mental intelligence is well up to the average.

So far as any indication can be given by dioptres of myopia, it would seem that children with from 5 to 15 D. of myopia are suitable subjects for these classes. Those with less than 5 D. are fit for the ordinary school with special precautions, such as those indicated under the heading of "Easy treatment as regards eye work"; those with more than 15 D. are suitable for education in the schools for the blind and partially blind (with the possible exemption from Braille teaching), unless the fundus conditions are fair and the vision, with a suitable correction, is so good that they can safely take advantage of the myope class. The children who are in these classes are regularly examined by an ophthalmic surgeon at intervals of six months.

The Myope Class.—The first necessity for the successful establishment and working of such a class is that it shall be associated with an ordinary school for normal children. The myope class should, as far as possible, be connected with this school. The reasons for this are two: (1) A better scheme of work can be provided by this association; (2) to establish the class as a separate unit is to run the risk of the children leaving school with a special mark upon them. Parents naturally object to any suggestion of their children being marked out as belonging to a particular class of defective child, even though it may be for their good, and for this reason the attempts which have been made to copy the London experiment in the provinces by establishing myope classes within the existing blind schools are to be deprecated. It cannot be too definitely insisted

upon that the only possible means of making these classes a success is by associating them, both in their practical working and in their classification, with the ordinary schools; for that reason in London they are always spoken of as "classes" rather than as "schools." The scheme of work laid down for these classes is as follows:—

(1) Oral teaching with the normal children for such subjects as can be taught orally.

(2) Literary work such as is necessary for the knowledge of the ordinary means of communication to be learned without books, pens, or paper, but by the use of blackboards and chalk, the writing to be done free-arm fashion.

(3) A full use of every sort of handicraft that will develop attention, method and skill, with the minimum use of the eyes.

The Class-room.—The one necessity of a class-room for myopes is perfect natural illumination. Artificial lighting for these rooms is a negligible consideration. All work other than physical exercises, oral lessons, or games is suspended immediately artificial light is required.

The ordinary school desk is unsuitable, and the special desks in use provide for each child a full-sized blackboard suitably sloped and at a convenient height for sitting, and also a full-sized horizontal table for handiwork. It is convertible from one use to the other by merely lifting the board. Each room has fitted all round the walls a band of blackboard. The boards are fixed so that they are available for both teachers and pupils without adjustment.

When one group of children is taking oral lessons with the normal-sighted in the ordinary school, the teacher will be employed in giving lessons requiring writing, arithmetic, or manual work to another group. The number of children that any one teacher can deal with at the same time must of necessity be less than the same teacher could cope with in an ordinary school. Individual teaching is much more necessary. Further, the desk fitting—the combination blackboard and table—takes up the room of an ordinary dual desk.

Experience shows that the greatest number any teacher can deal with successfully in any class working at the same subject and at the same time is twenty.

The Curriculum.—The oral teaching is taken with the normal children in the ordinary school with which the myope class is associated. By this means the myopic children are kept up to the standard of knowledge of their normal colleagues, and have the benefit of mixing with them in class under the oversight of the regular teachers.

The literary work of the children is done in the myope class upon the blackboards provided for each child, and upon the wall-boards. Letters must be large, and the chalk lines broad and strong, and to secure this the chalk supplied should be square-edged and of double the measure of the stock size. The small desk blackboards are marked with white lines 2 in. apart, and the wall-boards 4 in. apart.

In the higher standards the need of some permanent record of the work of the children is felt; and in the higher standards exercise-books are being tried of a novel pattern. They are made up of large black paper sheets, and the writing is done with white crayon, which gives a record of fair durability, but it can be washed off if desired. The exercise-books are clipped on to the desk blackboards, and the writing is done free-arm fashion as though on the blackboard, so that none of the dangers of ordinary writing, such as stooping over the work, are involved. The eldest of the pupils are allowed to make a permanent record of their work by printing. Two sets of printing types are provided for the use of each class. They are rubber-faced black-letter types, one of 1 in. height, the other of 2 in. height. These are mounted on wooden blocks fitted with lateral pegs and holes, so that they can be joined together to form words. The words are set up and printed upon large sheets of white paper, the record is permanent, and goes to form a class library of scrolls which are useful for subsequent teaching.

Physical exercises enter largely into the time-table, and attempts are made to associate some of the games with the instructional work, *e.g.*, large sheets of scenic

canvas are now supplied to two schools that have sufficient floor space; on these the teachers paint outline maps of different countries, marking out the position of the principal cities, rivers, mountains, &c.; the children walk about on the floor-maps, learning their geography by travelling it in miniature. With a teacher of resource such methods of instruction possess endless possibilities of interest.

The most difficult section of the work to arrange is the manual training. Whatever the work done it must be such that the fixed attention of the eyes is not demanded. For that reason all sewing-work is prohibited; it has been tried with a few of the elder girls, but was quickly stopped. Knitting, on the other hand, fulfils the necessary conditions; a child that has any aptitude for it soon learns to do it automatically and with little use of the eyes; such children are allowed to practise it. The junior children (both boys and girls) are taught paper folding, stick laying, felt weaving in colours, and knitting. The seniors and some juniors are taught modelling maps, rough woodwork where measuring can be done with rulers marked with minimum $\frac{1}{4}$ in. marks. Advanced basket work is taught according to the advanced scheme on workshop principles (but not including raffia work, which is too fine). Bent iron-work is satisfactory, particularly for boys; possibly also the netting of hammocks, tennis nets, &c. For the girls cookery and laundry of a simple kind, just sufficient to give an intelligent insight into the arts of housewifery.

These crafts are taught as a training in attention and care; it is not intended that any of the children should enter into competition with the blind in doing this work; for that reason any particular work of this kind is not continued to the point where rapidity and skill is reached. The scheme of education in view for the myopes is not merely technical but general. Many of these children are of high intelligence, and a good general training with special attention to the development of thought, initiative, a good bearing, and clear speech free from objectionable accent and idiom, will fit them for positions of usefulness and responsibility

of the in- and outdoor type, such as small traders, collectors, agents, visitors, &c. This kind of occupation presents no risk to the eyesight.

The Care of Blind Children.

The conditions that are responsible for blindness in children may be classed under certain broad heads.

(1) Blindness due to causes which are in their nature accidental.

(2) Blindness due to general disease in which the child is born and shapen.

(3) Blindness due to congenital deformities.

The first group, blindness due to causes that are in their nature accidental, covers a very large proportion of the cases of blindness amongst children. Forty-four per cent. of those in the London County Council Schools are therein included. In most of these blindness has followed destruction of the eyes by reason of the accidental inoculation of the surface membranes with some virulent micro-organism. In a few the eyes were injured by blows, foreign bodies entering the eyes, and so forth, which set up inflammation of such a serious kind that the eyes were destroyed. Of this group of cases 84 per cent. (or 36 per cent. of the total blind) were blinded by the purulent ophthalmia of the new-born. Of the remainder purulent conjunctivitis in later years accounted for 7 per cent., accidental injuries and sympathetic inflammation arising therefrom for another 7 per cent., and small-pox for 2 per cent.

In days not far remote in our own land, and even now in the Orient, purulent inflammations in the later years of life blinded innumerable eyes, and the present smallness of the total of blindness arising from this cause is striking evidence to the efficacy of modern medicine. Small-pox was formerly even more notorious as a blinder of the eyes of the young, but now the tale has shrunken to insignificant proportions, and let it be noted those on my list so affected had not been vaccinated.

Accidental injuries to the eyes of children, and the disastrous sympathetic ophthalmitis which may follow

thereon, are not so common amongst children as amongst adults. Adults run greater risks by reason of their occupations, and children would run fewer risks than they do were the atrocious game of "tip-cat" less popular in its season.

This group of children form the pick of the blind. They are indeed normal children except in point of sight. Physique, hearing, and intelligence are not bound up in a general depression by reason of a constitutional disease. Most have never known what sight is; the few who have when once they have recovered from the shock of the disaster are as capable of education as normal children.

The second group, blindness due to general disease in which the child is born and shapen, is also a large group, perhaps a good deal larger than our present figures lead us to suspect. Certainly fully 30 per cent. of the total of the blind children fall into this group. Through disease in the parents the children are born and bred in disease. These unfortunate children cannot be more accurately described than by the words of that most ancient of laments, "Born in sin and shapen in iniquity." The eyes do not suffer alone; ears, teeth, limbs, physiognomy, and brain suffer in more or less degree.

These are the poor material of the blind schools. Maybe they are mentally inferior, or even deficient from their earliest years, and there is always the liability that with any attack of ill-health the primary diathesis may reassert itself, aggravating the physical and mental disability. In going over my records of these cases, I am amazed to find how large a proportion ultimately find their way into schools or asylums for the insane.

The third group, blindness due to congenital deformities, includes about 20 per cent. of the children. It forms a collection of physical oddities or misfits. For some reason the nourishment of the infant developing within the mother has been arrested at certain points, and one or more parts of the body remain unfinished at the time of birth. A few of these defects can be dealt with by the eye surgeon, but for the most part they are

irremediable. The defect may be confined to the eye, or it may be associated with defects in other organs. These children may be described as being of nearly ordinary intelligence. Some have seemed to be to be quick-witted and of average capacity, but generally they are better described as of *nearly* ordinary intelligence. Some, on the other hand, are of distinctly poor mentality, even to amentia. The reason for the mental deficiency is not difficult to understand. Brain and eyes are most closely associated in origin and growth; what is capable of affecting one is very likely to affect the other. The subjects of congenital cataract, even though the defect be lenticular and a purely epiblastic defect, are very frequently just below average capacity.

I have grouped these cases according to their intelligence for a definite purpose—to point the moral of the necessity for some better classification of the blind for the purposes of education. The blind schools, and the curriculum found therein, are on the whole one of the most satisfactory educational features of the country, just because the work is so well adapted to the condition of the children. But even so there is room for improvement. There are forty schools for the blind in the country certified by the Board of Education under the Elementary Education Act of 1893, providing accommodation for 2,405 children, and having a total average attendance of 1,841 children on the register. It is evident from this that there can be no very satisfactory classification of the children attending any one of these schools. What is desirable is some sort of classification of the schools, so that this one or that might specialize for different types of blind children. With such a provision there could be a much more satisfactory system of training. The best of the blind in point of intelligence would receive the curriculum fitted for them without the continual reference to the incapacity of the mentally lame sitting beside them. And the mentally lame would no longer be urged to a pace beyond their capacity, the mere attempt at which is likely to endanger their poor mental balance.

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IX

THE DEAF CHILD.

BY

JAMES KERR LOVE, M.D.

Aural Surgeon to the Glasgow Royal Infirmary; Lecturer in Aural Surgery, St. Mungo's College, Glasgow; Aurist to the Glasgow Institution for the Education of the Deaf and Dumb; Hon. Fellow American Laryngological, Rhinological, and Otological Society; author of "The Deaf Child," &c.

THE association of deafness with defect is so apt to cause misunderstanding that it is well to state at the outset that deaf children as a class are not mentally defective. In spite of all that has been written about deaf children there is still a tendency even amongst educated people to regard deaf children as different from hearing children in their general organization and especially in their mental character. It cannot be too plainly stated that a deaf-mute child is, in almost every case, like a hearing child, except in the one respect that he has never heard. This, of course, means that without special training he cannot speak. During the first five years of his life he has no language except the very limited language of natural signs, and the years from one to five, the years of rapid language formation, have been lost to him. This loss is never made up and at 18 years of age he is usually in a position similar to a hearing child of 14 years. To put a deaf child on all fours with a hearing child, he should therefore remain at school till the age of 18 years.

THE DEAF CHILD AND THE DOCTOR.

Deafness has never interested medical men to an extent approaching the real claim of deaf children on their attention. The doctors have studied the diseases of the ear which produce deafness, the pathologists have

studied these diseases on the *post-mortem* table. But the lives of the deaf have been left to the teachers and the philanthropists. The teachers have therefore had to do their work without the help of their medical *confrères*, with the result that their methods are, for the most part, unphysiological. In particular, the deaf child has been neglected during the period of language formation from the age of 1 year to that of 6 or 7 years. When a deaf child was brought to a doctor or an aural surgeon between the ages of 18 months and 2 years because he had not begun to speak, the doctor had to discover the fact of deafness and to tell the mother to bring back the child in three or four years, in order that arrangements for education might be made. Handicapped as the deaf child is, by the lack of a sense, there is all the more reason that his education begin at once. It is far more reasonable not to send a hearing child to school till 10 or 11 years of age than to pay no educational attention to a deaf child till he is 6 or 7 years old.

The Diagnosis of Deafness.

During the first year of life, unless deaf children already exist in a family, the fact of deafness may easily be overlooked by a careful mother. She will produce proof that the child hears, because he turns round when a door is knocked or slammed, or when a heavy article falls on the floor. Such noises are felt, not heard, by a totally deaf child. When tests for deafness are applied, therefore, they must consist of sounds produced in the air and produced out of sight of the child. A dinner-bell or shouting by the surgeon are therefore the best tests. These sounds should be produced behind the back of the child whilst an intelligent observer watches the face for any change in facial expression. In older children of, say, 5 or 6 years tuning-forks vibrating in the air may be used as tests for locating the position of any remaining hearing the child may possess, but unless the child has had some training it is not easy to get reliable answers regarding the position of such islands of hearing. But the presence or absence of hearing can almost always be determined by the use of a properly arranged experi-

ment with the bell. If deafness has come on late in life its existence and the measurement of the remaining hearing are, as a rule, easy. If hearing has not been lost before the age of 6 or 7 years, speech is retained, provided any kind of education has been attempted. Tuning-fork tests may be applied to the mastoid process or the vertex with the view of locating the part of the hearing apparatus, the disease of which has caused the deafness. Answers to questions can be got and the degree of deafness determined. The only test of value is the human voice. The watch is not a valuable test of hearing in childhood at all, and even in adult life is much inferior to the voice, when the hearing distance has to be measured. Using the term "voice" in the larger sense, and therefore including the whisper, the following rule, called by the writer the Six Foot Rule, will be found useful in testing school children. If a child does not hear whispered speech with at least one ear at a distance of six feet, he cannot be educated profitably in the large classes which exist in the elementary schools.

The same rule may be applied in adult life, for if an adult cannot hear whispered speech with at least one ear at a distance of six feet he will not, without difficulty, be able to conduct business, and should either have recourse to one of the "Aids to Hearing"—ear-trumpet, electrophones, &c.—or, better still, he should learn lip-reading. When the whisper is used as a test unconnected numbers should be used, such as 1 9 3, d, e; 2 7 5, &c., and the face of the patient should be directed to an object in front of him, whilst the surgeon stand in a line at right-angles to the side of the patient's head. Otherwise lip-reading may take place and the test will be of no value. The whisper should be spoken towards the end of an expiration, so that uniformity of quality and intensity of utterance may be produced.

The Causes of Deafness.

Nearly half of the children who have to be educated in special schools and institutions are born deaf. We know little of the real cause of such deafness. When it belongs to the true hereditary type, that is, when it is transmitted in the direct line or when collateral

deafness is pronounced in uncles, aunts, cousins, &c., it is probably due to some lack of development in the internal ear, the auditory nerve, or the hearing centres, and it is probable, although no work on this subject has yet been done, that it follows closely Mendelian principles in its transmission. When no such true heredity can be traced and yet the child is born deaf or becomes deaf before speech is developed, the cause of the deafness should be sought for in some illness, such as meningitis, the only evidence of which may have been one or more fits, or in a history of syphilis. That syphilis causes deafness later in childhood is well known, and when the deafness is associated with other stigmata, such as keratitis or Hutchinson teeth, the diagnosis is easy, but when deafness is the only sign of the disease the diagnosis is difficult.

From the above it will be seen that no line can be drawn between congenital and acquired deafness. Naturally a parent is anxious to avoid the conclusion that her child was born deaf, and slight illness or accidents are often given as cause of deafness which is really congenital. On the other hand, deafness may set in so unobtrusively and unassociated with other alarming symptoms that an acquired case may be easily put down as congenital. Perhaps, on the whole, these errors correct each other fairly well and make our statistics of the proportion of congenital and acquired cases fairly correct, but their occurrence vitiates seriously our view of the incidence of special cases. Truly acquired deafness (apart from syphilis) is in most cases due to one of three great infectious diseases: scarlet fever, measles, and meningitis. The two former diseases, when they cause deaf-mutism, are usually complicated by the last and the middle ear may not be affected at all. But scarlet fever and measles may attack the middle ear and cause great destruction there without the nervous apparatus being affected. In this case, however, the deafness is not usually great enough to cause dumbness. Meningitis is the chief cause of acquired deafness. On the continent of Europe and in America it is more commonly epidemic than in Britain. In our country, however, meningitis in an

endemic form has always been a prolific cause of deafness and of deaf-mutism, and it is likely, when the bacteriology of endemic meningitis is more thoroughly understood, that the deafness with which we are so familiar in our institutions will be found to be due to the disease which is more commonly epidemic outside of our islands.

Other causes of acquired deafness are enteric fever, falls on the head, whooping-cough, &c., but when compared with the three diseases above discussed the importance is not great.

In adult life a cause of deafness, the nature of which is not well understood, is otosclerosis. This never occurs before the speech habit is well established, and so dumbness never results; but it is probably a truly hereditary disease.

Deafness of a high degree, but not amounting to "surdism" (that degree which hinders the development of speech, or causes acquired speech to be lost), may result from post-nasal adenoids. These growths are important in the child for many reasons. In the deaf child they are important for these reasons. They cause or increase the deafness partly due to other causes; they keep up, or prevent the cessation of, middle ear suppuration; they cause, if not removed early in the life of the child, much of the permanent deafness of adult years. But alone they probably never cause deaf-mutism. In the deaf-mute they hinder good speech. In all children, whether deaf or hearing, they hinder, if well-marked, the general development of the child, and they are responsible for the common and bad habit of mouth-breathing.

Middle ear suppuration alone seldom causes deafness of very high degree (involving dumbness), and it may be stated generally that in deaf-mutes the internal ear or its connections towards the brain are always involved.

The Classification of Deaf Children.

The effect of deafness on a child depends chiefly on two factors: its degree, and the date of its onset. If it be congenital and occur during the first two years

of life, and if it be great, dumbness is a consequence. If the speech habit be formed the deafness may be total, and the child may retain his speech. Some hearing, therefore, and some remembered speech, are valuable assets in a deaf child, and form the best basis of any classification for educational purposes. It is a curious fact that nearly all deaf children who are truly hereditarily deaf have some hearing, but it is an equally curious fact that this is seldom so great as to be of much value in teaching. The hearing of hereditarily deaf children is a pretty uniform quantity. On the other hand, cases of acquired deafness are either stone deaf, or have a great deal of hearing. The deafness of meningitis is nearly always total. That from adenoids and from middle ear suppuration, that from scarlet fever and measles, uncomplicated by meningitis, is nearly always partial.

Whilst the terms, hereditary and non-hereditary, congenital and acquired, must be retained for some purposes, we must have a different classification for educational purposes. Here we have to use a new set of terms, *i.e.*, "Deaf," "Semi-deaf" and "Semi-mute." These must now be defined. By the term "The Deaf" we mean "the ordinary deaf-mutes." They are so deaf that they do not acquire speech like other children through the auditory nerve. Their thought processes are different from those of hearing children. They cannot think in words which they remember to have heard. They are not "auditives." They may think in muscular movements, which they have seen or which they have made. Most of them do so in the former, a few in the latter. They hear little of any human voice, even of their own. Some of them have vowel hearing, a few consonant hearing, and the latter approach the semi-deaf. Their hearing is valuable, notwithstanding. If they be taught to speak, such hearing enables them to pitch their voice correctly, and the latter has a more agreeable tone.

By the term "Semi-deaf," we mean children who have hearing, not only for vowels and consonants, but for some words. Words spoken close to the ear are distinguished. They can therefore think in words they

have heard, and much they are taught may be given them through the auditory nerve. They are "auditives" in their thought processes, or, at least, they may be made so. The speech they learn is more easily learnt, its quality is more agreeable, and its articulation more nearly perfect. But it is never perfect, unless it has been made so by special training under an articulation teacher.

Along with the "Semi-deaf" may be classed the "Semi-mute." The term is not a good one, but it must suffice till a better turn up. The semi-mute child may hear nothing—usually he is quite deaf, but he has become so after the speech habit is formed, and his speech is recollected speech. Without teaching this speech is apt to deteriorate or may be entirely forgotten. With appropriate teaching the vocabulary of the semi-deaf may not only be preserved, but easily extended.

At the extremes of this scale two classes must be noted amongst the deaf. At the top, the merely hard of hearing; and at the bottom, children who are not merely deaf, but mentally defective. There are mentally defective children amongst both the hearing and the deaf, but amongst the latter the proportion is greater, say from 10 to 15 per cent. In spite of a fair remnant of hearing, a mentally defective deaf child must take his place in this lowest class.

Education of the Deaf.

The first deaf children to be educated were those who were gathered round big-hearted, philanthropic men, who had no training as teachers at all, and it is not surprising, therefore, that the teaching of the deaf fell into the hands of the charitable. In their hands it remained entirely, in Britain, until quite recently, and in their hands it largely remains still. Hence the institution for the deaf arose. The earliest institutions were called asylums. This word is the most eloquent commentary which could be used to express the difference between the older and more modern conceptions about the education of the deaf child. The deaf, as such—unless they be mentally defective—need no asylum. They are fit for the world, able, after being

educated, to win their bread in the world, and should remain in it during their period of education.

If the reader has grasped the point here raised, and also that hinted at when speaking of the thought processes of the deaf, he will be prepared to look at the three great questions which agitate the educational world with regard to the deaf: (1) Should a deaf child be educated in a day school or an institution? (2) Should he be taught to speak, or to use a finger and sign language, or both? (3) When should his education begin?

These questions cannot be discussed exhaustively here, but taking the last first, they may be briefly noticed.

A deaf child's education should begin as soon as he is known to be deaf. An educated mother can do much for a deaf child, an ignorant mother does not know where to begin. The mother must, therefore, become a pupil along with the child. The mother must be taught to make her child look to her mouth for the movements which represent speech. The child will easily do this. Hearing children do this. It is doubtful if a little hearing child could be taught to speak if he never saw the mouth of a speaker. The lip and mouth movements for every word and syllable are just as characteristic as the sound representing the word or syllable, but, unfortunately, many of the movements are hidden within the mouth and cannot be seen.

This early training of the deaf child may be carried out in various ways. In America several institutions exist for the education of little deaf children of 3 years of age and upwards. In Glasgow a visiting teacher goes to the children's homes and helps the mother to understand the problem of her child, and this is being combined with a nursery school, to which the little deaf children are to be brought in conveyances, as cripple children are.

Should a deaf child be taught to speak or should he learn the finger and sign languages, instead of, or in addition to, speech? He is not likely to do both well. If the finger and sign languages are used in the school at all they will become the vernacular of the deaf, for

they are easier than the acquisition of speech is, and all classes of the deaf may learn these silent languages. The acquisition of speech by the deaf is very difficult. The result is never perfect, but real success is unlikely unless no other form of language is used. I am not here speaking of writing, which both hearing and deaf children must learn. If you want to teach an English child the German language, you must put him where he cannot use anything else, and if you want a deaf child to learn and use speech, you must put him where he is compelled to use it as much as possible. He may sign sometimes—we all do that—and he may even be encouraged to use gesture and natural signs in their proper places, but speech must be the channel by which thought is expressed to him, and by which he expresses his own thought.

These contentions are not seriously questioned so far as the semi-deaf and semi-mute are concerned. But it is often asked regarding the true deaf-mute whether the speech results attained are worth all the trouble involved. The speech of the deaf-mute is admittedly imperfect, sometimes unpleasant, and generally requires the hearer to get accustomed to the particular speaker before it is all understood. The same is true of the lip-reading of a hearing by a deaf person. But if speech can be established as the ordinary means of communication between a deaf boy and his parents or his brothers and sisters; between a deaf man and his employer or his fellow-employees; or between a deaf man and his intimate friends; that boy or man has been raised from a small to a big world. He has been transferred from a limited to a great society, and he has called into operation a part of his brain which otherwise must remain unused. Further, in this greater world, he is less likely to marry a deaf person, and less likely to have deaf children.

Whether a deaf child should be educated in a day school or an institution depends on his mental condition. If he be mentally defective he should go to an institution. There is no kind of school that will make a mentally defective deaf-mute a good speaker. Further, he should stay in that institution all his life, because

he will never be self-supporting, and if he marry he is likely to have mentally defective children. Unless for mentally defective children, the day school is the place for all children, whether they be deaf or hearing. No institution is equal to a good home.

The Prevention of Deafness.

All discussion on the education of the deaf sinks in importance when compared with the solution of the problem of the prevention of deafness. Under any system of education, when everything has been done for the deaf-mute, deafness is a misfortune of the first degree. Can it not be prevented? Not altogether, I fear. The present deaf-mute rate is about 1 in 2,000 of the population. It seems to me likely that this may be reduced by half, 1 in 4,000 of the population. And this will take place chiefly by the prevention of acquired deafness. True hereditary deafness will, like the poor, always be with us. The better segregation of cases of measles and scarlet fever, the more careful treatment of syphilis in the parent and in the child, the prevention of meningitis, whether of the endemic or epidemic form, will reduce the rate of acquired deafness. But without unbearable restriction the prevention of true hereditary deafness seems to me an insoluble problem. It is a problem the solution of which should not be attempted without a far more careful study than has ever been bestowed on it. There are some families so badly tainted by defect of various kinds—deafness, blindness, insanity, epilepsy, &c.—and this defect seems so persistent, that, should scientific inquiry offer no other solution of the management of these cases, legislation may have to step in and discourage or prohibit the marriages of members of these families. But we are only at the stage of inquiry yet. Towards a solution of this question the writer suggests the following lines of study: (1) What are the causes of sporadic congenital deafness? How far is it due to congenital syphilis? (2) Whether mental deficiency is amongst deaf children more commonly present in acquired deafness, in sporadic congenital deafness, or

in true hereditary deafness? (3) What law, if any, does the transmission of true hereditary deafness follow? Is it Mendelian in its descent, or is it not?

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X

SPEECH DEFECTS IN CHILDHOOD AND EARLY ADOLESCENCE.

BY

LEWIS H. F. THATCHER, M.D.Edin., F.R.C.P.Edin.

Physician, New Town Dispensary, Edinburgh; Extra Physician, Lying-in Institution, Edinburgh; University Tutor in Clinical Medicine.

Speech Defects in Childhood and Early Adolescence.

A working knowledge of the causation and treatment of imperfect speech is of the utmost importance to all concerned in the question of education. On the recognition of faults and on their prompt correction depends, in many cases, both the comfort and future usefulness of the individual concerned. Many parents still hold the unfortunate, but easy, belief that any abnormality in the speech of their child is of no consequence, and that he will eventually "grow out of it." Speech characteristic of the years of early childhood is apt to be encouraged, and this, although attractive in the baby, is the very reverse in the older child, and is often difficult to correct. It is, therefore, but seldom that the family doctor is called in to give advice unless the defect is excessively well marked, and the treatment is either *nil* or is left in the hands of unqualified persons.

With the growing intimacy of co-operation between teacher and medical officer in schools of all classes this difficulty is largely remedied: the teacher—if so instructed—can report the case to the medical officer, who is then able to deal with it without delay. Organized medical inspection of school children also

brings to light many physical defects which may interfere with correct articulation.

By the time a child reaches school age the difficulties encountered during the education of the speech-producing mechanism should have been successfully overcome, and any abnormality is of importance, particularly in estimating the degree of mental development as a whole. Due attention must, of course, be paid to past and present environment, for imitation is the essential factor concerned in the development of perfect speech.

McLeod tested the articulation of 10,000 children attending ordinary schools in districts of the poorest and lower middle class. He found that 2·94 per cent. had some impairment of their speech: 1·82 per cent. were stutterers, and 1·12 per cent. otherwise imperfect. Of the latter, the majority would occur in the classes for younger children, for in the milder cases there is a marked tendency to spontaneous cure. In children of the "brain workers," where the neurotic temperament is more often found, the average will be higher. Here the typical defect will appear after fluent and correct speech has been acquired, and will be of the nature of a neurosis, *e.g.*, stuttering.

Among backward or mentally deficient children speech defects are extremely common, and increasingly so towards the lower forms of amentia. Here the typical defects may be generally described as a persistence of "baby speech" far beyond the usual period.

The Development of Speech.

Before a case of abnormal speech can be scientifically analysed and treated, a knowledge of the development of the faculty of speech and of the methods of producing the requisite sounds is essential.

Crying, the first act of a baby, serves as a most efficient exercise for the respiratory and laryngeal organs. Soon he is able to express emotion—such as pain—by this means, which is aided by facial expression and by gesture. Expressive *grunting* is often heard within the first three months. Almost from the first that part of the mechanism essential throughout life for

the production of intelligent speeech—the auditory speech centre—is silently receiving and storing up memories for future use.

The first attempt at actual speech is the *babbling* which the average infant commences when 3 or 4 months old. The first consonants produced are labials, giving, with vowel production, such sounds as *um-um-mum-mum-mum*. Soon other consonants are added, and inflection of the voice superimposed. In this way the articulating mechanism, including the motor speech centre, is exercised, but quite automatically, without any appropriate stimulus whatever. *Echolalia* is a phenomenon resembling this, but differing from it in that the motor speech centre does receive stimuli, but they are direct from the hearing apparatus, without the intervention of the auditory speech centre. Therefore the child will repeat the last letter-sound, syllable, or word said before him, but in a vacant, parrot-like manner, for the word means nothing whatever to him. This response is therefore extraordinarily rapid, and may be mistaken by parents for intelligent speech. When about 7 months old the child may begin to associate objects with the appropriate words he may hear, and at about 1 year is often using *words of his own invention* with a definite meaning and purpose. This indicates a gradual linking up of the primary speech couple—the auditory and motor speech centres. These connections are necessary for the acquirement of intelligent speech, for all words are normally produced through the medium of the first-named centre. During the second year advancement is more noticeable, and the knowledge of words rapidly increases. By the age of about 15 months he will be reproducing little words appropriately, and by the end of the second year short sentences.

As the words spoken become more numerous, difficulties in their production become more apparent; these difficulties vary with the state of general health, and are worse if the child speaks too rapidly. The speech may be *indistinct* and *clumsy*, with *scamping* or *slurring* of words, syllables, or difficult consonants. There may be substitution of easy consonants for difficult ones,

called *lisping*, or *lalling*, if well marked. *Stuttering* is of common occurrence during this education of the speech apparatus. By about 3 years old these defects should be becoming more and more rare, for the child learns to imitate the speech of his elders, and baby-speech is gradually forgotten.

The acquisition of speech, as of the power of walking, may vary within wide limits in normal children. Nevertheless, if there is no deafness, absence of reasoned speech at 2 years old should suggest the possibility of mental deficiency. The faculty of walking is usually acquired sooner than that of speech, and girls speak earlier than boys in most cases.

In otherwise normal children there may be unaccountable delay in the education of the speech apparatus. If there is no form of deafness, a hopeful prognosis may be given, for these children almost invariably learn to speak. A case of this sort was reported by Bastian :—

"The child was the son of a barrister. He had occasional fits between the ages of 9 months and 2 years, when they ceased. The child had always appeared intelligent, except that he did not speak. When 5 years old he had not spoken a word. Before he was 6, on the occasion of an accident happening to a favourite toy, he suddenly exclaimed, 'What a pity!' although he had never previously spoken a single word. The same words were not repeated, nor were others spoken for a period of two weeks. Thereafter the boy progressed rapidly, and speaking became most loquacious."

Physiological Laziness probably describes these cases better than any other term; dumb show is so much easier, and is rather apt to be encouraged. From the suddenness with which the power of speaking was assumed by an intelligent child, it is apparent that sensory impressions must have been stored up in the usual way, and that the only defect was in their expression.

General Delay in Development.—This may occur from an acute illness, or some chronic constitutional disorder may also cause delayed development of speech. The two conditions may be expected to improve together.

Temporary Dumbness is occasionally seen as the result of a fright, and is hysterical, sudden in onset. It is rare before the age of puberty. More often the cause is one of the infective fevers—particularly typhoid—or chorea. The essential lesion is either a toxæmia or a local embolism. This loss of speech may last for months, and then the faculty may be slowly reacquired. Dumbness of short duration is sometimes seen in mild illnesses, and that has been ascribed to exhaustion of the motor speech centre. In typical cases of this sort the loss of speech is gradual. It must be borne in mind that sudden loss of speech may be prodromal of serious intracranial disease, particularly tuberculous meningitis.

Voluntary Absence of Speech is sometimes seen. Although speech is perfect in congenial surroundings these children will neither speak to strangers, nor give any response whatever, either by word or facial expression, and are apparently deaf-mutes. They appear to be neither frightened nor shy, and later, when at home, may show that everything said was perfectly assimilated. Still regards these children as always eccentric or passionate, often backward or mentally deficient.

Finally, the voice may fail to undergo the usual change at puberty, or it may retain the peculiar "crack" characteristic of this age throughout life.

The Physiology of Speech.

The cerebral centres being intact and functioning, speech is produced by exact co-ordination of three factors, *viz.* :—

(1) The Respiratory Apparatus, producing the requisite expression of air through the glottis.

(2) The Laryngeal Apparatus, consisting of the vocal cords, which produce sound by their vibration.

(3) The Articulative Apparatus, consisting of the muscles of the mouth and tongue together with two sounding boxes, the oral and nasal cavities.

The vowels are produced by the vibration of the vocal cords in the current of air. The difference between them—ēē, eh, ah, oh, ōō (Latin pronunciation)—is caused by variation in the size of the oral cavity, this chamber being narrowest for i (ēē), and in its hollowest

or largest shape for u (ōō). It is essential to note that no element of friction is added anywhere above the glottis. If this is done, the letter sounds y and w are made y-i-e-a-o-u-w. For this reason Wyllie considers these letters as midway between vowels and consonants proper. Their laryngeal production is of the utmost importance to stutterers, who often find the sounds difficult.

The consonants are produced by the articulative apparatus bringing about some degree of obstruction to the outcoming blast of air. This escaping air may have been previously voiced in the larynx or not. If the closure is complete, an explosive (or stop) consonant will be produced; if it is incomplete the result will be a fricative sound. Professor Wyllie, of Edinburgh University, groups the consonants into a physiological alphabet where they are arranged according to their place and method of production. By his kind permission, I am enabled to reproduce this scheme here. Each letter sound must of course be pronounced as it is during the enunciation of a syllable containing it: thus, "s" should be pronounced not as "s" but as the sibilant sound at the beginning of such a word as "son."

A study of this alphabet will show that the consonants fall into three groups, the stop positions (positions of possible closure) being (1) at the lips, (2) at the anterior part of the palate, (3) at the posterior part of the palate. For (2) and (3) the action of the tongue is necessary.

(*a*) The typical five of each stop position:—

a voiceless explosive or stop.
a voiced explosive or stop.
a nasal resonant.
a voiceless fricative.
a voiced fricative.

(*b*) The extra fricatives that the second and third stop positions are capable of producing:—

The l and r of the second stop position.
The burring r of the third stop position.

(*c*) The voiceless and voiced fricatives produced at the two dental positions, the labio-dental and the linguo-dental, these being six in all.

PHYSIOLOGICAL ALPHABET (Wyllie).

I. Vowels.

y = i, e, a, o, u = w.

These should be produced in the Latin manner, as ēē, eh, ah, oh, ōō. y and w are consonants, not vowels, but they have very close relationships to the latter, initial y being very similar to i, and initial w to u.

II. Consonants.

(Each to be pronounced as it is during the enunciation of a syllable containing it).

	Voiceless oral consonants	Voiced oral consonants	Voiced nasal resonants	ILLUSTRATIVE SENTENCES.
Labials (1st stop position)	P (W)	B W	M	Peter Brown Made White Wax.
Labio-dentals	F	V	...	Fine Villages.
Linguo-dentals	(1) Th S	(2) Th Z	...	*Th*inkest *Th*ou So, Zealot?
Anterior linguo-palatals (2nd stop position) ...	Sh T (L)	Zh D L R	N	She leisurely Took Down Nine Large Roses.
Posterior linguo-palatals (3rd stop position) ...	K H or Ch	G Y R	Ng	Can Gilbert bri*ng* lo*ch* Hourn Youths?

I. Vowels.

Even Ancient Elves Are Awed Over Oozing.

This sentence represents only long vowels: their short equivalent can be represented by attaching the letter t to each vowel, thus: ēēt, it, et, at, ut, ot, ōōt.

II. Consonants.

The voiceless W and the voiceless L are given above in brackets: the former is now almost confined to Scotland, and the latter being peculiar to Wales. The burring or uvular R is also placed in brackets.

Explanation of *omissions* is as follows: C always = S or K exactly; Q has no value without U, and QU = KW; X = KS; soft G and J both = DZH phonetically.

Every letter sound is therefore the product of an exact co-ordination between the three factors of speech, for even those essentially laryngeal are modified by variations in the size of the oral cavity. The voiceless sounds should be touched off as lightly as possible—merely enunciated. Into the voiced consonants, on the other hand, the vocal element must be boldly thrown.[1]

Speech Defects.

Speech defects will be described under the following headings :—

(*a*) Faults in receptive paths to the brain, including the auditory speech centre :—

(1) Deafness, absolute or partial;
(2) Congenital word deafness.

(*b*) Faults in speech producing mechanism, including motor speech centre :—

(1) Physical defects of the articulative apparatus;
(2) Errors in co-ordination of the speech producing factors;
(3) Errors in nervous control of the articulative apparatus.

The importance of *the intellect* for the production of correct speech need hardly be emphasized. If attention and will are deficient, many sounds are missed altogether, or else imperfectly received. Few and faulty memories are stored up, and these, even if present, cannot be clearly revived in order to stimulate the sluggish motor speech centre to act. Hence the prevalence of imperfect speech among mental defectives, even of mild type.

Speech Defects due to Absolute Deafness.

It has been estimated that one in 2,000 of the children in the British Isles is deaf-mute. For if a child has never heard, speech will not be acquired without special methods of tuition. This congenital form of deafness

[1] For a fuller description of this function, reference should be made to text-books on the subject, particularly Professor Wyllie's standard work, " The Disorders of Speech."

is very apt to run in families. If the deafness comes on soon after the child has learned to speak—most often as a sequel to acute leptomeningitis—the faculty of speech will be gradually lost, and re-education required.

Treatment.—It is essential that education in a special school for deaf-mutes should be commenced as early as possible. The oral method of teaching language depends on the opening up of other afferent channels, *viz.*, those of sight and muscular sense. As these children learn to express themselves by gesture, care must be taken not to check this before an adequate substitute has been established in the child's mind. It is remarkable that this complete blocking of auditory perceptions does not often lead to serious mental deterioration; the subject learns much through the other channels, and power of observation becomes very acute.

After three or four years' tuition by experienced teachers a certain command of language has usually been obtained, but is flat and expressionless to a characteristic degree. It is considerably longer before the vocabulary is sufficiently full to enable ordinary conversation to be carried on, and finger language is mainly relied upon for this purpose.

These pupils must be kept under observation for some considerable time after leaving the school, for there is a tendency to cease to make use of speech so acquired. As a rule, they are best fitted for the lighter manual trades, such as tailoring or bootmaking, and are then able to make their livelihood with ease.

Congenital Word Deafness.

Cases of this developmental disorder were first described by Kerr, and later by Thomas, who noted its comparative frequency as a cause of deaf-mutism. The child is able to hear perfectly well, but the auditory speech centre is in abeyance. Therefore no memories of words heard are stored up, and although words may be repeated correctly, no idea whatever is conveyed as to their meaning. That is to say, the impressions pass directly from the lower auditory centres to the motor speech centre, without the intervention of the interpreting area—the auditory

speech centre. Intelligence is good, but usually hardly so acute as in those analogous cases of word-blindness, where the visual speech centre is similarly imperfect. The following case, reported by Thomas, illustrates the condition well.

"A. B., a bright and intelligent boy, aged 8 years. He attended infants' department of ordinary school from age 3 until 7, during which time he never attempted to talk. At age 7 he was admitted to special school, and the following note was made: 'Aphasia, hears but does not talk; looks intelligent.' After a year he was able to name objects pointed to, as 'book' or 'pen.' He heard well and would repeat words with correct intonation, but yet understood none when speaking; he kept his eyes upon one's lips, and seemed to understand a few words by lip-reading. His vocabulary rapidly increased: he called an inkpot a 'basin,' and as he has no word for ink he called the liquid 'black' or 'red' as the case might be. In spite of his handicap he learned to read small words as 'cat' or 'dog.' He could do small sums and was clever at all fingerwork, drawing both spontaneously and from copy. Shown a picture of a house, and being asked to point out the roof, he was unable to do so, but if it is pointed out to him, he at once says 'roof.'"

The treatment is precisely that of a completely deaf child, but language thus acquired sounds normal. Pitch and articulation are correct or nearly so, owing to power of imitating auditory impressions being retained.

A great command of language has been taught where sight and hearing were both completely absent. Here the only afferent path remaining intact is that of muscular sensations, which are both stored up and reproduced by the motor speech centre. Such cases are those of Helen Keller and Laura Bridgman.

Speech Defect due to Partial Deafness.

Partial deafness is very apt to lead to a careless way of speaking; words are not correctly heard, and when reproduced are often slurred over, or terminal syllables missed out altogether. Newman estimates that 1 per cent. to 3 per cent. of children attending ordinary schools

suffer from defective hearing, so a sharp look-out for it must be kept in every class. Common causes are wax in the ears; old or recent otitis media, often with perforation of the drum; chronic inflammatory conditions of the nasopharynx. Treatment must be prompt, and the child's position in the classroom specially allocated until hearing has improved.

Faults in the Speech-producing Mechanism.

(*A*) *Physical Defects of the Articulative Mechanism.*

Tongue-tie, although often blamed by mothers, is very rarely indeed a cause of retarded or imperfect articulation. If the child can protrude the tip of the tongue over the lower lip, or can pronounce words beginning with L, the tongue is free enough for perfect speech. Sometimes there is temporary interference with the production of dentals because of retarded appearance of the permanent incisor teeth.

Large Clumsy Tongue.—It is doubtful whether this condition really makes much difference to the speech. Thick and indistinct speech is often heard in mentally defective children, but is more likely caused by faulty management of the articulative apparatus as a whole, and not by any undue size of the organ.

Rare cases of congenital paresis of the tongue have been reported.

Nasopharyngeal Catarrh, or Hypertrophy of Lymphoid Tissue.—The nasal speech caused by these conditions is frequently heard. Production of the nasal resonants is interfered with, *e.g.*, "morning" becomes "bordig." The speech is usually thick and indistinct in addition.

In those cases of small nasopharynx due either to congenital high palate or to brachycephaly, minor degrees of congestion will cause obstruction. The presence of an unduly arched palate does not, in itself, give rise to any defect of speech, because of the marked mobility of the tongue.

Deficiency of the Roof of the Mouth causes a peculiar snuffling intonation with nasal twang, which is very characteristic. The deficiency is either congenital cleft

palate or acquired perforation, usually syphilitic. Congenital paralysis or inefficiency of the palatal muscles are very rare. Should this form of speech come on suddenly it is suggestive of an acute inflammatory swelling of the throat, or of diphtheritic paralysis of the soft palate.

Treatment consists in correcting the deformity by operation, or by fitting a false roof to the mouth. Constant tuition in articulation is essential, but results are usually disappointing. Even if the defect has been remedied by operation during infancy, speech when acquired is often abnormal.

(B) Errors in Co-ordination of Speech-producing Factors.

Difficulty in correct co-ordination is commonly found during early childhood, but should have been overcome before school-going age. Any survival of incoordination is mainly found in "nervous" children, or in those mentally backward.

Stuttering is the defect to be described under this head. This term will include stammering, to avoid confusion with the German nomenclature. There is no difference whatever in their nature, causation or treatment, and they are merely types of the same condition, which may be defined as a cramp-like spasm of some part of the speech-producing musculature.

Stuttering.

Stuttering is found temporarily during development, when it may be made worse by illness. Also in emotional disturbance, as fear or rage,—when even transient dumbness may be produced.

Typically, however, it is a neurosis, developing after fluent speech has been acquired, and often beginning with the onset of second dentition. Other indications of an unstable nervous system often co-exist, such as enuresis, night terrors, or habit spasm. Some direct cause may be related, such as a fright, anxiety, lowered general health, or some epoch in the child's life, as going to school for the first time. Peripheral irritation,

especially adenoids and phimosis, are sometimes blamed. Imitation is a most important factor in the causation of this neurosis, and heredity is of little or no account. Boys are much more susceptible than girls, in the proportion of five or six to one. They are often of intelligence well above the usual, and their innate "nervousness" tends strongly to make the affection worse.

Symptoms.—The difficulty is with the enunciation of the initial letter-sound or syllable of a word, the respiratory, laryngeal, and oral mechanisms being for the moment out of touch with each other. Often the necessary expiration is entirely neglected, in which case no voice can be produced except with inspiratory phonation, which is sometimes attempted. In a vast majority of cases, then, the fault is *lagging behind of the laryngeal element* necessary to bring out the following vowel or voiced consonant. When this sound is eventually produced, it may be thin and deficient in quality as well as quantity. Rarely there is a want of promptitude in the oral mechanism, *e.g.*, re-re-re-*resi*-dent. Sometimes a condition of *interrupted utterance* is heard. The words are brought out hurriedly and in groups, between which there are silent pauses, apparently for the purpose of arranging the next group of words to be enunciated. Rarely speech may be suddenly inhibited by spasmodic approximation of the false vocal cords (fourth stop position). "The patient's voice is at once interrupted, and with open mouth and congested face he silently struggles without effect to omit the imprisoned air." (Wyllie.) Kussmaul termed this variety "Guttero-tetanic."

That vocalization is the essential omission is shown by the fact that the worst of stutterers seldom has any difficulty in processes where voice is essential, as singing, intoning, or shouting orders. The natural tendency of a stutterer is to put emphasis upon the oral part of his apparatus, to the entire neglect of his laryngeal; he thinks all letter-sounds are produced in the mouth, and forgets altogether the essential current of air. These frantic efforts to articulate sounds which do not require articulation are of course completely useless, and

are most trying to the bystander. They often bring about a sort of nervous overflow which causes spasmodic involuntary twitchings of the face, and even of other parts of the body as well. These movements must be distinguished from the purposeful ones which the stutterer often adopts to relieve his feelings, such as tapping with the foot or beating one hand against the other. Kussmaul's classical description of a case must be quoted:—

"He closes the oral canal at one or other of the closing points, according to the nature of the letter to be articulated, and this he does as well as a man who possesses the faculty of speech could do it; instead, however, of allowing the vowel to follow without delay, he presses his lips, or his tongue and his teeth, or his tongue and palate, more firmly together than necessary; the explosive escape of air does not take place, the other muscles of the face and those of the glottis and even the muscles of the neck become spasmodically affected like those of articulation; gesticulatory movements are made, the abdomen is retracted, the head is drawn backward, and the larynx is drawn forcibly upward, until he finally works himself into a state of frightful agitation; his heart beats forcibly, his face becomes red and blue, his body is bedewed with perspiration, and he may present the picture of a complete maniac."

According to Wyllie, the difficulty is associated with the initial letter-sounds in the following order; sometimes difficulty is found with several in the same patient. (Refer to Physiological Alphabet.)

(1) P, T, K (voiceless explosives). Normally, these should be touched off lightly and easily, for they merely serve as momentary interruptions to continuous vowel sound, either as an "explosive" introduction to a syllable, or a "stop" termination to it. A "silent sticking" at the consonant, culminating in an exaggerated production, is usually heard, the preliminary attempts being mute, or obscured by incoherent sounds. Sometimes there is a rapidly recurring enunciation of the particular letter-sound which is causing difficulty, because the following laryngeal element is not brought

up to time; *e.g.*,——poor——Peter, or p—p—p—poor P—P—Peter.

(2) B, D, G (voiced explosives). These are a little less difficult. The radical fault is absence of sufficient laryngeal sound, which should be thrown boldly into the letter.

(3) The remaining consonants (voiceless and voiced fricatives and nasal resonants). In the voiceless fricatives, such as S or H, the sound of the letter is prolonged while the stutterer waits for the lagging voice of the succeeding letter-sound. In the voiced fricatives and the nasal resonants, the speaker produces the letter-sound voicelessly, or with feeble and intermittent voice, and dwells upon it indefinitely.

(4) The vowels seldom present any difficulty. They may be produced in a feeble and tremulous manner. Very often these difficulties are exaggerated by the stutterer attempting to speak with impossible rapidity.

Treatment.—Most stutterers cannot be satisfactorily treated at school. The presence of hypercritical classmates is apt to make their mental discomfort worse, and the hurried *viva voce* work required in class also increases their difficulties. Their presence must also be considered as a "source of infection" for other children. If in any way possible, then, private tuition should be undertaken for a time, under the supervision of the medical officer.

The first essential is to ascertain which of the speech-producing factors are at fault; imperfect control of the respiratory organs is wholly or partially to blame in most cases.

The exact letter-sound or sounds at which difficulty is found must be isolated. This is done by means of giving the pupil short test sentences to read aloud. These sentences should be arranged in accordance with the physiological alphabet, and should consist of short easy words.

The most satisfactory age to begin special tuition is about 12 years. By this time the child is usually becoming anxious to correct his speech, and the habit is not as yet too deeply ingrained. In younger children, much can be done by respiratory exercises;

lessons in articulation, encouragement to speak slowly, carefully, and with full voice, singing, shouting and reading aloud. In mild cases this can be carried out in special classes. In all cases every effort must be made to increase the child's confidence in himself, for excessive timidity is common, and apt to bring about actual fear of speaking.

The following directions comprehend the general method of dealing with a case. Emphasis must again be laid on the importance of anxiety on the part of the pupil to improve, for this results in regular and intelligent practice, apart from actual lessons.

Attend to the general health and hygiene; treat possible causes of peripheral irritation.

Order breathing exercises calculated to increase the capacity of the chest, and to improve the control of the supply and escape of breath. At first this may be done without the approximation of the vocal cords, but later vocalization may be added. The chest should be kept as full of air as possible.

Explain that the impediment is due to lack of the necessary harmony between the laryngeal and oral mechanisms: Wyllie's simile of the fine co-ordination between the two hands of the violinist necessary for the production of music is apt, and easily understood. Emphasize the absolute necessity of vocalizing the outgoing breath, while articulation may well be left to look after itself. The pupil is often encouraged by being shown how easily the two consonants y and w may be produced by the simple addition of a slight fricative element to laryngeal sound pure and simple: "yes"—" —ess"; "when"—" —en." Demonstrate that the voice need not be intermitted in order to interpolate consonants. This can be done by making him intone or sing vowel sounds with steady and prolonged resonance, and, while doing so, introduce his troublesome letter-sounds, which usually can be done with ease.

Teach him to speak carefully, deliberately, and with full voice, though without shouting. It is useful to teach in the open air if possible, or to have the pupil in an adjoining room, with the doors open.

Singing (if sufficient musical ear is present), intoning (as in the Church of England service) and reading aloud of poetry, and later, of the more difficult prose, should be practised daily. If the power of mimicry is good, Langwill has pointed out that imitation of someone else's speech seldom presents any difficulty to the stutterer. Therefore if the commencement of a sentence is surmounted by any of these methods, the remainder will sometimes follow quite fluently.

By means of alliterative sentences, the letter-sounds which present difficulty may be systematically practised, *e.g.*, "Peter Piper picked a peck of pickled pepper." Later, as a more advanced exercise, the initials may be mixed, voiced and voiceless. Langwill has pointed out that when the voiceless initial of any word in a sentence is the terminal letter of the immediately preceding word, no attempt need be made to reproduce it as the initial, *e.g.*, "Fanny took-Kate's hoop." The patient must be made to emphasize the laryngeal part of the voiced consonants, while, in contrast, those which do not contain voice are to be merely enunciated—not sounded—the voice being brought out promptly and emphatically on the following vowel or voiced consonant, as the case may be. With the nasal resonants, a loud humming prelude to the letter-sound must be insisted on, thus "hummmmmM—ary."

Grimacing must be corrected by practice before a mirror.

Patients occasionally get over the stumbling-block in their own way by using inspiratory phonation. This trick may remain after the defect itself has completely disappeared.

These cases must be carefully watched as there is a marked tendency to relapse under slight mental or physical strain. The duration of treatment varies with every case. Langwill found the following scheme to be sufficient for most young adults who visit the teacher:—

Lessons of about an hour each for six consecutive days; twice weekly for a further fortnight; a monthly practice with the teacher for a period of six months or so.

Continuous tuition for nine or ten weeks at least is often required, and longer if good self-control and discipline are lacking.

Prognosis as to ultimate easy and automatic flow of language is hard to decide: everything depends on the pupil. It is sometimes disappointing that, although he knows how to speak, and can do so perfectly when undisturbed, he reverts to the old habits on the least possible provocation, and outsiders may never appreciate any improvement.

Errors in Control of the Articulative Apparatus.

As a manifestation of "brain-storm" limited to the motor speech centre, a sudden, involuntary and meaningless ejaculation of a word must be quoted. Sometimes the word is a bad one (caprolalia). This condition is found in neurotic children, and is usually associated with various signs of an unstable nervous system, such as other habit-spasms, night terrors, or enuresis.

The defects to be considered are lisping, lalling and idioglossia, placed in order of severity. The essential feature in them all is the substitution of vowel or easy consonant sounds for those consonants found more difficult; there is usually slovenly and indistinct utterance co-existing. Most often they date from babyhood, and are occasionally ascribed to imitation, or to physical deformities of the mouth.

Lisping.—Of this common imperfection little need be said. It is a typical example of persistent baby-speech, or may be caused temporarily by deficient incisor teeth. The common conversions are S to TH, R to W, or Y; TH to S or F; K to T, G to D. Apart from affectation, this habit is usually soon lost. Lessons in correct articulation, as by instruction in a special class, may be required.

Lalling is a more marked form of persistent baby-speech. Besides the difficulty in pronouncing certain consonants, there is usually much slurring and scamping of words and syllables, so that the speech may be very indistinct. It is common in mentally defective children, and may then persist throughout life. The

lalling may be upon one consonant or upon many. Sometimes the child has one favourite consonant which is substituted whenever possible, and Y is often thus used. Tuition in correct articulation and respiratory control should be given. These special classes should form part of the routine curriculum, and should not be given after ordinary school hours.

Idioglossia is a condition where the most marked types of lisping and lalling are found. There is also in most cases much general indistinctness of articulation, so that altogether the language sounds like a foreign one, and is quite unintelligible until analysed. It differs from persistent baby-speech—such as is often found in imbeciles—in that speech is fluent and obviously intelligent, the vocabulary is large and the actual construction of the sentence is correct, for each syllable is represented by a separate sound. Fully two-thirds of the subjects are boys. They are bright and quick, and can express themselves well by gesture. They hear well, and can carry out complicated orders with ease, but make singularly little effort to improve their power of speech.

The cause is uncertain. Guthrie considers that the receptive paths are at fault, and that it is analogous to congenital word-deafness, and word or colour blindness. The more general belief is that the defect lies primarily in the motor speech centre, or in the connections between this and the auditory speech centre.

Colman analysed twelve cases, and found that the average number of consonants which could not be pronounced was eight; several others only presented difficulty when terminal. The posterior linguo-palatals were always affected, then the letter-sounds F, V, R. There was never any difficulty with the vowels; these sounds, together with T, D and N, were sometimes solely used, and might be substituted the one for the other.

One of his cases recited the Lord's Prayer thus: "Ouë Tahde na ah in edde, anno de Di na, I tidde tah, I du de di on ĕĕt a te e edde te ut te da ouë, dade ded, e didde ouë te tedde a ne ahdin to te tetedde adase ut, ne no te tetate, ninne utte enu, to I ad te nini, poue e dordy, to edde e edde, Amé."

Prognosis is good in cases of idioglossia proper. On the other hand, marked lalling on several consonants at the age of 6 or 7 is very suggestive of mental deficiency. For this reason an accurate diagnosis is of the utmost importance.

There is natural tendency towards cure by the age of 8 of 9; the child begins to make efforts to improve, and speech usually becomes perfect even in the absence of special training.

Treatment.—If possible the child should be separated from persons who understand his jargon. Correct articulation is possible if the attention can be gained, for the oral method of education must be employed—as with deaf-mutes. The teacher shows the requisite positions of the lips, teeth and tongue and exaggerated in his own person, and these the patient is made to imitate. Thrills over the larynx can be palpated, and the teacher may at times actually place the pupil's organs in their correct relationship for any letter-sound under notice. Special oral gymnastics may be devised for strengthening the articulatory muscles, and should be combined with instruction in correct breathing. Such exercises might include blowing wind instruments; holding objects between the teeth for a definite period; forced protrusion and deviations of the tongue in various directions.

Characteristics of Speech in Amentia.

Griesinger says: "The relations of speech are so interwoven with the whole process of mental development, and so necessary for education and intellectual advancement, that the classification of idiots according to their speaking is one of the best that can be established."

Four classes of mentally deficient cases are recognized, viz.: (i) The dull or backward child; (ii) the feeble-minded child; (iii) the imbecile; (iv) the idiot. They may be placed in two great groups, (*a*) educable and (*b*) ineducable.

Although disordered speech is compatible with complete intelligence—as in idioglossia—imperfections become more marked from grade to grade, until in

many idiots the faculty of speech is either absent or only represented by meaningless sounds.

The mentally deficient baby does not babble, and does not speak until long after the usual time. After the faculty has been acquired, baby-speech tends to persist unduly long. If there is no deafness, marked lalling on several consonants at the age of 6 or 7 is very suggestive of mental enfeeblement.

Ashby and Dendy, having examined some five hundred dull or mentally feeble children, found that 19 per cent. had well-marked speech defects, and a further 7·8 per cent. showed minor ones. Difficulty with speech still further cripples a backward child. Although simple questions are understood he is apt to cease trying to make himself intelligible, and so becomes even more retiring and self-centred. It is therefore important that special education should be undertaken as soon as possible. Lalling and general slovenliness of articulation are the most common faults; acquired stuttering is seldom heard.

Caldecott's statistics, quoted by Still, show that fully four-fifths of imbeciles may be expected to talk eventually. Their speech is always imperfect, varying from faulty pronunciation of a few consonants to an almost unintelligible mumble.

With the lower grades, there may be senseless babbling, echolalia, the use of words of their own invention with a definite meaning, and automatic replies. Rarely there is no attempt at speech at all.

Even if ineducable in the ordinary sense, it is remarkable how much improvement in speaking power may follow systematic teaching. Half the battle is to sustain the attention; this is often done by getting the pupil to imitate well-known sounds or to name interesting objects. Singing, reciting, and reading aloud are always most useful.

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XI

SPINAL DEFECTS IN YOUNG SUBJECTS.

BY

A. H. TUBBY, M.S.Lond., F.R.C.S.Eng.

Consulting Surgeon to the Evelina Hospital; Surgeon to the Royal National Orthopædic and Westminster Hospitals.

The Normal Spine.

The vertebral column consists of two parts, the anterior or the column of the bodies, essentially supporting in function; and the posterior or column of the arches, which forms a protection for the medullary substance, a means of attachment for the spinal muscles and ligaments, and is secondarily concerned in support. Excluding the sacrum and coccyx, the spinal column consists of twenty-four bones, the upper seven being called cervical vertebræ, the next twelve supporting the ribs are the dorsal or thoracic vertebræ, and the remaining five are the lumbar vertebræ.

The normal spine is not straight; it presents two curves forward—the cervical and lumbar—and one curve backward—the dorsal or thoracic. The line of gravity passes through the bodies of the second and twelfth dorsal vertebræ. The spine is rendered more elastic by the interposition of a disc of cartilage between each vertebral body, the intervertebral disc.

The movements of the spine are flexion or bending forwards, extension or straightening, hyper-extension or bending the body backwards, lateral flexion or side bending, and a rotation movement around the vertical axis. Lateral bending is very limited, and beyond a certain point it is always accompanied by rotation; and, inasmuch as the ribs are attached to the spine, any

rotation of the column causes the ribs on one side to move forward and those on the other side to move backward. This explains the projection of the ribs backward on the convex side of a dorsal lateral curve.

Maintenance of the Upright Position.—This obviously depends on active muscular contraction, for if the muscles are relaxed in sleep or anæsthesia the spine collapses. The muscular system, involved in maintaining the erect position, is of a highly complex nature. If one tries to *hold*, for example, a light dumb-bell at arm's-length for several minutes the strain of the sustaining muscles becomes unbearable. If the same bell is held erect over one's head, that is, if it is balanced, the effort is infinitely less. It is the same with the spine. The spinal muscles cannot *hold* it up for any length of time. They are assisted in maintaining the upright position by the anatomical construction of the spine, by the ligaments, and by balance; which last is a continuous adjustment by co-ordinated muscular action of the ever-varying position of the centre of gravity. The idea then is not one of prolonged and wearisome muscular effort, but one of constantly changing ripples of muscular action, no one action ever being protracted long enough to produce fatigue.

In sitting, the body weight is supported upon the pelvis and the under surface of the thighs. And sitting is of two kinds; either with the spine erect or relaxed. The former is not a position of rest, unless the chair-back is so arranged that mechanical support in the upper lumbar region replaces muscular tension. The importance of grasping this remark in arranging school desks for children is obvious. When sitting with the spine relaxed, it is bent backwards in a general curve, and becomes more so as the unsupported vertebral column imposes more and more strain on its muscles and ligaments.

Spinal Defects and Diseases.

(1) The most obvious is what is known technically as kyphosis of childhood and adolescence, or in common parlance, "round shoulders." There are also certain pathological alterations in the antero-posterior curves

of the spine which will be spoken of more fully presently.

(2) Congenital defects giving rise to what is known as congenital lateral curvature or scoliosis.

(3) Acquired scoliosis, or the ordinary lateral curvature.

(4) Antero-posterior curvature, due to disease and known as tuberculous caries of the spine, angular deformity or Pott's disease of the spine.

Before we discuss these more fully, we will proceed to describe a method of examining the back.

Clinical Examination of the Back.—The patient's back is bared as low as the top of the gluteal cleft. It is convenient to have in the dressing-room a loose flannel skirt, which can be put on by the patient after removal of the ordinary garments, and held in place just above the gluteal cleft by an elastic band. A jacket, with the opening and buttons behind, covers the front of the body. The patient then stands in a good light, with the back to the examiner and the arms hanging at the sides. The examination must not be hurried; and two or three minutes should be allowed to elapse as the child gradually relaxes the effort made in standing upright, and assumes the usual attitude and position. During the inspection the following points are observed:—

(1) The outline of the body, whether symmetrical or not, particularly whether one flank is more curved than the other, and if the arms make equal triangles with the trunk; also if one hip is more prominent than the other. Many people, although entirely unconscious of it, have one leg shorter than the other. In that case, a block should be placed beneath the patient's leg until the pelvis is quite level, and the effect of this procedure should be noted on the outline of the body.

(2) The level of the shoulders is noticed next, and if one is higher than the other the patient should be asked to rectify the position. Failure to do so suggests structural lateral curvature.

(3) Whilst the patient is at ease the position of the scapulæ should be observed and compared on the two sides; if one is habitually raised above the other, this

is suggestive of a lateral curvature, convex to the side of the raised scapula.

(4) The position in which the head is carried is remarked.

(5) The antero-posterior curves are observed, and any increase or diminution is recorded.

(6) The child's arms should now be crossed on the chest, with the hands resting on the opposite shoulder, and she should be directed to bend well forwards. The result is that the scapulæ glide forward and upward and partially bare the ribs posteriorly. Any posterior projection of the ribs on one side of the spine or sinking in on the other is noticed at once.

(7) The tips of the spinous processes, commonly called the spines, are now marked out in ink, and at once any deviation or otherwise from the middle line is noticeable. A record of any curve should be kept. A deviation of the spinous processes indicates lateral curvature, projection of the ribs on one side indicates rotation of the spinal column, and the combination of lateral deviation with rotation constitutes the deformity known as lateral curvature and scoliosis.

The above observations suffice to determine the presence or otherwise of scoliosis. It is of the utmost importance to be able to recognize the presence of deformity or of disease, because the earlier it is detected and treated the more satisfactory is the outlook; moreover, the treatment of lateral curvature and of antero-posterior curvature due to disease is almost diametrically opposite in most particulars.

Clinical Examination for Disease.—If the child complains of persistent pain in the back, in the chest, in the stomach, or down the legs, and if the movements are stiff and restrained, then a suspicion of spinal disease arises. It is inadvisable to wait until the backward projection of one or several of the spinous processes proclaims the existence of disease, even to the most unskilful observer. Long before that time the child should be in the hands of the surgeon. The most striking sign in the early stages of tuberculous disease of the vertebral column is the erect, carefully guarded, military attitude; and if the child is directed to pick up

an object from the ground, all the stooping takes place at the hips and knees and not in the spine, which is held quite rigid.

Round Shoulders, Faulty Attitude, and Flat Chest.

For the purposes of description the condition known as round shoulders may be analysed into three varieties: (*a*) The Round Back; (*b*) the Hollow Back; and (*c*) the Round Hollow Back.

(*a*) *The Round Back.*—The normal posterior curvature of the dorsal region is exaggerated, and encroaches on the normal anterior curvature of the cervical and lumbar regions. The spine in the cervical region is inclined forward, carrying the head with it, the hips and knees are somewhat bent, whilst the head and abdomen are projected forward, so that there is a combination of flat chest, round back, and prominent abdomen. At the same time the hips and knees are slightly bent.

(*b*) *The Hollow Back.*—The dorsal region of the spine does not project backwards so much as in (*a*), but the normal lumbar curvature forward is much increased.

(*c*) *The Round Hollow Back.*—The natural posterior dorsal curvature and the anterior lumbar curvature are increased, so that if viewed from the side the spine is markedly S-shaped.

These attitudes are essentially those of spinal muscular weakness, and are doubtless due to unsuitable school furniture, short sight, and the custom of wearing clothes suspended in an improper way from the shoulders; these all play their part. That muscular weakness or general muscular insufficiency, however, is the chief cause is confirmed by the fact that many of these children are flat-footed and knock-kneed. Special attention should be directed to the arrangement of the clothing. The fashion is, in girls, to suspend the petticoats from braces passing over the shoulders. The mischief is that the braces are so made as to press near the tips of the shoulders and thus increase the drooping forward of these parts. The braces should pass near the root of the neck; and, in order to keep them in that position, they should be

joined together by a transverse piece of webbing. In severe cases of round shoulders the following arrangement may be tried: A band of webbing, 1 in. wide, passes horizontally across the back at the level of the spines of the scapulæ; it is then brought forward over the front of the shoulder and beneath the armpits, and then passes diagonally across the back, so that one lies over the other. Where they cross in the middle of the back they are sewn together. To the end of the strap the clothes are fastened.

Congenital Defects of the Spine.

These usually take the form of deficiency of the arches of the vertebræ, giving rise to spina bifida, a condition from which very few infants survive; if they do, they are frequently liable to paralysis of the lower extremities. In some children, at the lower end of the sacrum and over the coccyx, a depression is seen indicating late closure of the arches of the vertebræ, and the name "Spina bifida occulta" has been given to this. As a rule no symptoms are evident.

Within the last few years we have recognized that many examples of lateral curvature are due to congenital causes, such as the bodies of the vertebræ being wedge-shaped instead of discoidal and imperfect, or to suppression of one or more of the spinal segments. In order to verify the diagnosis, Röntgen-ray photographs should be taken. The significance of these cases lies not only in the spinal abnormality, but also in the fact that with them there are present other deficiencies or deformities; thus the ribs may be greater or less in number than normal, the blade-bones may be misplaced or connected to the spine by bone, or various other abnormalities exist. Congenital scoliosis is very intractable and difficult to treat, and gives rise later in life to inveterate forms of spinal curvature.

Acquired Lateral Curvature.

Frequency.—Of 5,079 consecutive cases seen by the author at the Royal National Orthopædic Hospital, London, 428 presented this deformity. In the public schools of Denmark, of 28,125 children 386 were found

to have lateral curvature. In Sweden the percentage of school children affected was found to be as high as 24·6 per cent., which appears to be excessively high. It must, however, be remembered that the value of such figures depends on the standard adopted by the individual observer. The occurrence of this deformity is certainly particularly great in large towns, and is more prevalent in girls than in boys, probably being as four or five to one. In 57 per cent. of the cases it is said to have commenced between the age of 7 and 14 years.

Clinical Aspects of Lateral Curvature.—In modern literature it is described as (*a*) Changes in the outline of the spine, which have not advanced so far as to prevent active or passive correction; (*b*) structural or organic, where definite changes have occurred in the shape of the vertebræ, the intervertebral discs, and the ribs, shoulder girdle and pelvis.

The outlines assumed by the curved spine are various. Thus we have a long single or C-shaped curve, usually to the left; the well-known S-shaped curve, the curve usually pointing to the right in the dorsal region and to the left in the lumbar region. That is, the spine is curved in two directions, laterally. Three or more curvatures may be present, and some cases of scoliosis are associated with posterior projection of the spinous processes at the spot where the upper and lower curves meet, especially when they are nearly equal. Such instances may be difficult to diagnose from Pott's disease or tuberculous curvature.

Causation.—The ultimate causation of lateral curvature is spinal insufficiency or lack of resistance. The overweighted spine bends, and the load need not be abnormally great, yet if the supporting ligaments and muscles are not sufficiently resistant, it is relatively overweighted. In the widest possible terms the deformity is due to want of relation between the weight to be borne and the weight-bearing mechanism, which, of course, includes the muscles and ligaments. This has been expressed in the formula

$$B > T = D$$

where B represents the load, T the carrying power, and D the deformity. It therefore follows that any cause which diminishes the muscular activity and lessens the tension of the spinal ligaments may result in curvature. For practical purposes we may classify the causes under two headings, which include the majority of cases coming under ordinary observation. These headings are (1) Constitutional or idiopathic, and (2) occupation and postural causes.

(1) *Constitutional Causes.*—It is easy to understand how much weakly town-bred children, often insufficiently and poorly clad, suffer in their general health, and this is reflected in the state of the spine. The muscular system is lax, and such children cannot stand the strain put upon them by rapid growth, so that the development of the muscular and ligamentous system is outpaced.

(2) *Occupation and Postural Causes.*—The habitual curve due to faulty habits is often included in this form, and rightly so. In this type there are many factors concerned, both mental and physical. The mental state is often one of indolence and shyness, or of self-consciousness, so that the effect of any faulty attitude in sitting or standing is likely to be progressive.

The conditions and surroundings of school life have been most searchingly criticized. The strain of rapid growth and of puberty, and the fact that a child at school is sometimes subjected to undue fatigue, both physical and mental, may result in some insufficiency of the bony and soft parts. Disability sets in rapidly; and that position which is most easy is assumed occasionally, and then becomes more or less permanent. This is often the beginning of school curvature. There are other causes incidental to the faulty position of sitting and standing frequently seen in schools. We allude to the methods by which writing is taught, and the sloping Italian hand is greatly to be condemned. In order to save repetition, we may briefly enumerate some of the points most desirable in the school curriculum. Change of work is most necessary, and difficult and easy subjects should alternate frequently, and be interspersed with opportunity for obtaining fresh air and

exercise. Children assume bad attitudes because they are uncomfortable and fatigued; uncomfortable on account of the desks and chairs used, and fatigued by want of proper support and by overwork.

School Furniture.—The defects to be avoided are (*a*) the prolonged stretching of the spinal extensor muscles by continued stooping; (*b*) the assumption of distorted and twisted attitudes, which children with tired muscles readily adopt in order to obtain a change of position.

The following faults are often noticeable in chairs: The back of the chair is too straight and is not sufficiently high. The result is that the back-muscles, being unsupported, especially in the lumbar region, readily become tired, and the child leans to one side or to the other, the head and shoulders droop, and a habitual stoop is acquired. The height of the seat is too great, and in order to reach the ground the hips are twisted, so as to bring one foot down, and the back is less supported than before. The writing table is too high or too low, and faulty attitudes become the easiest to adopt.

It must not be forgotten that in prolonged sitting, the unsupported spine is subjected to much greater strain than in standing. In standing, the position is never constant, as the child throws more weight first on one leg, then on the other, now sways forward, now backward; that is, the centre of gravity is constantly changing. And these changes call for constantly shifting muscle combinations, so that no one group is pre-eminently strained. In sitting, the pelvis is partially fixed, and the flexed attitude of the spine is assumed and maintained. Unless the spinal extensors were in constant action the body weight would cause the trunk to topple forwards. It is this unrelaxed constant contraction that tires the muscles out. However, the disadvantages of the sitting posture may be minimized by appropriate seating arrangements.

R. W. Lovett gives an account of the school chair devised for the Boston (U.S.A.) School Commission, which was carefully worked out by Dr. J. G. Cotton, of that city, and there are now 22,000 such seats in use in its public schools. To quote *in*

extenso, the requirements are: (1) The height of the seat from the floor should be such that the feet in sitting rest on the floor; (2) the slope of the seat should be backwards and downwards about $\frac{3}{8}$ in.; the depth of the seat should be about two-thirds the length of the thighs; the width of the seat should be that of the buttocks. Some concavity of the seat is comfortable, but not essential; (3) the back of the seat should have a slope backward of one in twelve from the vertical line. In any case the seat must have a pad placed at the hollow of the back, in the lumbar region; (4) the height of the desk should be such that its back edge allows the forearm to rest on it naturally, with the elbow at the side; (5) the slope of the desk should be from 10 to 15 degrees. The proper distance of the eyes from the desks is from 12 in. to 14 in. The width of the desk should be from 22 in. to 24 in. The back-rest consists of a curved support of wood $9\frac{3}{4}$ in. wide and 5 in. high, with a concavity in depth from side to side and a convexity of 1 in. in profile, while slightly tilted backwards. The maximum convexity lies one-third of the way up, and when properly adjusted comes opposite the middle of the loins. This support is carried on a light casting, running in the groove of a single cast-iron upright attached to the back of the seat. A side screw fixes the height after adjustment; (6) the height of the desk and of the seat are also adjustable. The desk should be at such a distance from the seat as to allow the hand to come down, nearly to the edge of the desk, without the elbow striking the back-support; namely, let there be a distance from the sliding back to the edge of the desk, equal to the length from the wrist to the elbow. In this country, satisfactory school desks can be obtained from the North of England School Furnishing Company, Darlington.

In writing, all are agreed that the slanting hand-writing should be abandoned and an upright hand-writing cultivated, the exercise book being immediately in front of the pupil. The best possible position and light should be arranged. Incidentally, it may be stated that lateral curvature is often associated with adenoids, enlarged tonsils, and other causes of naso-

pharyngeal obstruction, and these should be sought for and remedied.

We have thus indicated the causes of lateral curvature and its prevention. The actual treatment of the condition is described in the ordinary text-books.

Spinal Disease.

In a work of this description it is not possible to enter in any way minutely into this matter. The symptoms in the early stages have been given in vol. i, p. 404, of my text-book. The condition is so serious and urgent and calls for such special treatment that school life in the ordinary sense must be completely interrupted. When the severity of the disorder has subsided, the child may attend the special cripple schools provided by the County Councils, or, if he is in another position in life, private tuition is the best form of education under the circumstances.

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XII

CARDIO-VASCULAR DEFECTS IN CHILDREN.

BY

THEODORE FISHER, M.D., F.R.C.P.

Physician to the East London Hospital for Children ; author of "The Heart and Sudden Death."

THE following observations are presented in the hope that they refer mainly to conditions which may not have been brought prominently before the notice of medical men engaged in work in schools owing to the fact that they are not common, or because they are of a nature which renders them liable to be misunderstood.

CONGENITAL CARDIAC LESIONS.

Amongst morbid conditions of the heart some varieties of congenital disease of the heart suggest themselves. The characteristics of a well-marked case of congenital cardiac disease are so obvious that no comment upon them is necessary. There are, however, minor examples of this disease which merit attention, because caution may be necessary in giving expression to an opinion with regard to prognosis. It is scarcely necessary to emphasize the well-recognized fact that life is not likely to be prolonged in children affected with congenital cardiac disease where there is definite cyanosis, though a certain number of these live beyond the period of school life. While this is so, few are sufficiently active to be physically fitted to attend an ordinary elementary school. In districts where there is provision for the education of the physically defective, these children are admitted to the special schools. The education they there receive adds an interest to the short span of life it is their lot to possess, and so far fulfils a useful purpose. There are,

however, other cases of congenital disease of the heart in which considerable length of life may be expected.

Before referring to cases of this nature which have come under my notice during life, a suggestion may be made with regard to one form of slight congenital defect the nature of which the experience of the *post-mortem* room suggests may give rise to error. I refer to a small perforation of the inter-ventricular septum. This septum presents a wide perforation in the majority of cases of congenital disease of the heart, and it is doubtless the rush of blood through the perforated septum which gives rise to the loud systolic murmur which in so many cases is heard all over the front of the chest. Although this defect in most instances is mainly responsible for murmurs which may be heard, the defect may generally be said to be secondary to some other abnormal condition in the heart. Occasionally, however, a perforation of the septum may exist alone, and may not only exist alone, but be very small, and be found after death in an adult where death has occurred from some cause quite unconnected with the heart. This fact suggests that a murmur audible in the situation of the most common murmur of congenital cardiac disease, when unaccompanied by any other indication that the heart is affected, may not necessarily be regarded as of serious import.

Other murmurs of congenital origin which also may be met with in adults are murmurs over the pulmonary area. Children in rare instances presenting evidence of slight pulmonary stenosis may give a history of having been anæmic and lethargic from birth, but otherwise do not differ from "delicate" children whose weakness is due to other causes. Yet such a defect need not have given rise to any suspicion during childhood. I once examined a young man, aged 24, for life insurance, in whom a marked pulmonary systolic murmur, associated with a thrill, was audible over the pulmonary area. Yet this young man was accustomed to ride a hill on a bicycle which was considered to be beyond the powers of most cyclists.

Another murmur of considerable interest audible in the same area is the murmur which the late Dr. G. A.

Gibson considered to be diagnostic of a patent ductus arteriosus. Here again in the few cases I have seen in children—four in all—the children may be described as delicate. I have, however, met with the same murmur in a woman, aged 25, who five years later was in good health. The description of the murmur given in my notes in the case of the woman may serve as an illustration of its characteristics. It may possibly be of interest to mention that the notes were unbiassed by any description previously read of a similar murmur, since not until a paper by Dr. Gibson appeared in the following year was I aware that such a murmur had been recognized. The condition is thus described: "A localized thrill is palpable in the second intercostal space, but is not felt above or below in the slightest degree." "A strange murmur is audible—at first like a loud venous hum, continuous through systole and diastole, with a loud second sound audible in the middle. The murmur, however, is undulating, waxing and waning with systole and diastole. Curiously enough, the murmur is very localized, is most clearly audible about 2 in. to the left of the sternum, and scarcely heard at all over the space of the mouthpiece of the stethoscope from the sternum." In a later note it is stated that the second sound was reduplicated. The peculiar feature of the murmur is its continuous, but at the same time waxing and waning, character, being loudest during systole. The fact that uncertainty still exists as to the meaning of this murmur—that is to say, its presence is not universally recognized as an indication of the existence of patency of the ductus arteriosus—suggests that few cases have found their way to the *post-mortem* room. This lack of evidence from the *post-mortem* room may be considered to be a point in favour of the view that when such a murmur is present the prospects of life need not be very materially affected.

The Significance of Cardiac Murmurs in Children.

The subject of murmurs audible over the heart in children is one which presents features of interest, and also occasionally of difficulty. Reference has already been made to some of the murmurs to be heard in

congenital cardiac disease. As a rule such murmurs by their character and distribution are easily distinguished from murmurs which accompany some passing disturbance or acquired disease of the heart. Now and again, however, a pulmonary systolic murmur may be so loud as to arouse suspicion that it may indicate the presence of congenital pulmonary stenosis. As a rule the impression made upon the mind does not deepen into anything beyond suspicion, but it may be of importance to note that a pulmonary systolic murmur of considerable intensity may be present in apparently a perfectly healthy and active child, and persists for years. If space allowed I could give notes of such cases. Here it may be mentioned that a pulmonary systolic murmur is extremely common during early childhood. As a rule the murmur is not loud, but is quite evident. This basic murmur may or may not be accompanied by a systolic murmur at the apex. To discuss the reason for this is not possible here. To those not, however, aware of the frequency of murmurs in healthy young children it is well to draw attention to the fact.

Another fact of equal importance is the ease with which murmurs are caused to appear by some febrile illness. These murmurs may persist for some weeks or months after the febrile illness has passed off. Not only is caution required lest too serious a view should be taken of such a murmur after some comparatively trifling illness, but it is necessary to bear in mind that after rheumatism a systolic murmur appearing during the acute attack will frequently disappear. Here it may be mentioned that a little consideration will show that a systolic murmur appearing at the apex during rheumatism cannot possibly be produced in the course of a few days by disease of the mitral valve. Small vegetation—if present—no larger than grains of sand cannot produce incompetence of the valve. It will be noted also—if listened for—that a pulmonary systolic murmur is generally present, and we know that pulmonary stenosis cannot be rapidly produced, and minute vegetations, if present on the cusps of the valve, could not produce the murmur. In rheumatism, as in other febrile illnesses, the murmurs which appear at the onset

of the disease are due to some disturbance of the heart other than disease of the valves. Murmurs due to disease of the valves, needless to say, only too frequently follow; but although this is true, a murmur present must be watched for weeks or months, or even a year, before it can be definitely said to indicate organic disease. The above remark applies chiefly to a systolic murmur audible at the apex. There is, however, a murmur, or more correctly a sound, which is frequently misunderstood. This is the dull sound audible in the diastolic interval which has sometimes been called "the third sound" of the heart. So frequently is it evident to the hearing of those whose ears easily catch low-pitched sounds that the words "third sound of the heart" can scarcely be called inappropriate. To attract the attention of the majority of observers, however, this sound requires to be abnormally distinct, and when thus abnormally distinct it may not only be evident to the ear, but a shock synchronous with it can be felt by the hand. When present this sound is not always audible with every beat, but may be heard only just at the commencement of inspiration. This is the position in the cardiac cycle, it may be mentioned in passing, that a pause frequently occurs in the pulse of a child producing the characteristic intermittent pulse of childhood. When the cardiac sound, however, is present, whether it should occur throughout the cardiac cycle or only at intervals, its nature is likely to be misunderstood. The diastolic sound is frequently considered to be a presystolic murmur, and thought to be diagnostic of mitral stenosis. This is very far from the truth. The sound, it is true, is frequently present in cases of mitral stenosis, but it by no means—in the great majority of instances—indicates disease of the mitral valve or of any valve. Its causation may be said, in some degree, to be still a mystery, but the sound is probably present, and sufficiently loud to be heard by the majority of observers, over every child's heart at some time between birth and puberty. It is perhaps most common in conditions of debility, but may be well-marked over the hearts of apparently perfectly healthy children. It may safely be said that such a sound existing alone without the

existence of a systolic murmur should not be considered to indicate any permanent affection of the heart. When associated with a systolic murmur at the apex, in the great majority of instances both murmurs may be considered to be "functional." In a few cases, however, early mitral stenosis will be present. In some of these the organic nature of the disease will be very evident, but in others a definite opinion should be deferred for a year or longer. Before leaving this subject, it may be interesting to add that the above remarks with regard to the liability of mistake are not mythical. I have known highly trained and experienced medical men not only frequently to fall into the error, but apparently be unconscious that there was any danger of mistake.

Much more could be said concerning the systolic murmurs and diastolic sound above lightly touched upon, but there are others which can scarcely be passed over without brief reference. Of considerable interest are those murmurs audible over a rapidly beating heart temporarily stimulated by excitement. Most commonly such a murmur is systolic, but it may be diastolic. Sometimes it is so harsh as to suggest a pericardial rub, at others is virtually indistinguishable from an endocardial murmur. As a rule it disappears so quickly that its nature is at once evident, but occasionally it may give rise to misunderstanding. A case of this kind, although not occurring in a child, may be worthy of mention. A young Oxford man, who had represented his University in the athletic sports, was examined for life insurance, and rejected by a prominent physician on account of an affection of the heart. A gentleman interested in this result asked me to examine him. When I first listened to the heart a diastolic murmur, which I considered to be unmistakably a diastolic aortic murmur, was audible down the left border of the sternum. The heart, however, under excitement, was beating rapidly. After a few minutes' interval I therefore examined the heart again, and no trace of the murmur was to be heard. The fact of its disappearance was brought to the notice of the physician who had rejected the young man for life insurance, and he courteously and generously examined him again, and passed him as a first-class life.

The dangers of finding something wrong with a healthy heart appear to be much greater than the dangers of overestimating the health of a diseased heart. To find something wrong with a healthy heart—especially where there is a nervous parent—may do much to ruin the character of a child for life. To think lightly of a diseased heart, personally, I do not consider to be a serious matter. Restraint may render the child's life a burden to itself, and do little to prolong that life. The danger of sudden death is so small that it may be neglected, and when a child with cardiac disease dies it is not, in the majority of instances, by slow cardiac failure, but as a result of a fresh attack of rheumatism affecting the heart. Restraint does little, it is to be feared, to ward off these renewed attacks of rheumatism upon the heart.

Functional Affections of the Heart in Early Life.

Towards puberty fainting, especially in girls, is not very uncommon, but—as is well known—is very rarely an indication of organic disease. Most cases of fainting in children, at least before the later years of school life, are not vasomotor or cardiac, but are epileptic in nature. Dr. Clement Dukes found cyclical albuminuria not uncommonly to be present in boys who fainted occasionally when standing during prayers after hurrying to be in time. Cyclical albuminuria apparently is dependent upon a vasomotor instability, and such an instability must predispose to fainting.

Another functional affection which occurs during childhood is *tachycardia*. An attack may last for an hour or more, and give rise to considerable distress. In several cases which have come under my notice the cardiac affection had apparently followed an attack of acute rheumatism. There has been no indication that any of the valves have suffered, but it is probable that the rheumatism has injured—possibly not permanently injured—the muscular wall of the heart. In these cases, although the severe attacks are only occasional, the pulse-rate between the attacks is generally high. I have a boy who suffers in this way now attending out-patients under my care. His pulse usually remains at

about 120 to the minute. The prognosis of these cases is a matter for investigation. In some cases of tachycardia which occur in adult life the affection first made its appearance after rheumatism in childhood. The probability is, however, that in most instances the affection gradually disappears before adult life is reached. Although I have laid stress upon the history of rheumatism, it should be mentioned that I have met with cases in which a connection with rheumatism was not obvious. Attacks of rapid beating of the heart, whether they occur in children or in adults, constitute an obscure affection. It probably has many causes. It may be difficult to say also in some instances where the rapid cardiac action is of the nature of palpitation which will have a short history or is a part of a much more lasting disease.

Another occasional sequel of rheumatism, and also of diphtheria, is cardiac pain. In a well-marked form this is rare, but slight pain over the cardiac area is frequently complained of, and tender spots may be present. Such pain and tender spots may have no connection with rheumatism. They frequently occur in weakly children. It is customary to call the pains dyspeptic. Indirectly there may possibly be said to be some truth in this opinion. The pains are in some way, it seems probable, dependent upon want of vasomotor tone, and this want of tone is commonly associated with dyspepsia.

Reference has been made to tachycardia, which—as has been mentioned—is a distressing affection. There is an affection of the pulse, however, which may almost be said to be a normal condition of the debilitated child, so common is it. Common though this pulse is, I have known again and again—as in the case of the diastolic cardiac sound—well-educated medical men look upon the pulse in question as an indication of some affection of the heart. The pulse is an intermittent pulse, in which the intermittence or pause occurs at every fourth or fifth beat. As previously mentioned, the intermission occurs just at the time expiration gives place to inspiration. This pulse may be felt at some time or another in nearly every child recovering from a febrile disease, is very common in weakly children, and

no doubt is met with occasionally in healthy children also. To look upon it as an indication of any form of cardiac affection would be a serious error.

It is also interesting to note that while the truly irregular pulse is generally an indication in a child of serious cardiac affection—occasionally such a pulse may have been present from birth. One medical student whom I knew, a good tennis player, possessed a very irregular pulse, which had been present from birth. He is now in practice, and must be past the midway point of the Biblically allotted span of man's life. Similar cases I have met with amongst children. Five years after a boy with a very irregular pulse was first seen I looked him up, and found him to be a most unusually well-grown and active boy of 16. Such cases when they occur are not likely to give rise to much difficulty. A very irregular pulse—such as was present in these cases—when of serious import is associated with other marked signs of extensive disease of the heart.

In concluding this necessarily condensed chapter upon various cardio-vascular conditions in childhood, or as they may appear during school-life, reference may again be made to the question of taking an optimistic or a pessimistic view of any abnormal conditions which may be found. I have indicated above that I consider the tendency of the majority of medical men is to take too serious a view. In some this serious view may take the common, but none the less foolishly alarming, form of a warning to friends or relatives of the probability of sudden death. My experience of children, both clinically and in the *post-mortem* room, has been extensive, yet no case of sudden death from cardiac disease in a child has come under my notice. It is needless to say that I do not go so far as to say that this form of death does not occur. Cases of congenital cardiac disease—mainly, however, before the years of school life—may die in convulsions, and I have heard of a boy with aortic valvular disease dying suddenly, yet so rare is anything of the kind that it seems to me that it is better to avoid any mention of the probability.

As to prognosis of organic disease, apart from the

question of sudden death, this is a serious matter. Little is to be hoped for where there is very obvious enlargement of the heart. The majority of such cases terminate before and soon after puberty, and few extend to the age of 20. On the other hand, children with obvious mitral stenosis may be very active. I have known such a boy win a running race and be capable of swimming a quarter of a mile. Should no fresh attack of rheumatism occur, such a boy, or one far less active, may live to between the ages of 30 and 40, or over 40. The majority of cases of mitral stenosis die between the ages of 30 and 40; but I have made an autopsy on a man, aged 65—an ostler until within a few weeks of his death—whose mitral orifice only admitted one finger. His cardiac affection had probably been present from early life. With aortic valvular disease the prognosis is more serious, but this disease is much more rare in childhood than mitral stenosis. Here it may be mentioned that it may be noticed that I have not referred to mitral regurgitation. Mitral regurgitation as a disease by itself in childhood does not exist. A loud systolic murmur is usually present in cases of enlarged heart associated with adherent pericardium, of which the prognosis—as has been mentioned—is very serious. A systolic apical murmur is also generally present in cases of mitral stenosis. The deformity of the mitral valve, however, produced by rheumatism, is not a puckering as is frequently thought, but is thickening associated with gradual contraction. Through the contracting orifice there is usually regurgitation, but mitral regurgitation existing alone as the result of rheumatism cannot be said to constitute a disease.

The vexed question of the effect of exercise upon the heart has not been referred to. My own opinion with regard to the matter, however, is that although functional disturbance of more or less lengthy duration may result from excessive strain upon the heart, the heart rarely suffers permanent injury. This may not be true of a heart the wall of which has been weakened by diphtheria, rheumatism or by some other infection, or toxæmia, but allowing that excessive exercise occasionally deleteriously affects such weakened hearts,

cases of cardiac disease arising in this way must be rare.

In the bibliography which accompanies this article will be found the titles of papers which present various views on the effect of exercise upon the heart, but the view of Dr. R. Tait McKenzie may be selected as being at least one which seems to appeal to that faculty which we call "common sense." It is as follows: "The body is constructed for a life of physical activity and the heart needs constant and varied movement for its proper development. Anything which curtails or prevents this natural means of growth must result in preventing the individual from reaching the highest possibilities."

Attention may also be drawn to the interesting observations of Morton Prince upon murmurs. He considers that some temporary murmurs which occur over nervously excited hearts are endocardial in nature. A similar thought has often occurred to and been expressed by me.

Other instructive papers are those of Drs. Hamil and Le Boutillier on "Inorganic Pulmonary Systolic Murmurs in Infancy and Childhood," and of Dr. D. J. Butler on "Percussion Findings of the Heart in Late Childhood."

"Mitral Dwarfism," a condition occasionally met with, is briefly dealt with by Dr. Parkes Weber.

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XIII

THE RACHITIC CHILD.

BY

ALEXANDER S. M. MACGREGOR, M.D.Glas., D.P.H.Camb.

Assistant to the Medical Officer of Health and Tuberculosis Officer for the City of Glasgow; late Deputy-Superintendent of the Belvedere Fever Hospital, Glasgow; author of "The Physique of Glasgow Children," &c.

Rickets occupies a unique position among the diseases of young children. Its seriousness depends much more on its complications and sequelæ than on the actual disease itself, which is, in general, a mild and chronic one, rarely fatal, and readily curable without any marked demonstrable results. All the consequences of importance follow from (*a*) the susceptibility it creates to catarrhal complications, and (*b*) the deformities of the bones arising from neglect of the condition in its earlier stages. Although only exceptionally a direct cause of death, it contributes indirectly to the high death-rate from such common diseases as convulsions, diarrhœal diseases and broncho-pneumonia, while measles and whooping-cough are peculiarly fatal in rachitic children. The local effect of rickets on the bones may result in serious impairment of growth, and in grave and even disabling skeletal deformities. It was this prominent consequence of rickets which led to its being classified among affections of the bones; but the point to be emphasized is that the disease is a general one which involves all the tissues, and one which can be recognized long before the serious and permanent deformities have had time to make their appearance. It is significant that a disease which is, in

general, mild and curable, should be followed by so much grave deformity—a deformity which is preventable.

Rickets in its general relationship to public health may be considered from two aspects: (*a*) The active stage, with its complications and relationship to the intercurrent diseases of childhood; and (*b*) the bony deformities and their consequences.

Clinical Characteristics of the Active Stage.

Course and Chief Symptoms.—Rickets is essentially a chronic malady, insidious in its onset and slowly progressive. Before the disease becomes definitely recognizable, the child may show symptoms of dyspepsia, *e.g.*, vomiting, diarrhœa or constipation, flatulence —symptoms which are, in most cases, traceable to incorrect feeding. This catarrh of the bowel is apt to become chronic and recurrent, remaining or increasing during the rachitic attack; and if long continued, malnutrition and wasting follow, growth is retarded, and the infant remains small and puny. The general retardation of growth affects also the developing teeth, which are delayed in their eruption usually in proportion to the severity of the disease. The muscles are feeble, and the child may be unable to walk, or even to sit up. Bronchial catarrh is commonly present, and convulsive attacks result from slight causes. As regards the bones, the skull is thinned in certain parts and thickened in others, while the fontanelle is wide and closes late. The ends of the long bones become swollen, particularly where the ribs join the costal cartilages (rachitic rosary), and at the lower ends of the radial bones. The outstanding result of the rachitic process in the bones is their softness and flexibility, which causes them to yield readily under pressure or muscular traction.

With regard to the after-effects and complications of rickets, the most important of the above manifestations are disturbance of nutrition, the tendency to catarrh of the respiratory tract, muscular weakness, the instability of the nervous system, and the deformities which arise from softness of the bones. These will be

individually considered along with the consequences to which they give rise.

Age Incidence.—Rickets becomes definitely recognizable when the bone changes make their appearance. Where the disease is mild, or when the bone changes are just commencing, its presence may be difficult to determine, and appearances which are inconclusive to some observers may be convincing to others. To these differences of opinion must be ascribed the remarkable discrepancy in the various estimates of the incidence of the disease in very young children.[1] Independent estimates even in the same series of children by two different persons have yielded very dissimilar results. Again, rickets is probably more common than is actually supposed, for *post-mortem* examinations often reveal rachitic lesions, *e.g.*, nodes on the under surfaces of the ribs, in cases where their presence during life was doubtful or unsuspected. These facts indicate the difficulty which exists in forming a true estimate of the extent to which rickets prevails, especially in young children. In very rare instances gross bone deformities, believed to be identical with those of rickets, have been observed in the newborn child, but it is now generally believed that rickets is not an intra-uterine disease.

Rickets becomes manifest in the great majority of cases between the ages of 6 months and 2 years. Of 1,662 rachitic children studied by Comby, 89 per cent. manifested signs of rickets under the age of 2 years. The disease, however, often persists into later years, extreme deformities resulting from continued softness of the bones. An acute illness may cause a recrudescence of the disease or may initiate an attack in later childhood. Measles, for instance, is a common starting-point of rickets. During convalescence the child "goes off its feet," as the mother expresses it, and on examination is found to be rachitic. Deformities may appear at any age up to puberty (late rickets). These cases are

[1] Kassowitz has considered that no less than 80 per cent. of newly born children are rachitic—an estimate quite unsupported by subsequent observers.

relatively uncommon, the general symptoms slight or not appreciable, and it is only in a limited number of bones that deformities are likely to be produced. Children show a remarkable tendency to outgrow the milder degrees of deformity resulting from early rickets. For instance, obvious signs of rickets are more common in children commencing school life than in those who have reached the close of that period.

Social Distribution.—In a town population recognizable rickets is much more common among the children of the poor than among those of the well-to-do classes. Striking differences in the prevalence of rickets in the various social grades are revealed by the results of school inspection. For instance, in Leeds Dr. Hall found rickets in 50 per cent. of children in a poor class school, and in only 7 per cent. in a better class school. Similarly in Dundee the schools in the poorest districts had the largest proportions of rachitic scholars. The severe types of rickets are almost entirely confined to the former class, and rickets in its worst form is to be found among the poorest classes of a densely-populated industrial town. This fact throws into prominence certain causative factors which contribute to accentuate the severity of the disease, namely, adverse conditions of environment and errors of hygiene. Kassowitz, in his study of rickets in Vienna, showed that, although the children of the well-to-do classes did not escape rickets in its milder forms, the more serious deformities were confined to the children of the poor. Kissel states that in Moscow rickets prevails equally among all classes, but that deformities are much less severe among the better class children. Dr. Clement Dukes[2] has commented upon the extent to which preventable deformities—many of them due to rickets—are found even among the boys examined for admission to Rugby School. He gives the following figures:—

[2] DUKES, C.: "A Record of the Physical Examination of One Thousand Boys at their Entrance on Public School Life," in "Transactions of Second International Congress of School Hygiene," vol. i, pp. 325. London: Royal Sanitary Institute. 1908.

Acquired Deformities	Lateral curvature of spine ...	44·5 per cent.
	Pigeon-breast	12·6 ,,
	Bow-legs	6·4 ,,
	Knock-knees	52·6 ,,
	Flat-feet	32·9 ,,

The prevalence of so much preventable deformity among the schoolboys of the upper classes of a public school, who have reached the age of 14, indicates that very serious inattention to hygienic principles prevails in the upbringing of these children during childhood and early school training.

Prevalence.—There are no trustworthy statistics on which to base an estimate of the prevalence or severity of rickets in different districts or in different classes of the population. The actual death-rate is valueless for this purpose; firstly, because it is too small, and secondly, because the rachitic child usually dies from some other disease which is tabulated as the cause of death, the contributory cause being overlooked or omitted. The death-rate is thus both insignificant and erroneous as an indication of either the prevalence or importance of the disease, and is useless for comparative purposes. It is stated that in Germany, during the six years 1886-1892, there occurred 286 deaths from rickets, which is only a fraction of the total mortality among young children. It is, therefore, impossible to gauge with any accuracy whether rickets is increasing or decreasing, or to what extent the great advances in sanitation in recent years have influenced the incidence and severity of the disease among children. It may be mentioned that in the opinion of some observers qualified to judge by long experience rickets as a cause of deformity in Glasgow is diminishing.

In estimating its prevalence in young children we are dependent on studies of the incidence of rickets among those children brought to the out-patient dispensaries of the large hospitals, and as regards children of school age on the reports of the school medical inspectors. Among the former group statistics are available for most of the large towns of Europe and America. Thus Kissel considered that in Petrograd 95 per cent., and in Riga 80 per cent., of the poor children were

rachitic, but these percentages are considered too high by other observers. In Prague, Ritter calculated the percentage at 30. In London, Manchester and Edinburgh, similar investigations showed that the average incidence of rickets among the out-patients of the children's hospitals varied from 30 per cent. to 50 per cent. In Dundee, similarly, 75 per cent. of the children had beaded ribs. Dr. Keating states that there is no difficulty in finding distinct evidence of rickets in at least 50 per cent. of the children under the age of 2 years attending the out-patients' dispensaries of London and Manchester. In Edinburgh Dr. John Thomson found 50 per cent. of the children affected with rickets. The following figures for Glasgow are based on a recent inquiry carried out by me among the children admitted to Belvedere Fever Hospital over a period of eighteen months. These children were drawn entirely from within the city boundary, and are fairly representative of the various classes of an industrial population. In 1,357 children between the ages of 2 and 10 years rickets was observed among males to the extent of 31 per cent., among females to 26·7 per cent. In 329 children between the ages of six months and 2 years the incidence among the combined sexes was 42·5 per cent.

TABLE INDICATING THE PREVALENCE OF RICKETS AMONG HOSPITAL CHILDREN (CITY OF GLASGOW FEVER HOSPITAL, BELVIDERE).

Age 2 — 10 years	Number of Children	Rickets: per cent.
Males	682	31·0
Females	675	26·7
Age ½—2 years—Males and Females	329	42·5
Total	1,686	—

These figures sufficiently indicate the prevalence of rickets among young children. When these children reach school age the proportion bearing traces of past

rickets is considerably diminished, and continues to lessen throughout school life. This is largely due to the process of involution undergone by the affected bones during the growing period of life, and in part also to the fact that children with deformed chests and damaged lungs tend to succumb readily to the intercurrent respiratory diseases of childhood. The results of the hospital inquiry just referred to illustrate this diminution. For instance, the incidence of recognizable rickets among children of the age group 1-2 years was 48 per cent.; among those at age 6 years 16 per cent. and 8 per cent. among those at age 9 years. Similarly, in the West Riding of Yorkshire the percentages for age groups 5, 7, 10, 13 were, in 1910-1911, 3·71, 2·19, 1·24 and 0·6 respectively. The following percentages of school children found suffering from obvious rickets are taken from reports of the school medical officers: Leeds, 3·7 in ordinary schools, in special schools 23 per cent.; Manchester, noticeable rickets in 3 per cent. of children in ordinary schools, 30 per cent. in Parkfield Residential School for Cripples, Liverpool, 2·4 per cent. in ordinary schools—"the percentage was frequently 4 per cent. for boys and 2·2 for girls newly admitted, and 1·5 for boys and ·7 for girls about to leave school"; Chester, 4·5 per cent.; Carlisle, 14·1 per cent.; Brighton—deformity of chest—4 per cent.; Scarborough, 3·6 per cent.; Dundee, 8·7 per cent. in boys and 2·5 per cent. in girls.

Geographical Distribution.—Rickets is almost entirely restricted to the temperate zone. It is uncommon in either hot or cold climates, and does not occur among uncivilized races. Broadly speaking, it is confined to the countries of Central Europe and the United States of America, and even within these limits the high altitudes and the plains are exempt. It has its greatest incidence and has been most studied in Great Britain, Germany, Holland and Belgium, France and Northern Italy. In general, its incidence is proportional to the density of the population, and there is a notable concentration of the disease in the large cities, particularly in the congested industrial areas, though it would appear that the various racial elements composing the

same town population are affected in varying degrees. In the cities of the United States the American population does not suffer to nearly the same extent as do the immigrant races, in particular the Italians and negroes. According to an estimate based on hospital statistics, in the city of Buffalo, U.S.A., the children of Italian immigrants recruited almost entirely from Southern Italy, where rickets is almost unknown, contract rickets to the extent of 70 per cent. Children of European parents in tropical countries not infrequently contract the disease, while the native children, who may be living under inferior hygienic conditions, escape. The absence of rickets from tropical countries is held to mean that high temperature and good air can counteract the bad effects of a cereal diet, which is considered by some to be a potent factor in the ætiology of the disease in this country.

The distribution of rickets in Great Britain was investigated by a Committee of the British Medical Association in 1889. They reported that rickets was much more prevalent and severe in industrial centres than in rural districts, and that, as regards the latter, Southern England suffered more than did the northern counties. In Dublin rickets is a rare disease. In country districts and in the healthy residential towns the extent to which it leaves traces recognizable in school life is small compared with the experience in industrial towns. Rickets, therefore, is fostered and aggravated by the adverse conditions of life in the large congested centres.

Rickets in its Relation to the Common Diseases of Childhood.—The most serious feature of the active phase of rickets is the susceptibility of the lungs to catarrhal inflammation. The prevalence of rickets in a population tends to increase considerably the fatality from the acute respiratory diseases of childhood. Rachitic children constantly suffer from a varying degree of bronchial catarrh, which is liable at any moment to spread and develop into broncho-pneumonia of a pronounced or even fatal character. Measles and whooping-cough, again, are normally accompanied by a certain amount of catarrh of the respiratory passages, and the high mortality from these diseases in young

children is due to the frequency with which fatal lung complications ensue; this mortality is increased when either of these diseases supervenes in children already suffering from rickets. For instance, of the children between the ages of six months and 2 years admitted to Belvidere Fever Hospital, Glasgow, during the years 1907-1908 suffering from measles and whooping-cough, the mortality among the rachitic children was 32·8 per cent., as compared with 21 per cent. in the case of non-rachitic children.

There is another serious aspect of this relationship between rickets and affections of the respiratory tract. When not directly fatal the bronchial catarrh tends to become chronic. When the lungs become infected during the active stage of rickets, prompt recovery is prevented by the lowered resistance of the tissues and by the soft and yielding property of the ribs. Thus the presence of rickets predisposes to permanent local injury to the lung tissue, and to the production of various well-known malformations of the chest. The serious nature of these effects will be further referred to.

An attack of rickets increases the irritability of the nervous system, and renders the child prone to various forms of convulsive seizure. Were it possible to analyse the underlying causes of the death-rate from convulsions, rickets would assume an outstanding position as a contributory factor. Indeed, so common is the association of severe and fatal convulsions with rickets, that one observer states that "practically all deaths from convulsions at the ages of about 1 to 2 years are confined to rachitic children." It is said that rickets is a common cause of epilepsy in later life.

The Changes in the Bones.

Rickets is, as we have seen, a general disease involving all the tissues of the body. The bones, however, are attacked in an outstanding degree, and it may be said that all the consequences of importance to physique arise from the interference with the growth of the bones and from the deformities which result. In the acute stage of rickets various structural and chemical

alterations take place in the growing bones, rendering them abnormally soft and unresisting.

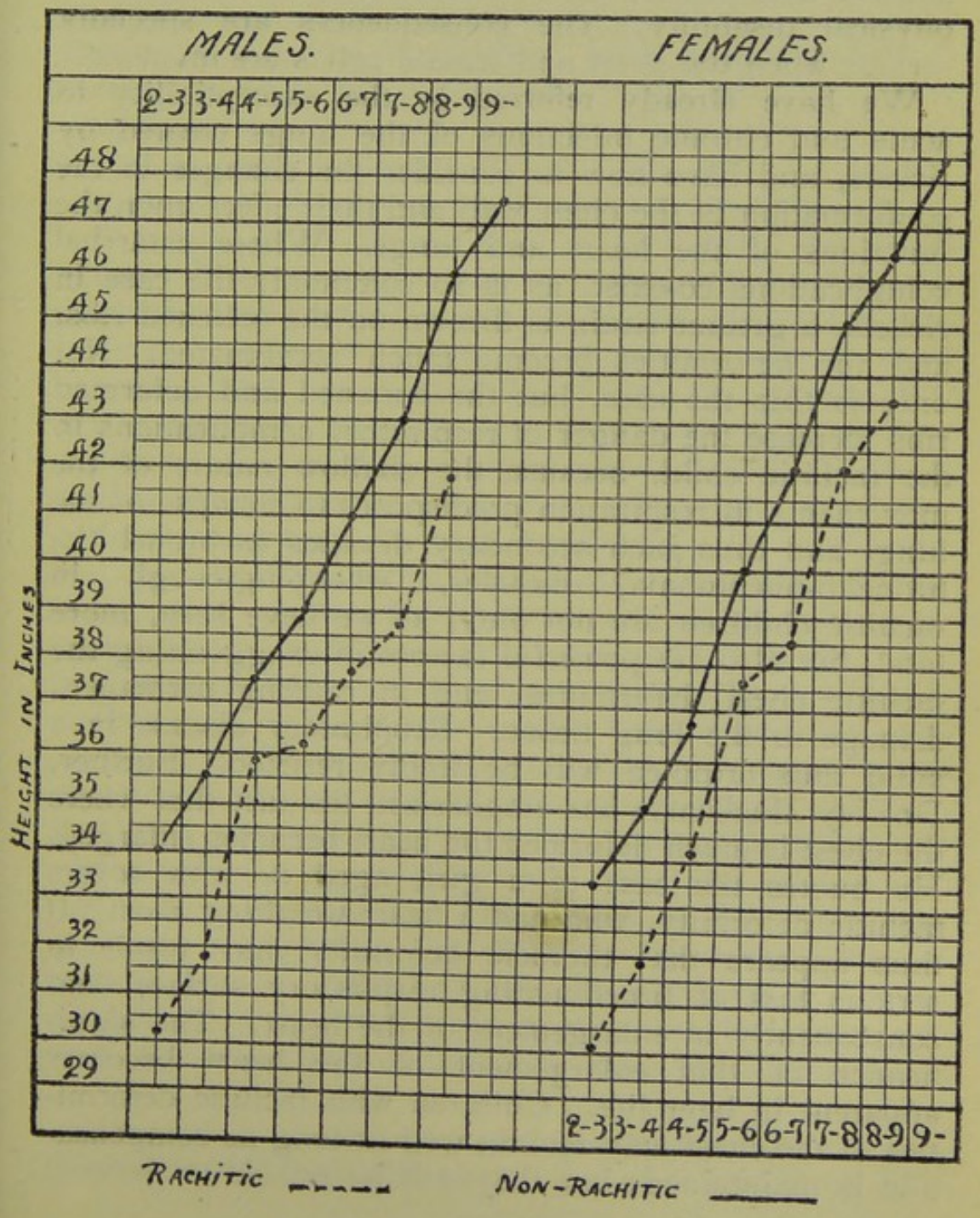
The swellings at the ends of the bones are the earliest signs of rickets, and may be the sole manifestation, disappearing when the active stage is past. When the softening is extensive the long bones are liable to become bent, twisted, curved, or fractured as the result of mechanical forces, such as gravity or muscular traction. In the extreme forms of the disease all the bones may suffer, but the effects of rickets may remain limited to particular regions, *e.g.*, chest, pelvis, head, or to one or other of the limbs. When the disease terminates the processes of calcification and ossification are resumed and intensified, so that the bones become abnormally dense and thickened. Marked deformities become fixed, the bent limbs remain distorted, and become heavy and hard like ivory. The swellings at the ends of the bones, however, tend to disappear, and slightly bent bones may even straighten out.

From the preceding description it will be apparent that the effect of rickets on physique is twofold: (*a*) Shortened stature owing to retarded or arrested growth and distortion of the long bones; (*b*) production of deformities in special situations, *e.g.*, chest and pelvis.

(*a*) *Effect on Height.*—Rickets is the commonest pathological cause of shortened stature. The bones may in fact remain permanently small, resulting in a dwarf-like formation of body (rachitic dwarf). "A boy aged 12 may be no taller than he ought to have been at 3." Apart from these extreme instances, which are not uncommon in districts where the disease most prevails, rickets is responsible for much of the low standard of height exhibited by the children of the poor in the large cities. This has been amply demonstrated by a recent inquiry among the children of Glasgow, carried out with the object of showing the extent of the relationship between rickets and shortness of stature in a city where the disease is very prevalent. The heights of the rachitic children and those in whom no sign of rickets could be detected were tabulated separately, and a chart was constructed in order to contrast the mean heights of rachitic and non-rachitic children from 2

years up to 9 years of age. The result is shown in the accompanying diagram, which reveals a considerable discrepancy between the two groups at all ages and in both sexes.

CONTRAST OF HEIGHTS OF RACHITIC AND NON-RACHITIC CHILDREN, BASED ON MEASUREMENTS OF 1,357 CHILDREN SUFFERING FROM SCARLET FEVER, MEASLES, AND WHOOPING-COUGH ADMITTED TO THE CITY OF GLASGOW FEVER HOSPITAL, BELVIDERE, DURING 1907-1908.



Rickets is thus a powerful factor in retarding the growth of city children, and probably contributes in a greater degree than is realized to lowering the standard of height of the poorer population among whom it prevails. In fact the rachitic children in the above group were found to be uniformly smaller than the non-rachitic children of the very lowest social grade, *i.e.*, the inhabitants of single apartment houses.

(*b*) *The Deformities and their Consequences.*—All marked deformities, wherever situated, involve serious physical disability. The consequences are specially serious when the chest and female pelvis are involved.

We have already referred to the susceptibility to acute and chronic infections of the lungs created by rickets, and have now to consider the changes in the conformation of the chest wall and their effect upon the functions of the heart and lungs. Where catarrhal complications co-exist, as is so commonly the case in rickets, a greater strain is thrown on the softened ribs, and the deformities become much accentuated. Not only is this the case, but the softened and deformed ribs increase the danger of respiratory complications in the rachitic child, because the shallow nature of the movements in respiration predisposes to collapse of the lung, and thus such secondary diseases as bronchitis, broncho-pneumonia, measles, whooping-cough in rachitic children are not only, as we have seen, more fatal, but also are powerful factors in exaggerating the rachitic chest deformities, and in causing permanent damage to the lung tissue. Respiratory disease in a child thus crippled will be feebly resisted. Further, Dr. Ivy Mackenzie has emphasized the fact that where the chest is much deformed the heart becomes enlarged. He quotes the case of a girl, aged 8, with severe rachitic deformity, who had a heart weighing 7 oz. It thus appears that thoracic deformity may result in serious loss of functionating respiratory surface, and consequently in enlargement of the heart. The significance of this enlargement of the heart becomes apparent in later life. Children with rachitic deformities of the chest may remain well as long as compensation is maintained; but they will be unable to perform

heavy tasks, and will easily break down. It is highly probable that even the minor degrees of deformity may be followed by some impairment of the function of the heart and lungs, and there is no doubt that this may form the basis of physical inefficiency in after life.

To sum up, the permanent consequences of respiratory diseases during childhood cannot be too forcibly emphasized. Bronchitis, broncho-pneumonia, measles and whooping-cough account for a very large proportion of physically unfit children and adolescents to a greater extent than is commonly supposed; and when rickets is present, in addition, such lung mischief is certain to be even more grave in its effects. These considerations alone would amply justify provision of hospital accommodation for measles and whooping-cough where the home circumstances are defective.

Arrested development may involve also the facial bones. The maxillary bones remain small, and consequently the teeth, in particular the permanent set, having insufficient room to develop, appear close together, and are irregularly placed or overlapping; this condition favours the lodgment and decomposition of particles of food, and dental caries is readily established. Thus the association of dental caries with rickets is well recognized. It is affirmed by Marfan that rickets may have a special selective local effect on the facial bones, its other manifestations being slight or even not recognizable. For instance, he declares that such malformation as a highly arched and narrow palate with narrow nostrils, and the commonly associated condition hypertrophy of the tonsils and post-nasal adenoids in young children, are local manifestations of early rickets. He states that almost all young children with enlarged tonsils and adenoids are rachitic. This belief is by no means generally accepted in this country; the observations of school medical inspectors may be expected to furnish data tending to corroborate or disprove this assertion. Dr. Brewers special inquiry[3] into the question of

[3] See Third Annual Report of School Medical Officer for the West Riding of Yorkshire, 1911.

rickets in certain schools in the West Riding of Yorkshire have an important bearing on these points.

Another deformity to which rickets predisposes, and which may cause serious disability, is flat-foot. Some degree of this is usually met with where the lower limbs are deformed. But the weakening of the ligaments caused by rickets may induce flat-foot, apart from the presence of actual deformity. The suffering caused to children and adolescents by this condition is often considerable, and the latter are seriously handicapped in following certain occupations, being often rejected by the factory surgeon. The presence of flat-foot is responsible for the rejection of a large percentage of candidates for the Army and the public services.

The extent to which physical incapacity due to rickets forms a bar to employment in the public services cannot be directly stated. Rickets, however, would be responsible for a considerable proportion of the rejections of recruits for the Army under the following headings:—

Causes of rejections[4]	Rate per 1,000 rejected on inspection
Defects of upper extremities	3·63
,, lower ,, ...	20·05
Flat-foot	8·12
Malformation of chest and spine	4·92
Under height	5·06

At the recruiting station in Glasgow a considerable proportion of candidates are rejected on account of preventable malformations, many of them due to the effect of rickets in early life.

Changes in the Muscular System.

Where rickets is neglected and not arrested by suitable hygienic measures, as is apt to be the case among the poor, serious disablement may follow from muscular weakness, apart from the presence of actual deformity. The muscles remain small, or if the disease persists they become atrophied from disuse, and considerable care

[4] See Report on the Health of the Army for 1911.

and intelligence on the part of the mother is required to restore the power of locomotion. It is the lot of many of these children to be confined to the house for years, the paralysis being accepted as an incurable condition, the child sitting about, unable to walk, or at the most merely able to stand. This paralytic condition has even been found in children as old as 10 or 12 years. When such children reach school age special educational provision has to be made for them by the education authorities. By this time, however, the muscles are atrophic, the bones small, the ligaments relaxed, the child suffers from malnutrition, and may have become phthisical. Out of 654 children admitted to the East-park Home for Cripple Children in Glasgow from 1904-1909, 251, or 38 per cent., requiring medical care and nursing were admitted on account of inability to walk following rickets. These cases do not by any means exhaust the list of children crippled by rickets for whom special educational provision is made. The cripple schools receive and educate still larger numbers. Rickets is responsible for the physical disablement in 50 per cent. of the children (of whom there are about 750) attending the special schools of the Glasgow School Board for physically defective children.

Into these special schools are received only such children as are physically incapable, owing to the severity or nature of their deformities, of making the journey to the ordinary elementary school. A large number, after a period of special care in the cripple schools, so far improve in physique as to permit of their being drafted into the ordinary day schools, showing that, although their deformities may be incapable of remedy, part at least of their disability can be removed by generous diet and hygienic surroundings. Recently (1911) a census was made of crippled children and adults in Birmingham by a special sub-committee of the education authority. Under 16 years of age 717 cripples were found in the city, and eleven under the care of the Poor Law Guardians. Of these 721 were medically examined as to the causes of their disablement, and rickets was found to be responsible for 10·1 per cent. of the cripples. In the age group

above 16 years, numbering 828 cases, rickets as a cause of crippling diminished to ·8 per cent. These figures, however, represent only those who are more obviously maimed. Many more must exist who are not so noticeably, but not less seriously, handicapped, especially when the chest is the chief seat of deformity.

It is commonly stated that rachitic children are backward in their mental development. This is undoubtedly true in a great number of instances owing to the confined and narrow life which the child is forced to lead from its crippled condition and state of malnutrition. Many rachitic children, again, being deprived of the wider scope enjoyed by the physically active, associate much with their elders and become precocious and "old-fashioned." In any case, rickets, like any other form of malnutrition, materially affects the power of continued mental application. It does not appear that an attack of rickets has any specific effect upon the brain tissue sufficient to produce a lasting mental deficiency. Rachitic school children will, however, betray a deficiency of mental application and concentration in proportion to the severity of the evil hygienic conditions in which they have been brought up, and which have accentuated their deformities. These are mostly the products of poverty, ignorance, or carelessness, and should at once attract the attention of the educationist. Much can be done to neutralize the effect of malnutrition prior to school life by the provision of meals and systematic physical exercise when the child has reached school age. Above all, a short preliminary period of residence in an open-air school would materially aid in restoring physical vigour.

The Ætiology of Rickets.

It was at one time supposed that rickets chiefly originated before the birth of the child. Occasionally children are born with deformities of the bones suggesting rickets, but the majority of these cases have, after careful study, been relegated to special diseases, such as syphilis and achondroplasia. The disease is not hereditary. Pini, in Milan, studied this aspect of rickets in 4,176 children, and found only fifty-two where

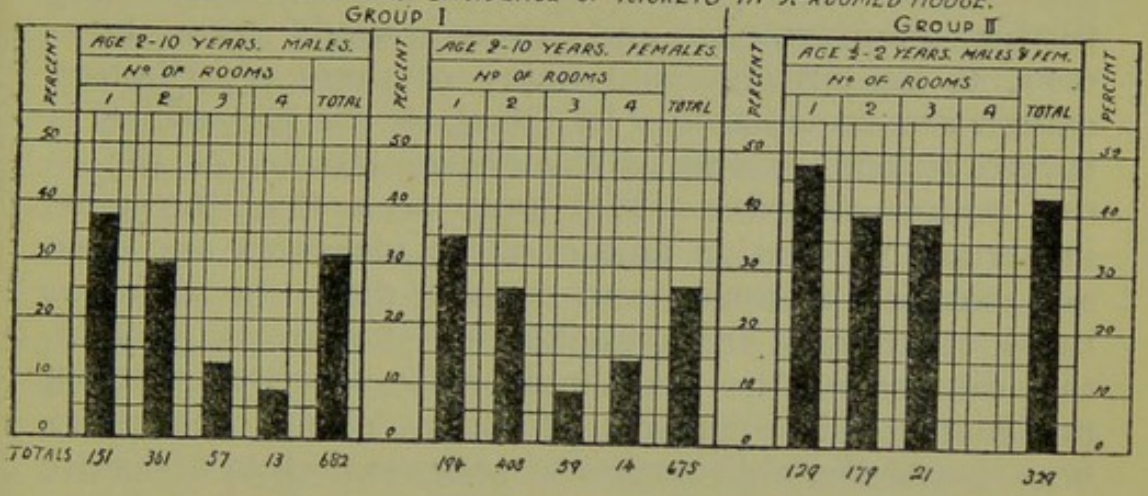
parental rickets appeared to repeat itself in the offspring. Children born of rachitic mothers do not tend to contract the disease if reared naturally. Conditions, however, which affect adversely the health of the mother prior to the birth of the child increase the susceptibility of the child to rickets. For instance, it has been shown that a child born in Glasgow is more liable to contract the disease if the parents are natives of Glasgow than if the parents were born elsewhere and have come to reside in the city. Thus it is generally held that rickets arises after the birth of the child, and the particular cause has been sought in almost every adverse circumstance of nurture and environment.

Errors in feeding have been considered by many to be the chief factor, particularly where the food is improper in quality rather than in quantity, *e.g.*, deficient in fat and proteid. Among the children of the well-to-do, who are otherwise carefully reared, rickets commonly follows such faults in diet. On the other hand, rickets may occur in severe form, in spite of adequate and suitable diet, *e.g.*, among the Italian and negro races in New York (Holt). Too early weaning and too late suckling have also been cited as causes; and hand-fed are much more susceptible than breast-fed infants. Among 845 bottle-fed infants Siegert found 81 per cent. with rickets, while out of 923 infants, who had been breast-fed for at least four and a half months, only 51 per cent. developed rickets. As a rule, children do not become rachitic during the period of suckling; where this occurs it is probably due to deterioration of the mother's milk. It follows that breast feeding is an important preventive of rickets. Lack of exercise, apart from feeding, has been found experimentally to produce rickets after weaning (Findlay). This observation, applied to the conditions under which the children of the poor are often reared, has been considered to suggest an important, if not the chief, ætiological factor. A child who is kept closely confined in a small, ill-ventilated, crowded tenement house gets not only too little muscular exercise for the development of chest and limbs, but lives in a vitiated atmosphere, and is starved of pure air. The respiratory interchange in the tissues

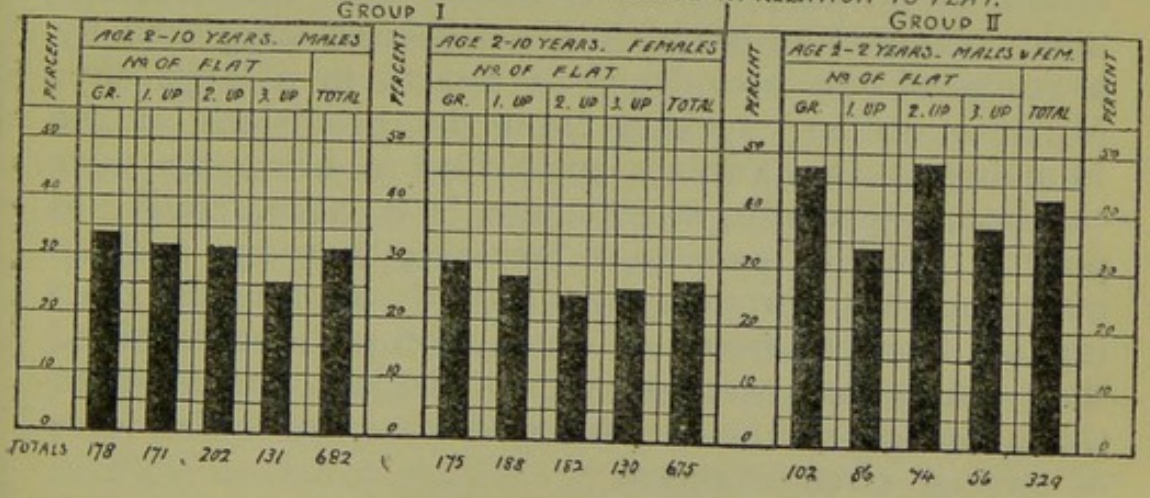
is lessened, and the child's vitality lowered. It is under these circumstances that rickets is most prone to occur, is most severe and prolonged, and its cure most retarded. Whether these conditions actually cause rickets or not, there is no doubt that they greatly increase the severity of the disease. From the public health aspect emphasis must be laid on the fact that, whatever the actual cause of rickets may be, its severity and the extent of its influence on physique are largely questions of general hygiene. In cities the distribution of rickets in the population follows closely the social gradation. While it does not spare the well-to-do, it is most common and most severe among the poorer classes where the conditions of life are unhealthy. In Glasgow the disease is closely bound up with life in the small tenement house. Particular attention was directed to this aspect of rickets in a recent inquiry into its incidence among Glasgow children. The social status of a family may be conveniently expressed by the number of rooms in their dwelling, and on this basis the population may be separated roughly into social grades. The accompanying diagram shows graphically that liability of children to rickets is greatest in the lowest social groups. In 1,357 male and female children between the ages of 2 and 10 years the percentage incidence of rickets was highest among the children admitted to Belvidere Hospital from the smallest houses, 37·8 per cent. of the children from one-apartment houses being rachitic, the figures for the two and three apartment houses being 29·6 per cent. and 12·2 per cent. respectively. So far as these figures go, they do not definitely settle the question whether the actual incidence of rickets is less in the larger houses, but they admit of the important inference that the children in the larger houses have a much greater capacity for recovery from rickets than have those reared in the smaller houses. That is to say, the prevalence of the severe types of the disease rapidly increases as the standard of life is lowered. Thus rickets is pre-eminently a disease fostered by the condition of life in the smaller tenement house.

As showing how city life predisposes to rickets, the results of an inquiry into the parentage of rachitic children may be quoted. Children who had been born and brought up in Glasgow, and whose parents were natives of the city, were found to suffer from rickets to the extent of 44 per cent., as compared with 25 per cent. where the parents and child were born elsewhere.

A. PERCENTAGE INCIDENCE OF RICKETS IN X-ROOMED HOUSE.



B. PERCENTAGE INCIDENCE OF RICKETS IN RELATION TO FLAT.



The adverse influences of city life tell not only directly on the health of the child, but also indirectly on the health of the mother, for it was found that in the group, where the mother and child were born in Glasgow, rickets prevailed to the extent of 42 per cent., while in the class where the mother was born outside of the city, and the father and child were natives of Glasgow, 28 per cent. were rachitic. Thus the incidence of recognizable

rickets is least among the children of families who have migrated into the town, and greatest among those whose parents are city-born, and in particular where the mother is a native of the city.

The Prevention of Rickets.

The real cause of rickets being imperfectly understood, it is impossible to formulate definite rules for its prevention. The general conditions which apparently further its prevalence and severity would seem, however, to be obvious, and many of these contributory causes are remediable. In Glasgow the prevalence of severe rickets is one of the object lessons of life in the poorer districts. We have seen that the most important preventive and curative measures are fresh air, exercise, adequate and suitable diet. In so far as these conditions are available for the growing child, this disease will be prevented or the severity of attack mitigated. The removal of dark, damp, insanitary houses and the obliteration of congested slum areas are clearly indicated. Thus the efforts of modern legislation to provide healthier houses and surroundings make common cause with the measures suggested by a study of the prevalence of rickets in a large city. Much is to be expected from the provisions of the Housing Acts. Parents compelled to bring up their children, especially where there is a large family, in poverty, and in particular recurring poverty, are too often unable to profit by medical advice as to the rearing of their children. It must, however, be admitted that ignorance, carelessness, or neglect are as often the cause of serious disabling disease as is the force of adverse circumstances.

It is remarkable that a disease which, if neglected, is fraught with such disastrous consequences should be regarded with so much apathy. Parents, in this district at all events, seem to consider it natural that their children should have rickets, when many of the other children in the street are deformed.

It should be one of the duties of infant health visitors to impress upon mothers the serious nature of this disease, to point out its early manifestations, which are

so often overlooked, and to urge the necessity of seeking immediate advice and treatment at the outset.

The Notification of Births Act has secured supervision of the infant up to the age of one year. The child then passes out of observation, and when it has arrived at school age irremediable damage has too often already been done—deformities preventable by ordinary care and intelligence have been allowed to become permanent.

Rickets is a grave disease in so far as it gives rise to physical defects which render the child less resistant to other diseases, handicap its education, and seriously impair its efficiency in after life, which it may do, even to the extent of rendering the adult unemployable. The educationist observes the mental backwardness resulting from prolonged malnutrition, and is compelled to provide special educational provision for those physically disabled. In Glasgow, where rickets accounts for over one half of the physically defective children in the schools, the average cost of educating these children is from two to three times that of educating the ordinary school child. The most that treatment in the special or open-air school can do for the rachitic disabled child is to remedy the ill-nourished condition so often associated with rickets, to improve its general condition and to strengthen its muscles. Remarkable benefit to the child can thus be wrought in the earlier period of school life, so that many of these children, after a period of preliminary treatment and physical training, gain sufficient stability to enable them to return to the ordinary school. Here the importance of suitable physical exercise should not be lost sight of. Parents should be advised when surgical operation may be of benefit.

The real remedy, however, must operate during the period when rickets most prevails and when the deformities are produced, *i.e.*, between the age of one year and entrance on school life. So far as concerns any effort being made to combat the errors due to ignorance or indifference in the care or feeding of children this period is untouched. Many of the adverse conditions which accentuate the severity of rickets already belong to the domain of the public health officer, and no better

illustration of the need for extending his systematic observation of children beyond the first year of life could be afforded than the defects caused by this disease during the period anterior to school life.

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XIV

DEFECTIVE GROWTH AND DEVELOPMENT IN INFANCY, CHILDHOOD AND YOUTH.

BY

HASTINGS GILFORD, F.R.C.S.

Medical Officer to Leighton Park School; Hunterian Professor, Royal College of Surgeons of England; author of "The Disorders of Post-natal Growth and Development."

The Normal Variations of Growth and Development.

On cursory examination of a girl or boy who is obviously undersized the first thoughts that occur to one's mind are as to the status of the condition. Is it normal or pathological? Is it unalterable or amenable to treatment? Is the defect one of growth alone, and therefore a mere quantitative disturbance, or does it have its source in some qualitative imperfection, constituting an error of development? Such questions must arise, for example, when we see standing side by side two boys of very unequal height. Thus one may see at the same school two boys of 13, one 6 ft. in height and the other only 4 ft., yet both coming within the range of normal divergence of growth, and showing no evidence of faulty development. Such divergencies may not even be, technically speaking, "variations," but "modifications" only, having their origin either in the tallness or shortness of the forbears or in some temporary vicissitude of rising development, such as will be corrected after the onset of puberty. It must never be forgotten that v. Baer's law that the racial

ancestry is recapitulated in the development of the individual is not only true of pre-natal development, but is equally true of post-natal development. Hence defective growth or defective development shown during the years of infancy, childhood, or youth may be no more than reminiscent of some corresponding backwardness during a past racial epoch, such as will be rectified when development has been carried on a little further. When, therefore, we see the boy, otherwise in good health, who does not grow but remains stationary for an unduly long period, it would be a cardinal error to attempt to improve matters by dosing him with drugs or with one of the much advertised growth stimulators. We should rather recognize that each child has its own standard of development, and when we have once assured ourselves that the environment is the best attainable we must rest content, and not fussily tamper with the normal processes of the body.

Some hitches in the progress of growth or of development are no more than the expression of one of the normal climacterics carried perhaps to an unusual degree. This is especially noticeable in the case of that change which intervenes between babyhood and childhood. Mothers are often alarmed when the fat and placid baby ceases to gain, or indeed actually loses, weight, and rapidly lengthens into a thin and restless child. In the case of an over-anxious parent with an only child, the needless coddling attention which is bestowed upon it, so far from doing good, may be actually detrimental, damaging the psychical development without helping the physical.

Let us now turn to defects of growth or of development which affect the body as a whole and are definitely morbid. For clinical purposes no division can be better than that which classifies such defects into those which constitute deformity and those which do not, and it will assist our description if we deal with extreme cases, such as constitute actual dwarfism, if at the same time we recognize that our words also apply to less conspicuous degrees. As a rule deformed dwarfs are stunted in growth or in stature only, and are not notably

delayed in their development; but well proportioned dwarfs are affected with infantilism.

Defects of Growth—Dwarfism.

Let us suppose that we have before us a child obviously of unequal growth, or bent and deformed. Perhaps the commonest kinds of deformed dwarfism are those due to *rickets* and *achondroplasia*. There is reason to believe that, though separate diseases, these two are closely allied, achondroplasia being a pre-natal manifestation of a morbid process which is expressed post-natally as rickets. The typical achondroplastic child is of the dachshund pattern, his body being comparatively long, his limbs short and frequently bent, the proximal segments being more affected than the distal. His undeveloped nose and comparatively big head add to his peculiarities, and in after life the physiognomy settles down into that long, flattened, coarse type, with a small, tilted nose which is so characteristic. Rickets, generally speaking, occurs at a later stage, and is therefore not so disastrous in its results. Its deformity is most conspicuously displayed in childhood just after recovery from the acuter manifestations of the disease, and is shown in the slightly shortened limbs, comparatively long body and big head, in the bowed legs or knock-knees, and in the thickened ends of the long bones, which subsequent years do much to correct. In the end rickety dwarfism is but moderate in degree, for the actual shortening of the long bones never approaches that which is met with in achondroplasia. Now that achondroplasia has been so fully and frequently described it is but seldom mistaken for rickets. But there is another disease now rarely met with, which is still usually confused with rickets.

This is *osteogenesis imperfecta*. Osteogenesis imperfecta occurs as a rule at a later age than rickets, and the deformity is far more severe. In bad cases the spine is crumpled to an extreme degree, and the lower limbs, especially the legs, are so twisted and deformed that in the worst cases progression is with the hands. But we meet with all degrees of the malady, from that which

affects most of the bones in the body to that which is purely local. Probably it is this local osteogenesis imperfecta which is responsible for some of those cases in which the ribs yield or the spine curves or the tibiæ give way, no other bones being affected and there being no epiphyseal thickening, no sweating, nor other indication of rickets. This complaint is closely allied to osteomalacia, whereas it is doubtful whether rickets has any affinity with that complaint. It is often associated with brittleness of the bones, and sometimes there are outgrowths of bone and cartilage. As in osteomalacia, the muscles are small and flabby so as not to increase the deformity; whereas in rickets and achondroplasia, in which disorders the bones are often relatively thick, sometimes even to the point of deformity, the dwarfism is apt to be thick-set, coarse, and muscular.

Another disease in which dwarfism is associated with deformity is *microcephaly*. In youth such cases can hardly be overlooked, for the smallness of the head, as compared with the size of the body, attracts the attention of even the most unobservant. But in infancy it is not unusual to find that microcephaly has escaped the notice of the doctor, and it is remarkable that the mother, usually so exact in her observance of a baby's peculiarities, may be quite unaware that the head of her infant is not nearly so big as it ought to be. Those artists in wax who model the lay figures to be seen in the shop windows of clothiers who cater for schoolboys often show the same lack of observation, for it is quite common to see these windows populated with imbeciles or idiots of the microcephalic order, the state of their intelligence being obvious, not only in their simpering vacuous expressions, but also in the smallness of their heads. Microcephalic infants at quite an early stage are noticed to be very backward in the many little ways which are watched for by mothers. As a rule they are restless, and in some cases the characteristic pointed physiognomy, caused by the receding forehead, the projection of the nose and the defective size of the mandible, soon makes itself evident. This, of course, is the physiognomy made use of by the caricaturist

when he wishes to portray an individual of defective intelligence. In the slighter forms of cerebral defect the impairment of bodily growth is not very obvious. An exactly similar state of affairs, but without microcephaly, occurs in those nondescript forms of congenital defective intelligence which are also grouped under the heading of amentia. Borderland cases of this sort are difficult to recognize. They are apt to be undersized, and the cerebral defect may be correlated with some bodily stigma which helps in its identification. They are also prone to show some gross inequality or backwardness of intelligence, some moral obliquity, or some oddity of behaviour which ultimately leads to their identification.

In such cases the deformity which is the occasion of their being grouped into the class of deformed dwarfs is less physical than mental. And the same is true of *Mongol* dwarfism. It is by no means certain that both this and microcephaly do not come under the head of infantilism rather than dwarfism, for in both cases not only is the brain checked in its growth, but also in its development. Indeed, in Mongolism the brain cannot be described as seriously defective in quantity, but only in quality. It is in a state of permanent infantilism. At the same time there is marked disproportion; for, whereas the brain remains always at its infantile stage, the facial characters and the sex organs never mature, and the growth of the body is dwarfed, yet in other respects development proceeds to its completion. The Mongol is known partly by his physiognomy, which, as a rule, is rather reminiscent of the Mongol than truly Mongolian; by the frequent presence of heart disease, of fissures at the corners of the mouth, and of laxity of the joints. The Mongol is an amiable imbecile. It is often not easy to detect the disease in infancy, because the characters of the Mongolism have not yet separated themselves from those of normal infancy. And the Mongol infant is so good and so lovable that months or even years may go by before the parents realize that their fat, sweet-tempered baby is in truth an imbecile. Nor is there any reason why this unpalatable truth should be thrust upon them, for very little can be done

to improve matters, and it is best that they should come gradually to a knowledge of their misfortune.

Defects of Development.—Infantilism.

Generally speaking, children of this class are well-built, though small in size, and evidently backward. We notice among them two types of bodily proportion. In Lorain's type the proportions are those commonly met with in late childhood, youth, or maturity. In Brissaud's type the proportions remain as in infancy or early childhood. *Lorain's type* is, as a rule, due either to the action of a toxin or to the inadequacy of some vital organ. Thus alcohol, lead, syphilis—one or more of this great triumvirate of evil—may lead to infantilism of this type, each carrying with it its own hall mark, either in the individual affected or in his parents. We may also have similar infantilism produced by intoxication of intestinal origin, apparently due to superabundance of the flora of the intestine, such as has been described by Herter. This is characterized by frequent attacks of diarrhœa, by abdominal distension or by other intestinal disturbance. It is probably closely related, if not identical, with the pancreatic infantilism of Bramwell. Toxic infantilism, lastly, may be set up by one of the infectious fevers, especially enteric, rheumatic, or scarlet. In infantilism of Lorain's type puberty is often much delayed, but in the end the infantilism disappears, though the stature remains permanently dwarfed. And here is the place to state that it must not be inferred that sexual hypoplasia and infantilism are synonymous. Sexual defect is often associated not with infantilism, but with feminism in the male or with masculinism in the female, and is also quite consistent with a normal development of the body in general. So also is it possible for a state of sexual perfection to exist while the rest of the body shows infantile characters. This occurs, for example, in precocious sexual development, in which the child does not cease to be a child because of the premature ripening of the reproductive organs. Moreover, in sexual ateleiosis the body as a whole, at any rate in regard to its size and proportions, may remain permanently childish, though the reproductive faculties

are sufficiently developed to admit of maternity or paternity.

The Lorain type of infantilism sometimes occurs in association with disease of the heart, liver, spleen, or kidney, and is then known as mitral or anangioplasic, as hepatic, as splenic or as renal infantilism. In these cases it seems not unlikely that the infantilism is the result of the adaptation of the development of the body to the needs of a defective organ. At any rate, adaptation of this sort undoubtedly occurs in rickets and achondroplasia, where the skeleton is the organ at fault, and there is reason to believe that the same principle obtains when other organs are defective. Infantilism so produced is best known as correlative infantilism.

Brissaud's type of infantilism is well shown in cretinism, in which infantile features are exaggerated. But it is important to realize that thyroid inadequacy not only accounts for cretinism, but when less marked also to what is known as myxœdème fruste. At the same time mere improvement in stature or in development as the result of taking thyroid extract cannot be accepted by itself as evidence of primary thyroid inadequacy, for the inaction of the thyroid gland is sometimes no more than an incident in the course of infantilism which originates in some other way. We sometimes see children with general delay of development in whom the intelligence is good and there is no undue sensitiveness to cold, nor other symptom characteristic of myxœdema or of cretinism, and yet the response to thyroid extract is prompt and emphatic. The hormone from the thyroid gland is such a powerful stimulator of metabolism that its cautious administration may be expected to do good even when there is no definite sign of thyroid inadequacy.

One of the most interesting of the forms of infantilism, and which is sometimes of Lorain's, and sometimes of Brissaud's type, is *Froehlich's infantilism*. In this disease there is conspicuous sexual defect with general backwardness of development associated with obesity. And this obesity is of a peculiar type, for as a rule it is less conspicuous on the limbs than on the trunk, and

less on the trunk than on the cheeks. It may be of a markedly florid type, but we are not as yet sufficiently acquainted with the disease to be quite sure of some of these secondary particulars. Sometimes it is associated with certain psychical disturbances or with sleepiness. Dickens's description of the fat boy in "Pickwick" suggests that he himself had at one time the opportunity of observing a case of Froehlich's infantilism. It is the result of hypoplasia of the pituitary body. This gland may either be too small, or it may be the seat of a tumour or of some degenerative process. If there be a tumour it will probably be the occasion of headaches, of visual defect, and of other signs of a cerebral tumour.

Ateleiosis and Progeria.

It may chance that in a large school one of the children in the upper standards attracts attention by his diminutive size and infantile appearance, and by the facts that his intelligence is good, that he shows no sign of disease, is not fat, and has never had any illness which can account for his infantilism. He is probably affected with ateleiosis. In most of these cases it will be found that the sexual development is conspicuously immature. It would be wrong to describe the development as stereotyped, for, as a matter of fact, it continues almost imperceptibly, so that in one case it was observed that it took thirty-five years to attain the bodily development which usually takes place in five years. This condition is distinguished from Froehlich's infantilism in that there is no undue fatness, that it often occurs in families, that there is no evidence of pituitary defect, and that occasionally, it may be after some delay, the sex organs come to maturity, though the childish proportions persist. Lastly, it may fall to the lot of the observer to find an example of that exceedingly rare infantilism which is from the beginning associated with evidences of prematurity, the two running side by side, and culminating in death from premature old age between 15 and 20. This is Progeria. As yet there is no evidence as to the cause of its extraordinary symptoms, but it is extremely important that every case

should be fully investigated and described. The same may indeed be said of every case of infantilism, partly for its own sake, but still more for the light which may thereby be thrown on the processes of normal growth and development.

Lesser Forms of Defective Growth or Development.

The causes of dwarfism or of infantilism are not as a rule difficult to identify, and once we are familiar with them we are soon able to recognize the slighter manifestations, such as curtail growth or development, without giving rise to actual dwarfism or infantilism. Anyone whose observing faculties have been so trained is never likely to suffer from ennui when watching a number of children at play, or, indeed, any crowd of people. Among them he can soon pick out some of short stature, whose length of body and shortness of limbs show that they are achondroplastic without being examples of actual achondroplasia. Slight rickety shortness is also not uncommon, and now and then an individual may be seen whose facial appearance and lack of stature betoken a mild degree of Mongolism, the mental state being also a little below par, though by no means imbecile. I myself once met with one of the less conspicuous forms of ateleiosis on the occasion of a casual visit to a council school; and we must all agree that it is not unusual to come across the slighter forms of cerebral deficiency among those we pass in the street or deal with in the ordinary affairs of life. Slight thyroid or pituitary inadequacy is also not very uncommon; but the evidences of osteogenesis imperfecta and of the toxic and correlative forms of infantilism we should hardly expect to recognize on mere casual inspection. On the other hand, no one who has once seen progeria is likely to pass it over, for its unfortunate subjects are invariably the victims of embarrassing attention. I have also myself witnessed some of its features in people of meagre development, who, though showing some indications of progeria, cannot be termed examples of that disease.

It need hardly be said that these are not the only

forms of growth defect and of development defect. No part of the body is exempt from variations in quantity and quality, and some of these are of decided importance in their bearing on general growth and development. Thus backwardness in the development of the primary sex organs retards general development, and in girls this same anomaly is liable to occur in association with chlorosis. Undergrowth or infantilism of the heart and arteries is another concomitant of chlorosis as well as of general dwarfism and infantilism. Many other variations in size and constitution are to be looked for in infancy, childhood and youth, but enough has now been written roughly to indicate the chief forms and the methods which should guide us in our search for them.

General Classification.

The following is a more complete classification of the defects of growth and development as met with in infancy, childhood, and youth :—

Defects of Post-natal Growth and Development.

I. *Somatic.*

A. Defects of Growth or of Stature—Dwarfism.

(1) *Skeletal Dwarfism.*

(1) Rickets; (2) achondroplasia; (3) osteogenesis imperfecta; (4) anosteoplasia (cleido-cranial dysostosis); (5) osteomalacia.

(2) *Cerebral Dwarfism.*

Microcephaly and other forms of amentia.

(3) *Dwarfism from Pre-natal Deficiency of Lower Limbs.*

(1) Phocomelus; (2) ectromelus.

B. Defects of Development—Infantilism.

(1) *Symptomatic.*

(*a*) Toxic. (Alcoholic, syphilitic, rheumatic, intestinal, &c.)

(*b*) Correlative. (Splenomegalic, renal, hepatic, cardiac, &c.)

(*c*) Endocrinous. Thyroid. Pituitary.)

(*d*) Mongolism.

(2) Essential.

(*a*) Ateleiosis. (Sexual. Asexual.)

(*b*) Progeria.

II. *Reproductive.*

(1) In the female—masculinism.

(2) In the male—feminism.

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XV

DEFECTIVE GIRLS IN SECONDARY SCHOOLS.

BY

CATHERINE CHISHOLM, B.A., M.D.

Medical Inspector to the Manchester High School for Girls; author of "The Medical Inspection of Girls in Secondary Schools."

Secondary schools for girls may be divided into two classes. There is first the high school, supported or managed by a board of governors, appointed by trust deeds drawn up on behalf of those who founded the school. These schools generally contain girls socially of the middle class, the daughters of professional and business men. A number of such schools, being aided by a Board of Education grant, also contain a certain percentage of girls who have obtained scholarships from the elementary schools. The other type of secondary school is wholly provided for by the educational authority of the town or county where it is situated. The large proportion (93 per cent. in one northern city) of girls attending this type of school have come from the elementary schools. There is also a small proportion of girls who have received their early education at private schools.

General Considerations.

It can be said generally that the girls in the secondary schools of all types are drawn from a higher social scale than those in the elementary schools. For even those who proceed from the elementary schools are the children of parents who can afford to sacrifice for some

years the earnings of their children. We shall, therefore, naturally expect to find some variation from the defects found among elementary school children.

There is also a further difference between the children attending elementary schools and those found in secondary schools. The children in secondary schools include girls up to the age of 19, instead of only children up to 13 or 14 years of age, and in the secondary schools proper girls below the age of 10 are usually not included. Where children below this age are accepted they are in a preparatory or kindergarten department. This, again, will provide a differentiation in the defects likely to be found.

We may naturally expect to find among girls of such a class and age fewer defects of nutrition. Indeed, the general average of height and weight appears to be very good, and though intimate knowledge of circumstances and careful questioning will elicit cases of actual shortage of food among girls attending secondary schools, these cases are very few (from time to time 1 per cent. of the girls of a typical high school have had assisted or free dinners), but among the girls attending is always a number where the fault is more often in the ratio of the necessary ingredients of the diet rather than in the actual quantity of the food supplied.

The distance many of the children attending secondary schools have to travel often makes it difficult for the midday meal to be taken at home, or without too long an interval after the morning meal. Experience has shown that attention to the provision of a hot midday meal at a reasonable interval after breakfast causes a marked improvement in the physique of all the children, whether strong or delicate, who were previously deprived of such an opportunity.

Relative Frequency of Defects.

The result of care and watchfulness and the better opportunities for recovery from illness afforded in the homes of secondary school girls is shown in the comparative immunity from the chronic sequelæ of the acute infections of childhood. The bad valvular lesions so often found in the out-patient department, as the result

of rheumatic fever, are practically not found in the secondary schools. Only 3 per cent. of the girls attending a typical high school suffered in the slightest degree from any heart defect. This included all cases of congenital heart defect, cases of slight dilatation, as well as compensated valvular cases after rheumatism.

Nephritis following scarlet fever and ear mischief after measles are but seldom met with. Indeed, in secondary schools the amount of ear defects is markedly slight. Only 3 per cent. have, or have had, any ear trouble of any description in one school of the high school type from which statistics were taken, and 4 per cent. in another of the county secondary type. These latter included 2 per cent. suffering from deafness due to enlarged tonsils and adenoids. Therefore when we consider that some cases of deafness are due to tuberculous trouble, some to trauma, some to external ear trouble, those resulting from the sequelæ of infectious disease must be very few.

The raised standard of personal cleanliness is also noticed in the secondary schools, though this standard varies largely with the locality, and in the case of the county or municipal secondary school, with the standard enforced by the medical authorities in the elementary schools. Where children have to travel in public vehicles it is inevitable that occasionally parasites are picked up. But skin diseases, such as impetigo or scabies, are very rarely found. In girls' schools also ringworm is occasionally, but rarely, found. Psoriasis is more common.

The result of the comparative personal cleanliness of the girls in respect, particularly to teeth and hair, also of the comparative healthiness of their surroundings, together with the care taken in convalescence from acute illness, is shown in the small numbers, *i.e.*, 6 per cent., who present even slight degrees of enlargement of the lymphatic glands. Double that number of cases are found in the elementary school children of corresponding age in the same town. It must also be noted that even the slightest cases are included in the statistics of the high school girls, so that the difference of incidence in the two classes is probably even greater.

Of these cases some are doubtless due to necrosed teeth, but here again more care is taken among high school and secondary school parents that these dental defects are attended to.

Less than 6 per cent. of the girls in a Lancashire high school had obviously neglected teeth. In a Yorkshire secondary school in a small manufacturing town 9 per cent. were found. In the elementary schools of the Lancashire town 20 per cent. of the girls of 13 years of age had bad or dirty teeth.

As we find a greater care taken for personal hygiene and attention to more complete recovery after illness, we find a greater tendency for gross affections to be attended to. Those children who have come from the elementary schools have already once been through the net of medical inspection. Cases of tonsils and adenoids causing marked deafness, frequent colds, nasal discharge, and bad mouth breathing are only occasionally found. Five per cent. of the girls in one school had already had operations for the removal of tonsils or adenoids, or both. There were, however, still 12 per cent. of girls with some degree of enlarged tonsils, and 3·6 per cent. still had adenoids sufficient to cause them to be mouth-breathers.

Medical inspectors who report on the presence of enlarged tonsils and adenoids give such widely varying numbers that either the incidence varies greatly in different towns, or the personal index of the investigator is unduly high. In three northern towns containing somewhat similar schools the figures vary between 5 per cent. of operated cases and 3 per cent. still mouth-breathing in one school, to 19 per cent. in a second, and only 6 per cent. in a third, and of this 6 per cent. only 2 per cent. were said to be bad cases. There is still marked reluctance on the part of some parents to resort to operative measures, and not sufficient stress laid by some medical practitioners on the necessity, after operations on tonsils and adenoids, of practising breathing exercises in order to keep the post nasal cavity well aerated. Or perhaps it is merely that the parents do not pay sufficient heed to their instructions.

On the whole respiratory diseases are not prevalent

among secondary school girls. Occasionally an early, previously unsuspected, case of tuberculous trouble may be detected. Occasionally cases of bronchitis are found, and more frequently cases of defective breathing and poor chest development, which are much benefited by special attention to exercises, particularly breathing exercises, both in and out of the gymnasium.

Eye Defects.

The total number of girls with eye defects in the Manchester High School was 15 per cent. These were almost all errors of refraction. This compared favourably with the 22 per cent. of cases in Keighley Secondary School, and Dr. Helen Wilson's 28 per cent. in the Sheffield High School. There is no doubt that conditions in preparatory schools, as well as in the ones occupied by the girls at present, markedly affect their eyesight. Girls who have never been troubled by slight defects at once suffer if they get run down, and eye defects are likely to be increased by bad lighting and poor print. In the elementary schools in Manchester 16·4 per cent. of the girls of 13 years of age are, or ought to be, wearing glasses. Thus there is a slightly higher percentage than in the secondary schools. In addition to the errors of refraction, there were a very few cases of strabismus and external eye defects, but cases of blepharitis were comparatively rare, and diseases of cornea and conjunctiva but seldom noticed, whereas these diseases are more frequently met with in the elementary schools. About 4 per cent. of defects other than errors of refraction are found in the elementary schools of Manchester.

Spinal Defects.

The defects which are most frequently found by inspectors in girls' secondary schools are the different types of spinal curvature. This is specially noticed for several reasons. A good carriage and a normal balance of the bony structure of the body are of particular importance to women, not only for athletic reasons (important as those are), but also for functional

reasons. Any deviation from the normal curves is liable to lead to compensatory curves elsewhere.

Secondary school girls are prone to grow quickly to a height rather exceeding the normal height for girls of all classes. Their weight may or may not proceed *pari passu* with their height. The correct carriage of the spine depends on (1) The development of the musculature; (2) the habits of the individual. Girls who are under weight and anæmic, not feeling up to much exercise, will have muscles not sufficiently strong to support the rapidly growing frame, together with the rapidly developing figure. It is just at the age when this becomes most of a strain, *i.e.*, at 11, 12, 13 and 14, that the demands of education become heavy.

Among the girls in the preparatory and kindergarten divisions the tendency to curvature is much less marked except among very delicate or very studious girls. But later on there is a demand for long hours spent in reading or writing work, for time spent in violin or piano practice, and unless opportunity for frequent change of position and relief from strain is allowed there is a tendency for the muscles to become fatigued and the spine to sag into bad positions. The importance of suitable desks for each individual, for proper lighting, good type in the text-books, and of frequent intervals for stretching the limbs, is now recognized. The keenness for athletics and games, by improving the muscular condition, is a valuable antidote to sedentary habits.. In the first year of medical inspection 25 per cent. of spinal curvatures were noticed in the Manchester High School. This included all the girls then in the school who had any degree of kyphosis, lordosis or lateral deviation. Most of the cases were only in .the first stage, and could be corrected by putting the girl in a good position, but were quite marked in the erect position. Only a few were so bad that private outside treatment was necessary. It is instructive to note how quickly after the correction of the position at desk or table, and with the help of suitable special exercises, performed with the willing, intelligent co-operation of the girl, improvement of even bad cases is seen. The co-operation of the patient is stressed, as both the

quickness of the improvement and its permanence largely depend on the girl's keenness in doing the exercises and intelligent interest in the reason why the special ones are given.

In a later year the cards of a number of girls who had been in the school for some years were examined, and it was then found that 29 per cent. of the girls then had, or had in the past, suffered from some postural defects, *i.e.*, curved spine, prominent scapulæ, tilted pelves, or flat foot.

In the Keighley Grammar School Dr. Margaret Sharpe records 23 per cent. of cases of lateral curvature, most of them "slight and likely to be remedied." Dr. Helen Wilson, of Sheffield, reported 22 per cent. in the high school of that city.

Defects of the Feet.

The matter of flat foot is one which needs emphasis. The causes which conduce to defective muscular power in the spinal column also affect the maintenance of the arch of the foot. A great improvement in the musculature of the foot is produced by proper exercises and a consequent freedom from the tendency of one or other side of the ankle to fail.

Blood Disorders.

Closely associated with muscular weakness is anæmia. This one might expect to find in girls of adolescent age in comparatively large numbers. But where good conditions of hygiene are in force the proportion found is really low. In the Manchester Elementary Schools in 1912, 8·17 per cent. of the girls of 13 were stated to be anæmic, 4·4 per cent. of the High School girls in the first year of school inspection were markedly anæmic. But the proportion stated largely depends on the standard adopted by the examiner. There is no doubt also that it depends on the care with which early cases are noted and special opportunities afforded for rest, fresh air and access to sunshine. Where organized games and gymnastics are practised such cases must be attended to or serious heart strain

may, and sometimes does, result. There is no doubt that much of the mischief for which games were blamed in the early days of girls' participation in them was due to their being played by girls in a state of health not sufficiently good to warrant the exertion.

Nervous Defects.

Under this heading the writer has been able to gather and give but few statistics. It is in guarding against such defects that the medical officer in secondary schools is of most value, but the work can in no way be assessed statistically. There is no doubt that many girls in secondary schools, though suffering from no pronounced nervous complaint, do tend to overstrain their nervous system already under high pressure from the natural demands of development. There is no doubt also that the effects of such pressure are not always evident immediately, but often emerge in nervous breakdowns during university or college life. The demands of competition, not only among those striving for academic distinction, but also among many weaker girls, who know they must prepare to earn their own living, cause the conscientious girl to work at a pressure which experience shows is unwise.

The preparation for many, if not most, of the careers open to women of the middle class are entered by examinations of matriculation standard. Even cookery and secretarial work of any good standing must be accompanied by a general education of this standard. Most girls are exceedingly conscientious and put all their energies into the effort to reach this standard. The consequence is that the average girl who must earn her living has a more difficult standard to reach than the average boy who may enter business or apprenticeship from a less academic standpoint.

Moreover, the natural antidote of games is often to the girl an added tax. Absorbed in her work she takes part only in organized games, and instead of games being free relaxation in the open air, and, therefore, a merely pleasurable muscular effort, they become another competitive effort. There is also the added interest of enjoyment, but inasmuch as she takes her part in these

as a member of a side a further stimulus, in the shape of loyalty and public spirit, is added to spur her on when her own inclination or fatigue would cause her to draw back. The result is that the medical inspectors of such schools have constantly to lay stress on the necessity for sufficient time for rest and sleep. Girls are frequently found who, while suffering from no disease, become slow in response to teaching, pale, suffering from headache and lassitude. Such cases cannot be included in any statistics, but it is in the supervision of them that a system of medical inspection in secondary schools is most beneficial.

The knowledge that the medical authority is at hand encourages the mistresses to report girls whom they notice are becoming tired or failing in the quality of the work they produce. The work can then be reorganized on a system based on correlation between the educational necessity and the physical powers.

More sympathy is obtained from the parents when rest or diminution in the amount of study is advised by the medical authority than when the teacher notifies the parent that the girl is overtired. The production of the best results becomes a scientific study interesting to both teacher and doctor, and well worth further development than has so far obtained in most schools.

Experience has shown that cases of headache and lassitude and disappointing after-results found among girls who have striven for entrance scholarships at the age of 11 and 12 have been due to over-working the nervous system.

Headaches due to eye-strain are often found to occur before the eyes have been corrected by glasses.

Headache due to auto-intoxication by constipation, dyspepsia and bad teeth are occasionally discovered; but constipation among these girls does not appear to be so prevalent as in later life.

True migraine exceptionally occurs, and very slight cases of *petit-mal* are, from time to time, discovered attending secondary schools.

True mental deficiency, such as would qualify for special schools, is not met with in secondary schools, though in the junior and kindergarten divisions

borderland cases are certainly met with. Occasionally cases of mental unbalance do develop with the onset of menstruation, but the very rare case met with by the writer was in a very badly nourished girl working for a trying examination.

Cases of hysteria ought seldom, if ever, to be met with in a school where the discipline is good and the amount of healthy exercise afforded is ample.

Chorea, as in the case of other more grave manifestations of rheumatism, is occasionally, but very rarely, met with in secondary schools, and such cases are generally noticed and stopped at once.

Frequency of micturition and occasionally cases of diuresis are among the more frequent of nervous disturbances among the young, delicate and more highly-strung children. They generally improve quickly with rest, consideration from the class mistress, and the regularity of school life.

One case among six hundred girls was found to have suffered, and was still to some extent suffering, from Graves's disease. Four per cent. of the girls had a physiological enlargement of the thyroid with the onset of puberty. As in the secondary schools the girls pass the years of sexual development at school there is an opportunity of observing the effect of study on this stage of their lives and of the amount of physical disturbance which the monthly cycle causes. There is no doubt that at this time the health of the growing child should be carefully watched, as the combined strain of growth and education is severe. But evidence shows that under wholesome hygienic conditions the onset of menstruation is accompanied by a marked improvement in the general health. This is particularly noticed in girls who have previously appeared to be delicate. Menstruation was stated to be unaccompanied by any physical pain or disturbance in 58·6 per cent. of 500 cases carefully examined. In 14·4 per cent. there was only slight and occasional pain felt; 19·2 per cent. of the cases had only slight pain or discomfort which never affected work. Only 7·8 per cent. had pain which could be described as severe—2 per cent. of these had pain occasionally or always of a character so severe as to

incapacitate them for one or two days. The delicate and anæmic girls suffered most from dysmenorrhœa. Of the girls who suffered from anæmia to such a degree that the hæmoglobin in the blood was under 80 per cent. of the normal amount, 56·5 per cent. suffered more or less pain or disturbance. Among the anæmic girls also was found a greater tendency for undue profuseness of the flow; 59 per cent. of the cases of over-profuse flow were found among the anæmic girls, and among these cases again was a larger proportion of discomfort and pain during the period. It is important that such girls should have opportunities for rest at the period time, and regular constitutional treatment, or a vicious circle is set up and their anæmia becomes much increased. Such cases have been observed to respond readily to the suggested line of treatment.

Finally, one may reiterate that the defects found in secondary schools vary from serious unsuspected trouble to very slight defects. The great majority of girls present some points of health or physical surrounding to which it is advisable that the parent's attention should be drawn.

If attention is directed to the early stages of bad tendencies, the result is the saving of much time and disappointment. It is most important, if inspection in secondary schools is to be of any value commensurate with the time and money expended, that the medical officer should be frequently available for consultation with the principal, and that some regular method of checking the health of the girls from time to time should be adopted. The routine measuring and weighing of the girls will provide one standard of progress. If this is done by the gymnastic mistress, and she and the form mistress report at regular intervals girls whom they notice to be flagging, the medical officer will have the opportunity of inquiring into the daily life and medical history of such pupils, and obtaining some improvement.

Secondary schools which are being medically inspected ought to be visited at least twice each term by the medical officer, otherwise the inspection becomes a

mere checking of defects found in the girls on entering. This is in itself a valuable result, but it is merely a part of what should be done.

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XVI

DEFECTIVE BOYS IN SECONDARY SCHOOLS.

BY

JOHN LAMBERT, M.A., M.D., B.C., M.R.C.S., L.R.C.P., D.P.H.

Medical Officer to Lancing College; late School Doctor to the Brighton Education Committee.

"SECONDARY schools" include not only the large group under the direct control of education committees, but also private schools, the grammar schools, and the public schools. Boys in such schools are drawn from all classes of the community. At present there is no legislation compelling routine medical inspection in these schools, but the more progressive municipalities have already initiated inspection in those under their control, and in many of the public schools the routine examination of entrants has been carried on for many years.

The ages of boys in our secondary schools are generally from 12 to 18 years, hence, in addition to the usual defects of childhood, others, more particularly associated with puberty, demand consideration. During this period the developmental processes, whether in physique, brain power, or character, do not proceed with an easy regularity, but rather by a series of leaps and bounds, instability being a prominent feature. The organs of the body are working at high pressure, and the metabolic processes are at their period of greatest activity, and as a consequence of this evidences of strain may make their appearance in various ways. Many of the commoner defects, especially associated with puberty, are due in great measure to avoidable stress and strain, physical and mental.

Statistics of Defects in Secondary Schools.

At the present time statistics relating to the frequency of these defects in secondary school boys are not numerous; this is partly due to inspection being optional only, and also to the fact that such reports are often published privately and do not find their way into general circulation. The first report of any importance was that made by Dr. Dukes, then Medical Officer to Rugby. From a routine inspection of the entrants to the school he was able to publish statistics which showed that an astounding number of defects existed in boys whose childhood had presumably been spent under favourable conditions, and who had come from the homes of the more successful members of the community. These records have led to more interest being taken in boys in secondary schools, and while subsequent papers have not shown such a high percentage of defects, yet it is certain that they do occur with such frequency that it is advisable that a routine inspection should be carried out on all boys in these schools at definite intervals.

Forms of Defect and Disease met with in Secondary Schools.

Acute Diseases.—The boy during puberty and early adolescence is peculiarly susceptible to the *acute infectious diseases,* and unless protected by a previous attack it may be said with some certainty that definite exposure to one of these diseases will be followed by an attack. The minor febricula, colds, and catarrhs of the upper respiratory and oral passages are frequent—much more so than in the adult. Complete immunity to these attacks is rare, but as puberty advances the attacks become less severe and less frequent.

Acute pulmonary tuberculosis in the adult form not infrequently becomes manifest at the adolescent period.

Pneumonia and appendicitis also occur with some frequency among boys in secondary schools.

The commoner defects revealed by routine inspection are those generally met with in elementary schools, but

they are in many cases modified by the effects of puberty.

Defects of Vision.—Much near work with the eyes, often by artificial light, is done in secondary schools. In the higher forms the amount of work is such that reading must be carried on during preparation for a considerable period, hence eyestrain is by no means infrequent; generally this is associated with an uncorrected error of refraction, but occasionally it is a simple *asthenopia*. *Hypermetropia* causes less trouble than in the elementary schools, unless associated with astigmatism, the vision in many cases becoming better as the boy grows older. *Myopia,* with or without astigmatism, is especially noticeable during puberty. The increase of myopia during this period has been dealt with in many papers, and it is a well-known fact to all engaged in school medical work that it tends to increase progressively with the amount of near work, *i.e.*, with the passage of the boy up to the higher forms. Thus, whereas the percentage of myopes in the elementary schools of Brighton was 9 per cent. for 1910 in the 13-year-old group, this had increased to between 13 and 16 per cent. for the three highest forms in the secondary boys' school. Occasionally this progressive myopia is associated with headaches of a migraine type, and in these cases rest is absolutely necessary.

Blepharitis and *corneal ulceration* are much less frequently met with than in elementary schools.

As regards the frequency of errors of refraction in secondary schools, Dukes found in an examination of 1,000 boys entering Rugby 12·8 per cent. with myopia, 4 per cent. with hypermetropia, 2·7 per cent. with astigmatism, and 1·2 colour blind; from my own statistics of 120 new boys at Lancing College, 9 per cent. were hypermetropic, with or without astigmatism, 14 per cent. had myopia or myopic astigmatism, and 2 per cent. had mixed astigmatism, while one boy was colour blind. Dr. Kerr reports that in an examination of two secondary schools, 28 per cent. of boys were found to be defective in vision, and only 10 per cent. had spectacles, while many showed signs of eyestrain.

Auditory Defects.—Boys with serious defects of

hearing are not often met with in secondary schools, as they are rapidly found to be unfit for such education and are removed. *Otorrhœa* is also uncommon except as a sequel of some acute infectious disease. Dukes, in his 1,000 cases, states that thirteen had Eustachian deafness, nineteen aural deafness, and two otorrhœa; Kerr, that 7 per cent. had defective hearing, and 3·5 otorrhœa.

Cutaneous Defects.—Acne is the commonest skin disease met with in secondary schools. The occurrence of boils or furunculosis also is common, while urticaria is not infrequent. *Ringworm* is rare, as there is a great tendency to a spontaneous cure at puberty.

Defects of the Nose and Throat.—Boys of the secondary school class seem to have adenoids and enlarged tonsils almost as frequently as those of the elementary schools. In my own series of 120 new boys I found that 46, or 38 per cent., had been operated upon for enlarged tonsils or adenoids prior to admission, that 12 per cent. had adenoids, and 5 per cent. enlarged tonsils on admission, while 17 per cent. were mouth-breathers. Dukes gives 11 per cent. as mouth-breathers on admission to school.

A considerable number of boys show the secondary effects of delayed operation for adenoids in deficient physique, and deformities of the spine, chest, and jaws.

Deformities in Secondary Schools.

Congenital deformities are not common. The following list of *acquired* deformities is that given by Dukes as met with among Rugby schoolboys :—

Deformities	Percentage
Lateral curvature of the spine	44·5
Antero-posterior curvature of the spine... ...	·1
Pigeon-chest	12·6
Bow-legs	6·4
Knock-knee	52·6
Flat-foot	12·9

Dukes especially mentions that these were all definitely well marked cases, and that very slight defects

were not recorded. The percentages are astonishingly high in regard to lateral curvature and genu valgum, and such high figures have never been recorded by other observers.

Lewis Williams, of Bradford, in an analysis of the deformities of 342 boys of ages 10 to 16 in a secondary school, gives 1·5 per cent. as suffering from rickety deformities, and 7·9 per cent. from other deformities. My own series of cases showed that 16 per cent. had lateral curvature of the spine, and of these only a few were other than very slight, 10 per cent. had kyphosis, 2 per cent. slight genu valgum, and 14 per cent. some chest deformity, *i.e.*, either rickety, flat-chest, or pigeon-chest, and 2 per cent. flat-foot. At the age at which secondary boys are seen many of the rickety deformities are disappearing, while the statical deformities are beginning to become more noticeable. Rapid growth and the loss of muscle tone, which so often accompanies this period, are very favourable to the development of this latter group of deformities. I am personally convinced that many of the slighter degrees of these deformities undergo a natural cure as the rapidity of growth lessens and consolidation takes place, and that a great deal too much importance is attached to the minor degrees of lateral curvature, &c. Apart from very simple exercises and reasonable precautions they may be left to a natural cure.

Dental Defects.

The teeth are, in this class of boys, generally well cared for. Dukes noted 57 out of 1,000 as neglected. In my own series of cases, out of 120 boys 6 had perfect dentition, 17 showed definite irregularity of the teeth, while the average number of teeth stopped was 3·5, and the average number of carious teeth requiring attention was only 0·5. In an examination of 134 boys, Kerr reports 83 as having two or more defective teeth, while Williams, of Bradford, gives 99·1 per cent. as having one to three carious teeth, and 0·3 per cent. as having over four.

Cardio-vascular Defects and Disorders.

Minor disturbances of function, *e.g.*, arhythmia, bradycardia, or tachycardia, unassociated with structural changes are not infrequent. A temporary hypoplasia may be found; hyperplasia is usually the result of vascular disease or excessive exercise. Dukes gives 9 cases of valvular disease in 1,000 examined, while Kerr gives 9 in 134 boys, 3 due to valvular diseases and 6 functional only. It is important in boys of this class to see that games are not commenced too soon after an acute febrile illness, as dilatation and disturbances of function may readily follow if undue strain is thrown upon the heart too soon.

Vascular disturbances, *e.g.*, the occurrence of chilblains, &c., are common. According to Dukes 437 out of 1,000 boys had chilblains during winter. The vasomotor system during puberty is remarkably unstable and is readily affected by afferent impulses.

Defects of the Central Nervous System.

The common neuroses of childhood tend to occur less frequently as puberty advances, but occasionally sleep-walking or talking, teeth-grinding, enuresis, &c., will be found to persist till quite late in this period—more especially in the presence of any unusual physical or mental strain.

Epilepsy may make an appearance for the first time during puberty; according to Sir William Gowers, 25 per cent. of cases commence at this period.

Symptoms of overstrain may occur especially before and during examinations; boys of the neurotic type should be carefully kept under observation at such periods. Speech disturbances of nervous origin, *e.g.*, stammering or stuttering occurred in 7 per cent. of Dukes's cases, and in 5 per cent. of my own cases.

Defects of the Genito-urinary System.

Functional or cyclical albuminuria is probably much more common during puberty than is generally supposed. Dukes gives 15·7 per cent. of cases; 24 per cent. of my own cases showed albuminuria in varying

amounts, with no organic disease of the kidney. It occurs, as Dukes has pointed out, in the neurotic type of boy, and in those whose vasomotor system is unstable.

Hernia occurred in ·8 per cent. of Dukes's cases, and in 8 per cent. of my own; varicocele was met with in 9 per cent. of Dukes's cases.

Minor sexual disorders of function are not uncommon during puberty; organic disease is very rare. Circumcision had been performed in 42 per cent. of my cases before admission.

Defects and Disorders of the Respiratory System.

Asthma and bronchial catarrh are the two diseases most generally met with in secondary schoolboys. Phthisis in its chronic forms is rarely met with. Apart from emphysema in boys who have had many attacks of asthma, I have met with no lung defects in routine inspection of entrants.

General Conclusions.

Enough details have been brought forward in the preceding pages to show that inspection is as urgently needed in secondary schools as in the elementary; there can be no doubt that in many private, and even public schools, boys work under conditions of faulty environment which would not be tolerated in an elementary school.

Prophylaxis must follow on the same general lines in all schools; the seating, lighting, and heating of the schoolroom must be improved and brought up to the ideal as far as is possible.

In the matter of dietaries and of sufficient hours of sleep much still remains to be accomplished in secondary schools.

The provision of medical or surgical treatment for defects is a much easier process than in elementary schools, as parents are more amenable to advice and are able to pay for such treatment. Deterioration of health is not infrequently noticed during the holidays, especially in boys of the public school class. This can

be largely attributed to insufficient sleep, and it cannot too strongly be urged that boys while at home should not be allowed to keep adult hours.

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XVII

SCHOOL CLINICS.

BY

LEWIS D. CRUICKSHANK, M.D., D.P.H.

Medical Officer and Chief Inspector of Physical Education, Scotch Education Department; late Principal of the Dunfermline College of Hygiene and Physical Training; author of "School Clinics at Home and Abroad."

PUBLIC opinion responded with remarkable rapidity to the suggestion of medical inspection. It is now responding with equal readiness to the claims of the abnormal child for adequate medical treatment. The experiment of utilizing voluntary agencies for the treatment of the diseases of school children has been fully tested in most of the large educational centres. Those agencies have accomplished a great deal of excellent work; but in most cases they have proved themselves unable to cope with the great numbers of children requiring treatment. This fact has led to a full recognition of the need for establishing a new institution, the special function of which is to undertake the detailed examination and treatment of those diseases for which the existing organizations are inadequate. Where this institution has been established it has grown naturally out of the school organizations, and is called a *School Clinic*.

No school clinic in this country is over seven years of age. Brighton, Cambridge, and Woolwich were pioneers in 1907. Since then school clinics have multiplied rapidly, until there are now over 150 of them scattered throughout the country. This rapidity of growth is perhaps the best evidence of the need for this new institution.

But already there is evidence that the school clinic, established primarily for detailed examination and

treatment, is becoming the correlating centre for all the measures that educational authorities are making, in ever widening range, for the physical well-being of children under their care.

The Organization of School Clinics.

It is advisable, where possible, that the school clinic or scheme of treatment should be organized as one piece of machinery with the other branches of the school medical service. It will be possible to adhere strictly to this principle only in the case of clinics or treatment schemes maintained entirely out of public funds, and under the control and direction of the local education authority. In the case of clinics supported partly by voluntary contributions and partly by contributions from local education authorities, it may still, however, be possible to obtain an effective measure of control through the school medical officer. But schemes of treatment that are entirely "voluntary" are more difficult to co-ordinate with the school medical service. They may give the necessary facilities for treatment, but their imperfect incorporation with the vital machinery of the school medical service tends to render them less efficient.

As far as possible, then, the school medical service, whether concerned with inspection, treatment, or prevention, should be built up into a synthetic whole. Every effort should be made to prevent undue dissociation from the parent scheme of any new agencies it may be found necessary to introduce. Efficiency and economy, both immediate and ultimate, will be more readily obtained by the operation of a single effective organization than by a number of separate agencies with limited spheres of activity.

In the efficient *management* of a school clinic there are three main points that require consideration. These we may now consider.

(1) *Effective Supervision of Treatment.*

Whatever the size of the staff employed in the school clinic, it is desirable that there should be one responsible head—preferably the chief school medical officer. It

should be clearly understood that any part-time doctors, dentists, oculists, nurses, or voluntary workers that may be attached to the clinic are, while in attendance, under the control of the responsible medical officer. Where there is an imperfect understanding of relations, and where different persons adopt different principles in dealing with the cases, friction results, and the harmony and success of the work suffer. Certain broad principles underlie the problem of the treatment of school children, and for administrative reasons these should be clearly understood and loyally adhered to by the staff of the clinic. Personal differences in methods of treatment are matters beyond the province of the supervising officer, except in so far as they are inapplicable to the requirements or are clearly beyond the scope of a school clinic.

Again, it should be observed that, although the school clinic claims to provide methods of treatment not normally available for many diseases, its methods may degenerate into a mechanical routine and become largely ineffective. This tendency is all the more marked where large numbers attend for the treatment of precisely similar diseases. To guard against such mechanical routine is one of the most difficult tasks of the supervising medical officer. It takes time to investigate carefully the effects of treatment in certain cases, and there is a tendency, when the work of the clinic is heavy, to repeat mechanically the previous day's treatment when investigation would show that some modification of the method of treatment is called for.

And this danger of mechanical routine becomes still more marked when much of the treatment is carried out by nurses. Nurses are competent to discharge, with great efficiency, much of the routine work of treatment, and it is unnecessary to employ medical men where nurses can do the work. At the same time, nurses should be under the supervision of a doctor. All cases treated by nurses should be seen at regular intervals by the doctor, and the date of his examination and any change in the method of treatment carefully recorded. Nurses will then be in a position to take a more intelligent interest in their cases, and to direct the attention

of the doctor to any case where he may have omitted to make the periodical investigation into the effects of the treatment. Unless some systematic method of supervision is exercised over the treatment of chronic diseases, such as running ears, skin diseases, and eye inflammations, much valuable time may be lost, and the ultimate cure of the child delayed. Moreover, loss of confidence on the part of parents in the efficiency of the school clinic may result.

(2) *Effective Control of Attendance.*

It is easier for the school clinic than for the hospital to secure regularity of attendance. But inasmuch as regularity of attendance, unless compulsory, is always somewhat difficult to obtain, even the school clinic may show weakness at this point—one of its so-called points of strength. The clinic has the advantage, however, if it is open during school hours, that attendance may be regulated to some extent through the school by the assistance of schoolmasters. But the responsibility for regularity of attendance cannot be thrown entirely upon the school. The school should be regarded as a co-operative agency only, and, if judiciously used as such, it may materially assist the " following up " and supervising arrangements of the clinic.

The success of the clinic, then, as a means of securing effective treatment will depend largely upon its arrangements for " following up." Effective " following up " will secure the *attendance* of children recommended for treatment as the result of medical examination, whether routine or special. On the other hand, *regularity of attendance*—a point of first importance—will depend largely upon the efficiency of the method of registration employed. The method should be such that, at the close of the day, it should be possible to discover, with a minimum of trouble, cases that should have attended that day, but had absented themselves. The more important cases could be " followed up " immediately, while the less important cases could be notified or got at through the school or the attendance officer. Whatever details individual medical officers may find it necessary to introduce into their system for the control

of attendance, the points indicated may be regarded as the minimum necessary to secure effective work.

(3) *Accurate Registration of Cases.*

Accurate registration of cases and attendances is an essential feature of a well-organized school clinic. It is not only important that these records be kept, but that the method employed should fit into the system in use for regulating the attendances. Simplicity of method, with a minimum amount of clerical work, is what should be aimed at.

It is frequently found to be an advantage to make up the returns at the close of each day. Any great variation in the attendances is thus more readily discovered, and, if necessary, investigated. It would be idle, however, to lay down rules as to methods of registration, for there must be many differences in detail among the methods suitable to different localities.

It is desirable also in the early stages of the development of a new departure that careful records of work should be preserved. Much valuable information, gained from experience, will then be available. New light will thus be thrown upon the efficiency, the economy, and the results of treatment; and the bearing of medical treatment on the wider problem of general physical efficiency will be seen in its true perspective.

The Functions of the School Clinic.

A well-equipped school clinic is generally regarded as fulfilling two main functions, namely, "inspection" and "treatment." A school clinic may, however, fulfil only one of these functions. Hence we are accustomed to speak of "inspection clinics" and "treatment clinics." We may now pass to a consideration of the various forms of school clinic.

(1) *The Inspection Clinic.*

An "inspection clinic" is a convenient centre at which the school medical officer conducts examinations of special cases not falling within the scope of "routine" school medical inspection. The following

summary of the purposes of an inspection clinic is taken from the Report (1910) of the Chief Medical Officer of the Board of Education: (1) The further and fuller examination of children referred as a result of medical inspection in the school. (2) The examination of children referred in regard to fitness to attend school, or to undertake physical exercises, swimming, school journeys, &c. (3) The examination of candidates for admission to special schools—schools for the deaf, blind, mentally and physically defective, open-air schools, &c. (4) The supervision of children suffering from such conditions as uncleanliness and ringworm. (5) The periodical supervision of all cases of phthisis. (6) The inspection of children who have suffered from infectious and contagious diseases, and of "contacts" prior to their return to school.

In large centres it is, of course, much more convenient and economical to centralize such special work in an inspection clinic. Here the medical officer will have at his command the necessary facilities and equipment for accurate diagnosis. He will be in possession of the necessary apparatus for microscopic examination in cases of ringworm, for bacteriological diagnosis in cases of infectious diseases, for the accurate estimation of visual defects, for careful investigation of diseases of the ear, nose and throat, and many other defects requiring the resources of a well-equipped consulting room.

Further, the centralization of this special work in an inspection clinic has additional advantages. Numerous cases not found on routine inspection will be dealt with at such a clinic. These cases will be referred by nurses, teachers, attendance officers, parents and others. The fact that the work is conducted at a special centre during stated hours becomes generally known. This facilitates the reference of cases more especially by teachers and parents. Where an inspection clinic exists, there is thus less delay in the inspection of special cases; still less is there the risk of their being overlooked altogether.

The inspection clinic thus becomes a sort of central "clearing station" at which special cases are examined and referred according to their conditions. Some will be excluded from school; some will be referred to the

school clinic for treatment; some to the hospital; some to the family doctor; some to the special schools, the open-air school, the school for the physically defective, the school for the mentally defective, the skin school, the school for the blind, the school for the deaf and dumb, where these exist.

(2) *The Treatment Clinic.*

Where an inspection clinic already exists, and the education authority finds it necessary to establish a treatment clinic, the latter will naturally associate itself with the former. In practice, the necessity for a "treatment clinic" usually arises out of the "inspection clinic"; hence the treatment clinic will naturally incorporate itself with the inspection clinic, and become an integral part of an extended system of educational hygiene. The more closely acquainted we become with the intimate associations of inspection and treatment the greater are seen to be the advantages of this organic unity.

Owing to the variety of diseases requiring treatment, the work of a fully organized school clinic tends naturally to divide itself into departments. This division into departments develops as a matter of expediency. It is found, for example, that one set of conditions does not require "treatment" by a fully qualified medical man. They can receive appropriate treatment by a nurse working under medical supervision. Other sets of conditions require the attention of specially qualified persons, and fall naturally to be dealt with by such persons. Although this division of the work of a school clinic into departments is more or less an arbitrary one, it will nevertheless serve as a useful method of classification for purposes of description. Moreover, it has been frequently found that when a school clinic extends its operations it does so by the addition of one or more of the departments that we are about to describe.

The work of a school clinic as a "treatment centre" may embrace one or any number of the following departments: (a) General medical department: (1) treatment of minor ailments; (2) cleansing schemes;

(3) X-ray treatment of ringworm. (*b*) Ophthalmic department. (*c*) Dental department. (*d*) Orthopædic department. (*e*) Operative department.

(*a*) *Considerations regarding General Medical Department.*

(1) *Treatment of Minor Ailments.*—This department undertakes the treatment of all conditions that require what may be termed dressing; for example, inflammatory diseases of the eyes, of the ears (including discharging ears), of the nose and throat, skin diseases, &c. The treatment of the majority of these diseases may be undertaken satisfactorily by a nurse working under medical supervision. This does not mean that those diseases do not require skilled treatment. Nurses readily acquire great skill in the "dressing" of quite serious conditions. So numerous are the cases requiring daily treatment that it is more economical for the nurse than for the doctor to do the routine work.

Perhaps one of the most interesting features of this department of the clinic work is the vast amount of suffering that can be relieved at comparatively little cost. Given suitable accommodation, the equipment need only be of the simplest kind. A few chairs, a high couch for cases that require treatment in the recumbent position, a table, a sink and wash-hand basin, with hot and cold water supply, a couple of pails—one for soiled dressings, and one for use as a foot bath—a few simple dressings, drugs, lotions, ointments and instruments are sufficient to make possible a great amount of useful work. Sums varying from five pounds to twenty pounds, depending upon the number of children to be treated, will suffice for the equipment of such a department in a school clinic.

(2) *Cleansing of Verminous, &c., Children.*—A certain amount of "cleansing work" may be undertaken by the school clinic. Such an arrangement may be useful, particularly in the cleansing of individual children. But unless special provision exists in the school clinic for the thorough cleansing and disinfecting of body and clothing (conditions necessitating suitable bathing accommodation and a steam-disinfector), such a scheme

would not be considered complete in itself. It should be regarded rather as accessory to a more general scheme of cleansing (where such exists), arranged in conjunction with the sanitary authority.

(3) *X-ray Treatment of Ringworm.*—It may be accepted that there is a general agreement that the only satisfactory treatment for ringworm of the scalp is by X-rays. Not only are the results generally satisfactory, but there is some evidence to show that by strict supervision and treatment the disease may be ultimately stamped out. Dr. Lewis Williams, Bradford, in his Report for 1911 writes: "There has been a very marked decrease in the number of cases of ringworm. The decrease is undoubtedly due to the strict exclusion of the children from school until cured, and the provision of treatment by means of X-rays."

Dr. Williams gives also the following figures relative to X-ray treatment. The total number of cases treated during 1911 was 285; of these 246 were cured by one application; seven required a second application. The average number of "exposures" per child was 3·37, and the average number of days until cases were cured was 30, less than a fifth of the average time required by drug treatment.

It seems clear, then, that where ringworm is prevalent, treatment by X-rays is the only satisfactory method of cure. But for such treatment an installation is required. An efficient installation costs from £100 to £200.

In the absence of an X-ray installation it is still possible for the school clinic to discharge useful functions with respect to ringworm. During drug treatment it may not be necessary in every case to exclude affected children from school. Infection from ringworm may be reduced to a vanishing quantity if the hair be closely cut, and the head kept scrupulously clean and free from scales. These points may be secured by frequent cropping, daily washing and smearing of the head with ointment. These things provided for, the child may attend school, if he wears a linen cap. Such a method of dealing with ringworm is, however, applicable only where strict supervision, such as a school clinic pro-

vides, is possible. This practice is in vogue in Dunfermline and Birmingham.

(*b*) *The Work of the Ophthalmic Department.*

The work of this department comprises two distinct groups of cases, namely: (1) Inflammatory diseases of the eye and its appendages, and (2) Defects of vision.

(1) *Treatment of Inflammatory Diseases.*—It may be convenient in the majority of clinics to delegate the treatment of the less seriously affected cases in this group to the nurses working in the general medical department. The ophthalmic surgeon could himself undertake the treatment of the more serious cases. It is, however, desirable that this work should be intimately associated with the work of the general clinic. It must frequently happen that the eye specialist will visit the clinic only on stated days. In practice it has been found that, where the clinic is sufficiently large to justify the procedure, it is better for the eye specialist to devote a certain portion of his time to the examination and treatment of the inflammatory cases in the general department where he can have the assistance of a nurse who will be able to apply the treatment in his absence. Such an arrangement is both efficient and economical; it makes possible frequent and regular treatment. It has the further advantage that it makes a minimum demand on the eye specialist's time. In many instances the eye specialist is appointed to deal only with cases of visual defect; the treatment of the inflammatory diseases of the eye being left to the medical officer in charge.

(2) *Correction of Visual Defects.*—This work requires to be undertaken by an eye expert. Frequently the school medical officer has the necessary experience to enable him to undertake it.

The method of estimating the error of refraction differs slightly in detail in different clinics. In some clinics accommodation is paralysed by means of homatropine and cocaine, and in others by means of atropine. When homatropine is used the preparation of the eye and the estimation of the refractive error can be carried out during one visit. When atropine is used, a prelim-

inary visit to the clinic to receive the necessary instructions about the preparation of the eye will usually be required, unless, as is done in some cases, the school nurse visits the home to see to the preparation of the eyes. When atropine is used the paralysis of accommodation is more complete and the estimation more accurate, but many consider that for children of school age the correction made under homatropine is sufficiently accurate.

The number of cases that can be corrected in a given time will depend largely upon the skill of the oculist. Nominally four cases an hour may be considered a good average. Every school clinic that makes provision for the correction of errors of refraction also arranges to see that the spectacles are obtained, and that they fit properly. It will be necessary also in most cases to make arrangements for the periodic re-examination of those children who have obtained spectacles.

In rural districts successful efforts to meet the difficulty of providing for the correction of visual defects and the supply of spectacles have been made by a number of education authorities. In some counties, for example, Essex and Somersetshire, numerous "vision clinics" have been formed in conveniently situated schools. In others, for example, Flintshire, a portable set of apparatus, including an extemporized dark room, is provided.

(c) *The Work of the Dental Department.*

Dental clinics are already more numerous than any other form of clinic. Several factors contribute to an explanation—the extreme prevalence of dental caries, the growing information as to the effects of bad teeth upon health, the definite nature of the treatment required, and the fact that the problem of treatment at special clinics is uncomplicated either by hostility from dentists or by the possibility of hospitals undertaking the work. Indeed, it is difficult to see how efficient treatment on a sufficient scale can be organized except in dental clinics.

The work of the school dentist may be conveniently considered under "inspection" and "treatment."

(1) *Dental Inspection.*—Is it necessary for the dentist to inspect children in order to select cases for treatment? The answer to this question will depend upon the purpose of the dental treatment. If the object be to provide merely for the extraction of obviously decayed or septic teeth, then the selection made by the school medical inspector will be sufficient. But as the main object of dental treatment is conservative, it is desirable that the cases for treatment should be selected with care. In this case an examination of the teeth with a dental mirror and probe should be carried out by the skilled dentist. His special training will enable him to conduct the examination expeditiously; and he will be better able to select the cases that are most likely to benefit from conservative treatment. Experience has shown that for conservative dentistry to be productive of the best results, it is necessary to bring the dentist into relation with the child early. It has, therefore, become almost the universal practice to concentrate attention upon the early permanent teeth, and to confine conservative work to children between the ages of six and eight.

But it is necessary to "follow up" the cases treated by systematic re-inspection. This should be done at least once a year. Experience would appear to show that no tooth commencing to decay during the year is likely to decay to such an extent as to be "unsavable" within the year.

(2) *Dental Treatment.*—The aim of school dentistry is, in the main, to preserve in good condition the permanent teeth and to apply pálliative treatment to such temporary teeth as do not require to be extracted. Moreover, it has to be pointed out that, the earlier treatment is undertaken, the more rapidly and efficiently it can be conducted, and with much less suffering.

A certain amount of extraction will be necessary for conservative reasons. But those extractions will be confined mostly to temporary teeth. The relative frequency of "fillings" and "extractions" varies considerably in different clinics. In the Cambridge Clinic it has been found that there is on the average one extraction for each child treated—the fillings at this

clinic being an average of $3\frac{1}{2}$ per child. In other clinics —*e.g.*, Deptford, Dunfermline and Bradford—extractions and fillings are more nearly equal in number.

Where numerous extractions or painful treatment is necessary, the use of a general anæsthetic has been found to be of great value. In Bradford Clinic use is made of an installation of gas and ethyl chloride. In Dunfermline Clinic a mixture of nitrous oxide and oxygen is in use.

The numbers that continue to receive treatment at dental clinics is evidence enough, if such were necessary, that the fear of pain on the part of the children does not constitute an obstacle to the success of school dentistry.

In country districts dental clinics are fairly numerous. The difficulty here is merely one of organization. Some counties employ whole-time itinerant dentists, while others employ a number of part-time dentists. It is perhaps too early to express an opinion on the relative economy or merits of the two schemes.

(*d*) *The Work of the Orthopædic Department.*

The chief features of orthopædic work may be grouped as follows :—

(1) *Individual Gymnastic Treatment.*—The purpose of this department is to undertake the treatment, by means of medical gymnastics and massage, of certain forms of physical deformity.

The following deformities show the type of case most suitable for treatment by gymnastics and massage, namely, lateral spinal curvature (scoliosis), round shoulders (kyphosis), hollow back (lordosis), flat chest with shallow respiration, knock-knee, flat-foot, weak and atrophied limbs following infantile paralysis, &c. Similar treatment is also found useful in sprains, and as a post-operative treatment in cases of adenoids. In such a clinic treatment is given by means of gymnastic movements applied to each patient individually. These movements are arranged for each case in the form of a "table" or "prescription." The principle underlying the compilation of this "table" is that certain of the exercises shall have a special or localized effect on the particular deformity to be treated, and that these

shall be interspersed with exercises having a more general effect. The object of the latter is to improve the general physique at the same time as the deformity is being treated. This general strengthening treatment is of equal importance to the special treatment. In practice the two are always combined. Breathing exercises are also freely interspersed throughout the "table." The treatment of each individual takes from ten to thirty minutes, occasionally forty-five minutes, depending on the nature of the case.

The treatment provided at such a clinic is not of itself, in every case, sufficient to effect a cure. In many of the more pronounced deformities the patient is taught a series of "home" exercises, which he is expected to practise once or twice daily. These home exercises are of the greatest value in assisting treatment at the clinic. Their continued practice for a time after the deformity has been cured is important in preventing recurrence.

The duration of treatment varies greatly. In some of the simpler cases a few weeks' treatment may effect the necessary restoration to the normal. In other cases many months' treatment may be needed before the desired results are obtained.

(2) *Collective Gymnastic Treatment.*—Experience has shown that there are large numbers of children affected with incipient deformities. For these special exercises need to be given if the incipient deformities are to be checked in their progress or cured. It would appear that such cases can be suitably dealt with in groups. While experience may show that such a method is successful in improving minor or incipient deformities, it cannot apply in the case of pronounced deformities. Here individual treatment will always be required. This fact rather strengthens the claim for collective treatment of incipient deformities. There is an inclination to look upon an incipient deformity as unimportant and to pass it over. How many incipient deformities progress to the stage of obvious deformity we do not know. But when a deformity has become "obvious" it is much less amenable to treatment; treatment demands much more time, greater gymnastic skill, and

greater cost, with less hope of cure. Indeed, it is doubtful whether education authorities can ever afford to give the necessary attention to the many children that are in need of skilled individual gymnastic treatment. At most, some of the larger authorities may appoint a medical gymnast to overtake as much work as possible. But such a method can hope to deal only with a few of the more serious cases. A comprehensive method of treatment would be to follow the principle of collective treatment in the earliest stages, and to confine the work of the clinic proper to the treatment of serious cases.

Collective treatment in incipient deformities, and also individual treatment of marked deformity, are possibilities that lie within the powers of most education authorities. The medical gymnast is, in a sense, already in the schools. Practically all expert teachers of physical education have had training in the principles and practice of medical gymnastics. In several of the physical training colleges the instruction given in medical gymnastics is of a very high order. The students of these colleges should be quite competent to undertake, under medical supervision, a small amount of special treatment work, in addition to their routine duty as teachers of physical education. It seems a pity that throughout the length and breadth of the land such persons should be available, and that so little demand for their services should be made.

(*e*) *Operative Work in the School Clinic.*

The operative work of a school clinic is confined chiefly to the removal of enlarged tonsils and adenoids. Whether the numbers requiring operation are sufficient to justify the establishment of a special department is doubtful. It may perhaps be necessary, owing to local circumstances, for the education authorities to make special provision for this work; but it cannot be said that the need for such special provision for operative work is at all general. Moreover, it is work that is not free from risk, and operative work of this kind demands the resources and safeguards of a well-equipped hospital. In any case, where it is

necessary to provide for such work co-operation with the hospital should first be considered.

Where such work is undertaken it will usually be necessary to perform operations during the morning, and to provide facilities, such as recovery rooms with couches or beds, for the children to remain for some hours after the operation. After-treatment in the form of nasal respiratory exercises is of the utmost importance.

Advantages of the School Clinic.

As a centre for treatment, the school clinic has already shown itself to present numerous advantages and few disadvantages.

These advantages may be briefly summarized as follows:—

(1) *Facilities for Treatment.*—(*a*) The clinic provides appropriate methods of treatment not otherwise normally adequate to the demands. This applies more especially to diseases of the ears, eyes, skin, and teeth. (*b*) It provides treatment for cases that would otherwise never be treated. This is particularly true when the school clinic is under the control and direction of the school medical officer. (*c*) It provides more continuous treatment, and gives greater individual attention than is possible at the majority of hospitals. (*d*) It provides the best means for re-inspection of treated cases. Re-inspection is an important procedure in many cases, if the full benefit of treatment is to be maintained. (*e*) It may provide for the dental treatment of non-necessitous as well as of necessitous children. Special arrangements will be necessary in most cases for the dental treatment of non-necessitous children at reduced charges. If these are not provided, it is unlikely that those children will receive any attention, the usual dentists' fees being prohibitive.

(2) *Simplicity of Organization and Administration.*—(*a*) The clinic facilitates treatment without delay, without long journeys, and without the long waiting common in hospitals. Where a clinic exists children that require treatment pass naturally from inspection to treatment. Time is thus saved in obtaining treat-

ment; and parents may not need to accompany their children. (*b*) The clinic ensures a minimum of leakage between inspection and treatment, and facilitates the control and regularity of attendance. These advantages will naturally depend upon the method of registration employed, and the efficiency of the system of "following up." (*c*) Dr. Lewis Williams, of Bradford, has found that medical inspection without the provision of adequate medical treatment diminishes school attendance, while with adequate medical treatment it actually increases attendance.

(3) *Social Advantages.*—(*a*) The clinic establishes a more vital connection on the part of the education authority with the whole movement of educational hygiene. When under the control of the education authority the clinic cannot fail to increase their interest in the health movement, now making vigorous claims for recognition in the educational arena. (*b*) The clinic serves to build up intimate relations and personal knowledge among parents, teachers, doctors, and children. (*c*) It gives less trouble to the parent, while it presents the physical well-being of the child as of interest not only to the child and the parent, but also to the State. Parents have been accustomed to think of the State as interested only in the mental equipment of their children. The school clinic, perhaps more than medical inspection, will tend to emphasize the national importance of physical efficiency, and teach parents to regard it as of equal importance with mental efficiency. (*d*) When a clinic is fully organized and in effective operation, parents will be encouraged to refrain from the indiscriminate use of charity and from the abuse of hospitals. The clinic will be aided in this respect through the operation of the Education Authorities (Medical Treatment) Act, 1909.

These are some of the more important advantages of the school clinic. But when it assumes other functions than that of treatment, and becomes the administration centre for the whole of the work of the school medical service, it will readily be realized that with the great possibilities of development that lie within the compass of educational hygiene, the possible future influence of the school clinic may be very considerable.

Of the disadvantages of the school clinic there is little to be said. It has been alleged that it does not offer a solution to the admittedly difficult problem of treatment in the counties; and that in towns the facilities that it offers are apt to undermine parental responsibility. Experience has already shown, however, that both objections are more or less theoretical, for the principle of the school clinic can be successfully applied in country districts, and the school clinic, perhaps more than any other institution of a similar nature, tends to increase, rather than to diminish, the sense of parental responsibility.

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XVIII

DENTAL CLINICS FOR CHILDREN.

BY

L. STORROW SHENNAN, L.D.S.EDIN., D.D.S.PENNA.

Surgeon-Dentist to the Dental Clinic of the Carnegie Trust, Dunfermline.

As in the various other branches of medicine, so in the dental profession thinking men are now giving more consideration to preventive measures—particularly where the child is concerned. They recognize that the condition of the teeth is so intimately bound up with that of the general health that if the child be protected from absorption and infection from organism-haunted cavities in the teeth, and if good food be provided, he is rendered more capable of fighting successfully against disease.

GENERAL CONSIDERATIONS.

In point of fact, dentists are beginning to realize that the range and influence of dental caries are not merely local, but that it is an important factor in the production of oral sepsis, of alveolar suppuration, and of such habits as food-bolting; further, that it is of etiological importance in such pathological conditions as inflammation of the tonsils, digestive disturbances, gastric catarrh and ulceration, in the severe anæmias, in peripheral nerve irritations, and probably even in epilepsy. All recognize it to be a cause of neuralgia. When one considers all these points it seems futile to treat diseases of the alimentary tracts in patients whose mouths contain carious teeth, which act as reservoirs of bacteria in surroundings ideal for their growth and dissemination. Regular absorption of poisonous products must take place, and this affects the whole body very seriously by impairing its general tone and lowering its

vitality and powers of resistance to infections of every kind. Dental defects may aggravate constitutional disturbances and prove a cause of malnutrition and consequent mal-development. The individual with carious teeth is incapable of masticating his food sufficiently or of impregnating it well with the salivary juices. Food incompletely masticated remains longer than it should in the stomach. Fermentative changes may arise with, as results, digestive disorders and gastric catarrh.

Enormous sums are expended every year in removing people to the country or to the mountains or to the sea-shore in order that they may breathe purer air. Milk is sterilized in the general endeavour to destroy organisms which may produce disease, but yet most people harbour in their carious teeth micro-organisms whose presence renders all these elaborate precautions more or less nugatory.

In tuberculosis direct infection through carious teeth is highly probable, though, so far as I know, not proved, but caries, by inducing a chronic inflammation of the upper cervical glands, must favour the spread of that disease, because the tubercle bacillus is more able to develop in glands whose resistance has been lowered in this way. In actinomycosis it is recognized that the ray-fungus may gain access to the body through carious teeth.

The converse proposition, that malnutrition affects the condition of the teeth, is not necessarily true. Perfect teeth are occasionally seen in children who never use a tooth-brush and who live under the most unfavourable conditions. One of the first children examined by the writer in school clinic practice was a case in point. His mouth was in splendid condition, the teeth free from caries and clean. No tooth-brush had ever been used. On inquiry, this boy, 11 years of age, was one of the poorest in the school; as the school doctor put it, "he had sometimes to eat crusts off the streets." In spite of all his disadvantages he was big and healthy-looking.

There is more or less marked relationship between physical and mental soundness. A child suffering pain cannot be expected to attend to his lessons or to learn

so well as one who is free from pain; and, moreover, the task of the teacher is rendered more difficult. As Professor Limberg, of Petrograd, remarks: "What is the use of proper school ventilation when the mouths of 6 per cent. to 8 per cent. of the children are cesspools, so that their breath pollutes the air?" And again: "The child may be carefully clothed, but bad teeth have more influence upon the general health." Dr. Jessen, of Strassburg, says: "The greater the amount of dental disease, the worse the development of the child, and the worse the condition of the teeth, the worse the school report."

Statistics from all countries show that dental caries is prevalent in 78 to 90 per cent. of the school population. The dental profession is awake to these facts, and in consequence is recognizing that rational dentistry is a branch of preventive medicine, preventive, moreover, of diseases the seriousness of which becomes more and more evident with every advance of scientific investigation.

Means Employed for Dealing with Dental Defects in other Countries.

Russia.—In Russia attention began to be directed to the necessity for care of the teeth of school children in 1879. In that year Professor Sklifosovsky examined 400 children in Petrograd, and found that 72 per cent. of these had carious teeth.

In 1882 Dr. Palmovitz, in Finland, found that 45 per cent. of the students in the higher schools required dental treatment. Subsequently distinct advance was made, and in 1896 a Commission was appointed by the Society of Russian Dentists. Professor Limberg was chairman, and the Commission made the following rules: "(1) It is essential that children's teeth be examined, and admission to the schools granted only to those with teeth naturally healthy or rendered so by appropriate treatment. (2) To eradicate disease every school should have a dentist to examine the children's teeth twice a year and to give them the necessary treatment. In the military schools the dental officers are required (*a*) to take care of the mouths of the pupils and to use prophy-

lactic measures, and (*b*) to accustom the children to daily care of the teeth, and (*c*) to keep a detailed record with observations as to the results obtained, and to report on expenses and materials used."

Germany.—In Germany also it is a considerable time since the first attempt was made to educate the public as to the relationship between dental hygiene and general health. In 1861 the Central Committee of German Dentists offered a prize for the best popular treatise on this subject. This was awarded to Suersen in 1864, whose book ran through several editions. In Strassburg in 1902, after seven years' agitation, Dr. Jessen obtained permission to establish a municipal school clinic. A sum of money was voted for this purpose, and the clinic is now worked under the best auspices. Inspections are conducted at the schools, and the pupils are sent under the supervision of the teaching staff to the clinic, chiefly out of school hours, though when the condition of the teeth is very bad pupils are allowed to attend during school hours, but only two from the same class at one time. Attention to the teeth of children between the ages of 3 and 6 is compulsory. Pupils with bad teeth are not allowed into the vacation colonies (holiday camps), and they are not allowed to attend school if they refuse to have their teeth attended to. Tooth-brushes are provided for the children by the school authorities, and the school dentist demonstrates how to use them. Lectures are given to teachers, and conferences are held to which parents are invited. Upon the inspection charts, which are sent to the parents of those children requiring attention, simple information about the temporary and permanent teeth and certain rules of dental hygiene are printed. The child brings this chart each time he attends the clinic. The result of this work is seen in the report of the inspector of the Strassburg schools. This states that instead of the school attendances suffering the children actually lose less time in undergoing treatment than in remaining away from school whilst suffering from toothache. Increased strength, physical, intellectual and moral, is evident, and therefore the interests of the schools themselves benefit. Many other towns in Germany have followed

the example set by Strassburg, and at the end of 1911 there were 119 dental school clinics in Germany.

France.—In this country less has been done than in either Russia or Germany. Up to 1908 no attempt was made to introduce dental hygiene in the communal schools. As a matter of fact, an existing law prohibits a dentist from entering the precincts of the school. Apart from the teachers, only inspectors, cantonal delegates and doctors can enter it. It is thus only by courtesy that a dentist is allowed to make inspection of the mouths of children attending the schools, and this is carried out only to a limited extent in some of the colleges and higher primary schools. The fault lies a good deal with the dental profession in France, who do not show sufficient energy in advancing their claims. In the normal schools and boarding schools supported by the State a dental service has been organized. Two dentists are nominated, one to inspect and the other to operate. The pupils are examined twice a year, and charts indicating any necessary treatment are sent to their parents, who take the child for treatment to their own dentist, so that the principal advance made in France is the establishment of the obligatory dental inspection chart. Latterly dental services have been organized in connection with the Public Relief Board. Attendance is given twice a week, and urgent cases receive attention at the hospitals immediately. As remarked by Mdlle. Sommers in a paper on the subject, "All these innovations are useful, but they are not sufficient to check dental caries on a national basis. In order to render the teeth of the whole community healthy and to raise the general standard of health, it is necessary to institute school dental clinics."

Sweden.—Here Dr. Forberg, by his indefatigable zeal, soon brought the importance of dental hygiene to the knowledge of his fellow-countrymen, and in association with the Swedish Dentists' Society prompt steps were taken. In 1896 this society selected a Committee which examined dentally 18,000 (school) children. The condition of affairs revealed was so serious that conferences were held in the primary schools and in the colleges of the capital, and lectures were organized for

children, parents and teachers. Large money prizes were offered for the best books dealing with the teeth and oral hygiene. Statistics of dental caries were shown at a health exhibition held at Stockholm, and the public journals interested themselves in the question, and insisted that the State should intervene. In 1905 the question was taken to Parliament. Complete treatment was given during 1911 at the schools in Gothenburg, and two dental clinics were established in Stockholm, the first one in 1907.

Belgium.—In Brussels there is a complete dental service, established by the late Mr. H. Bôn in 1877. On Thursdays the children attend, accompanied by a master. The schools are visited twice a year, each child being specially examined. It is well attended, both by those indicated by the dentist as requiring attention, and by many who come of their own accord. The school population is 12,000, distributed in twenty-one schools. Schaerbeek has also a school dental service and a clinic.

In Antwerp visits are made to the primary schools, and where the case is urgent, under communal rules children are taken to the private house of the practitioner, who performs extractions and inserts dressings. This is managed by a doctor, not a dentist. It does not include a clinic. The same state of affairs exists at Liége; a doctor of medicine manages the service. Visits are made to the schools, but there is no clinic. At St. Gilles and Anderlecht children are sent to the hospitals; there is no clinic.

Switzerland.—There is a polyclinic at Lucerne, divided into two parts, one for general medical treatment and the other for dental treatment. In the dental department all school children without distinction—not only the poor—are cared for.

Austria-Hungary.—School dentistry makes slow progress in Austria-Hungary. The Austrian School Dental Hygienic Society, established in March, 1911, opened the first school dental clinic in Vienna, and it was found that 99 per cent. of the children had carious teeth. In Hütteldorf the Red Cross Society placed a pavilion in the garden of the primary school.

In Lower Austria, at Berndorf, there has been a school

dental clinic since 1909. In the orphan institutes of Vienna and Judenau two dental clinics are to be established, and others are to be opened in Liesing, Purkersdorf, Neulengbach, and Baden.

In Upper Austria there is no school dental clinic, but private dental practitioners are invited to inspect the teeth of children in the council school of Linz. In Styria, at Graz, tooth-brushes and powder are provided for the poor children. In Fürnstenfeld and Gleisdorf district school dental treatment is obligatory. In Galicia, at Lemberg, a dentist was appointed in 1907 to examine and treat the teeth of children. At Biala there is a dentist for the primary school.

At Prague six school dentists are at work. In the other provinces of Austria and in Hungary there are some medical inspectors, but no school dentists.

Denmark.—Twenty years ago the subject of public care of children's teeth was first brought forward in Denmark. On examination, 93 per cent. of the children were found to have carious teeth. At Frederiksborg, from 1900-1909, a dentist was appointed who visited the various public schools to examine the children. In Svendborg, from 1896 to 1906, the public school children were attended free of charge. The Danish Society for the Care of Children's Teeth, established January, 1910, has already done good work in appointing local committees, which in turn have established clinics and appointed school dentists. Such clinics are established in Esbjerg, Sgórring, Svendborg, Fredericia, Frederiksborg. In other towns one or more dentists have been appointed to examine at the schools, and treatment is given at their private rooms. In Copenhagen children are treated at the dental school, at the polyclinics, and at the new Rigs Hospital.

Italy.—The subject of school children's teeth is just being considered in Italy. Dental inspection at Milan, Turin, Genoa, Leghorn, Padua, Bologna, and Rome shows that nearly 90 per cent. of the children require treatment. This treatment is given partially at Genoa, Turin, and Bologna, and is given under the auspices of the municipality or by benevolent institutions, but there are no true school dental clinics.

Spain.—School dentistry is in a backward condition in this country. "This is owing to the dentists not caring much for teaching or making known what dentistry includes in all its public manifestations." In Madrid there is an organized dental inspection in schools. The posts are not paid, but "there is great enthusiasm, and what will not be done officially will be done by private initiative." In Barcelona ten dentists inspect and treat the district school children. They are treated at the dentists' private offices.

United States of America.—At New York there are three or four dental clinics supported by benevolence in which needy children in the public schools are attended to. In New York State the Health Commissioners appointed four dentists as consultants and lecturers to the Department. These co-operate with the Board of Education. Rochester, Buffalo, Syracuse, Elmira, Cincinnati and Cleveland (Ohio) have dental clinics supported by public subscriptions. In Philadelphia (Penn.) there are ten clinics free to children at the public schools. Clinics are also established at Washington (D.C.), Baltimore (Maryland), Brooklyn, Boston, Worcester (Massachusetts), Newark (New Jersey). In Chicago (Illinois) a dentist is on the Health Committee, and clinics are being gradually established there. At Ann Arbor (Michigan) dentistry is recognized as essential to public health, and at Denver (Colorado), San Francisco, and Los Angeles also there are free dental clinics supported by benevolence.

Means Employed for Dealing with Dental Defects in British Colonies.

Canada.—In March, 1911, in Toronto, a dental inspector was placed on the medical inspection staff of the Board of Education. There is a public clinic with six operators maintained by the city council. In Ottawa, Guelph, and other towns also there are public clinics. In Quebec physicians appointed by the town council examine the children's teeth. The McGill and Laval College dental clinics attend to those requiring treatment, and for this they receive a grant from the city. In Winnipeg there is a public clinic in the

general hospital two mornings a week. This is supported by the profession generally.

Australia.—The question of care of the teeth of school children is progressing slowly but surely in Australasia. The State of Queensland in 1911 appointed the first dental officer to the staff of the school medical officers. It was a purely experimental appointment, but the results have been such that within twelve months of its inception two assistant inspectors have been appointed. These inspectors examine all schools throughout the State. In Brisbane gratuitous treatment is given at the Dental Hospital in necessitous cases, a special surgery being furnished by Government for the purpose. In country schools the headmaster declares which pupils are unable to pay for treatment, and these are treated by the inspector after his inspection is over. All others are expected to obtain the necessary treatment privately. Lectures are given to the children, parents, and teachers on oral hygiene, and leaflets are distributed. Arrangements are made for research work through the Commission of Public Health, and the chief dental inspector states "that he has been able to gather some intensely interesting information and data which may prove of practical value." Periodical visits are made to the country districts where there is a sufficient number of children in one centre. The State is about 1,000 miles by 700, and sparsely populated. Institutions such as reformatories and probationary schools are visited every few months. In Victoria, New South Wales, West Australia, and Tasmania there are no dental clinics, and the muncipalities have done nothing in the matter.

At the Annual Exhibition of the Australian Natives Association held in the month of January, 1913, at Melbourne, there was a hygienic section. In this the Odontological Society of Victoria had collected an exhibit of specimens, charts, &c., pertaining to oral hygiene; and a series of lantern slides was shown.

New Zealand.—Inspection is carried out by medical inspectors who have undergone a special course of instruction at the Dental School of the University of Otago. In most of the large towns the elementary school children are treated at the dental hospitals or

dental departments of a general hospital. In Auckland inspection is made by the dental surgeon in charge of a dental hospital established by the Hospital and Charitable Aid Board. The children are entered on the hospital books as patients. Treatment is optional, and only a small percentage of the children ever return for attention, as it is left to themselves to do so or not. Those whose parents are unable to pay are admitted free. Others are charged merely a nominal rate. It was found that parents take little or no interest in the preservation of their children's teeth, as out of 1,857 examined only fifty came for treatment.

Means for Dealing with Dental Defects in Great Britain and Ireland.

It may be said that the question of school dentistry first began to be considered seriously in this country in 1883.

At the annual meeting of the British Dental Association held in Cambridge in that year, Mr. W. Macpherson Fisher, of Dundee, read a paper on "Compulsory Attention to the Teeth of School Children." He argued that children's teeth should have the same careful consideration as other parts of the body, "that every child's mouth ought to be examined and treated on its entrance into school life . . ." and at least once a year, or oftener, by a qualified dentist. "For the working classes and those too poor to pay for dental service dental dispensaries or other aids should be provided." At the 1886 annual meeting, held in London, Mr. Fisher further insisted that this is a subject which "belongs to the public, and that upon the dental section of the medical profession rests the responsibility of teaching it." "Medical care is given to children in reformatories, industrial schools, orphan schools, endowed hospitals, also Poor Law schools and workhouse schools, but their teeth are neglected." In 1888 he presented a report at the Dublin meeting of the Association, and asked for a small grant to provide means to enable the members of the Association to prove for themselves the correctness of his statements. Some 100

books were provided, and the results were brought forward at the annual meeting at Brighton in the following year. In March, 1890, a committee was appointed "to continue and conduct this collective investigation as to the teeth of school children, and to report thereon finally to the Representative Board." Seven annual reports were issued, showing that 12,318 children had been carefully examined and the condition of every tooth in each child's mouth recorded.

Of late years school dentistry has made rapid strides, and its work is now gradually extending over the juvenile population. In the English public schools, for example, Haileybury College, Wellington College, Marlborough College, Felstead, Uppingham, and schools of a similar type, special arrangements are made for dental service to be given at the schools. At Mill Hill School the boys are inspected each term and a report is sent to the parents. The mode of procedure in these schools varies; but the importance of dental inspection and treatment is recognized, and the necessary facilities are usually available.

At some of the residential benevolent institutions, such as Dr. Barnardo's Homes, the London Orphan Asylum, St. Anne's Asylum, including orphanages for the care of children belonging to the working and middle classes, dentists have been appointed for many years past, and dental clinics (although not known under that name) have been maintained.

In the Poor Law schools a dental service is becoming very general. In the larger schools, such as the parish and district schools of London, dental clinics have been in operation for years, and the standard of work carried out is extremely good. Even now in the smaller boroughs dental arrangements are made, and the general tendency is to conform to the regulations recommended for adoption by the Local Government Board to Guardians when appointing dentists. These regulations, if compulsory, would make the dental service still more efficient. In many cases they have been adopted; and it is hoped, and it is probable, that before long the Local Government Board may be able to make these appointments and regulations compul-

sory. (See Local Government Board Circular, dated July, 1897.)

The Metropolitan Asylums Board, who have the care of many feeble-minded children, have appointed several dentists to look after the children under their control.

Industrial and truant schools, of which a large number exist, are under the control of the Home Office, which has sanctioned the provision of dentists to a large proportion of these schools.

The elementary school population numbers more than six millions. Medical and dental inspection has been for some time carried out, and recently dental clinics have been established in London, under the London County Council, and in many provincial towns by the local education authorities, and the number of these clinics is steadily increasing. These clinics, staffed by part-time and whole-time men, are usually well equipped. Provision is made for a surgery and waiting-room; there is generally a nurse in attendance to give assistance. So far the authorities seem anxious to give the dentist every opportunity for carrying out his work efficiently and well. Much will depend upon the results obtained through the working of these clinics. The public have been told that they are to expect an improvement in the condition of public health, provided the teeth of the children are cared for; and although not interested in the mode of procedure adopted in working these dental clinics, they, no doubt, are looking forward to substantial results as the outcome of their working.

Sir George Newman, in a speech to the members of the School Dentists' Society, laid down four general principles for regulating school dentistry in England. These are: (1) All arrangements for each area should be under the supervision of the school medical officer; (2) the inspection and selection of all cases should be carried out by the school dentist himself; (3) conservative dentistry, both for inspection and treatment, should concentrate upon a definite age period, 6 to 8 years; and (4) dental treatment should always be followed up by regular re-examination, and, if necessary, renewed

treatment. It is hoped that the new Exchequer grant of £60,000 will encourage local education authorities to further progress in this matter.

British Dental Clinics.

Cambridge.—The first school dental clinic in England was established at Cambridge in 1909. At first it was subsidized by a private individual, then it was taken over by the municipal authorities. It is well organized, and everything done to encourage attendance. No extractions are performed at the clinic, but at the hospital, where a room is placed at the disposal of the school dentist. Elementary school children are treated free of charge. Lately an assistant dental officer has been appointed.

Brixton, South London.—Here a clinic was at first subsidized by a private gentleman who grudged no reasonable outlay. The work was begun in January, 1910. Attendance is given on two days after school hours. A nurse is provided. There is an extraction day, when gas is given in bad cases.

Reading.—Of the clinic at Reading, Mr. Vernon Knowles reports that during the first eight months, from December 1, 1910, to July 31, 1911, every school in the scheme of dental inspection and treatment was visited, and the teeth of all children of 5 and 6 years inspected and charted; treatment was afforded at the school clinic in respect of the permanent dentition in those cases where parents gave their consent. It was found that in the children of 5 years of age the first permanent molars were—in by far the majority of cases—unerupted, and where they were in evidence the proportion of instances in which there was any indication of decay was so small as not to justify the time spent in examination and charting. During the months of June and July special attention was given to the inspection and treatment of children of 8 years of age attending at three of the schools. This inspecting and charting took appreciably longer, as the cases requiring treatment were far more numerous and the ravages of decay more extensive. The information and facts gained from the above inspection indicate the advisability of starting with children of 6 and 7 years of age, and

following them up through their school life by subsequent inspections. Small charges are made according to weekly wages of the parents.

Kettering.—With regard to the clinic at Kettering, Mr. Bryan Wood informs me that the children are drawn exclusively from the infants' department. A batch of about sixty are first examined, and their parents are notified that their teeth require attention, and that if they agree the necessary treatment will be carried out by the school dentist at a cost of so much (the charge varies from 1s. to 3s., the former figure including one filling and any number of extractions, and the latter four fillings and any number of extractions). Treatment is then undertaken for those children whose parents give their consent, no further examinations being made until the first batch of children is practically disposed of; this means that no time is lost in examining children for whom treatment is not available. The treatment consists of filling all first molars that are not so far gone as to need pulp treatment, and the extraction of all badly carious temporary teeth. He finds that only about one-third of the parents consent to treatment of their children.

Norwich.—Here the Board of Education furnishes dental aid to children attending the public elementary schools. The cost of this scheme is not to exceed the proceeds of a farthing rate, and this sanction is limited to two years. During 1911, the school dentist informed me, 1,870 children were examined by him in the schools. 1,004 teeth were made artificially sound; 2,499 teeth were extracted. The medical report states that 83 per cent. of the children suffer from caries.

Bromley.—A clinic was established at Bromley in January, 1912, and restricted to children between the ages of 6 and 8 years. Two half-days were given per week, one attendance for inspection in the schools, and the other for treatment at the clinic. A fee of 6d. per attendance for treatment was charged. No charge was made for inspection. No report is yet (January, 1913) available.

Deptford.—There is a clinic at Deptford subsidized by the London County Council. A small fee is paid for treatment. The cost per head is not quite 3s. 3d.

The following extract from report shows dental work done at the Deptford school clinic from August 28, 1911, to July 31, 1912 :—

Number of children who attended	2,794
,, attendances	3,736
,, temporary teeth extracted	3,964
,, permanent ,, ,, ...	730
,, tooth stoppings	4,974
Other operations :—$AgNO_3$ applied, scaling, cleaning, &c.	400
Nitrous oxide gas cases (from January 1, 1912)	297

Worthing.—Arrangements have been made by the education committee for the inspection of the teeth of children attending the elementary schools in the borough of Worthing. Treatment is given to those of ages 5 to 7½, but also to older children if conditions demand. A small fee is charged to parents who are in a position to pay; to others treatment is free. In only 36 per cent. of the cases were the parents willing to allow their children to undergo treatment.

The following is extracted from the report of dental treatment for the year ending July 31, 1912 :—

Number of children on the registers of the schools ...	3,594
,, ,, under 8 years of age who have been examined	907
,, ,, over 8 years of age who have been examined	382
,, those examined whose teeth need attention ...	1,143
,, those examined whose teeth are all sound ...	152
	or 12 per cent.

	Up to 8 years of age	Over 8 years of age
Number of temporary teeth sound	11,509 ...	908
,, ,, ,, savable	320 ...	3
,, ,, ,, unsavable ...	3,820 ...	951
,, permanent teeth sound	3,463 ...	6,397
,, ,, ,, savable	92 ...	320
,, ,, ,, unsavable ...	69 ...	491
,, children treated	— ...	301
,, attendances made by such children	— ...	520
,, extractions	— ...	777
,, fillings	— ...	80
Cases for gas...	— ...	37

Sheffield.—A school dental surgeon was appointed in March, 1911, and work was undertaken along the following lines: (1) Inspection of the teeth of school children in various parts of the city was carried out as a preliminary measure; (2) the complete dental treatment of the children selected for the open-air recovery school; (3) dental treatment of children between the ages of 6 and 8 in certain schools; (4) urgent cases sent up by the school medical officers, nurses, &c., have been treated on two half-days per week; (5) the treatment of the teeth of the children attending the industrial school at Hollow Meadows has been undertaken, the school dental surgeon arranging to visit the school once every month in order to treat children recently admitted. The following is a statement of the work done during the year:—

Number of children inspected	7,660
,, ,, treated	555
,, extractions	780
,, fillings	501
"Gas" cases	153
Local anæsthetics	20
Silver nitrate dressings	98
Arsenical dressings	9

Dental Clinics in Scotland.

Nothing was done with regard to treatment of the teeth of elementary school children in Scotland until 1910, when the Carnegie Dunfermline Trust instituted in Dunfermline a dental clinic for board school children. Lately, however, provision for school dentistry has made a large advance.

In the public schools, such as Fettes, Loretto, Glenalmond, and Merchiston Castle (Edinburgh), arrangements are made by which the pupils are examined periodically, and treatment given either by the school dentist, if the family dentist is too far away, or by the family dentist when the pupil is at home on holiday. A chart showing what attention is required is usually given, and the pupil takes this with him when he goes on holiday.

The Merchant Company Schools, Edinburgh.—The

pupils are medically examined (1) on their entrance to the school, (2) on passing from the primary to the intermediate classes, and (3) on entering the post-intermediate classes. The inspection includes an examination of the teeth, and is conducted by the medical officer of the district appointed by the School Board, unless in the cases when parents desire to have it done by the family doctor.

Residential Benevolent Institutions, such as John Watson's Orphan Hospital, and Donaldson's Hospital in Edinburgh, have arrangements made for examination by local dentists. In the case of the former, children requiring fillings have them put in at the Dental Hospital; a charge is made for extraction under an anæsthetic.

Queen Victoria School, Dunblane.—There is an annual contract with a local dentist who visits the school twice a week. This contract covers extractions, fillings, &c. The boys at first dreaded a visit to the dentist, but now there is no trouble whatever, and they go quite willingly.

Quarrier's Homes, Bridge of Weir.—A qualified dentist visits the homes once a fortnight.

The Scottish National Institution for the Education of Imbecile Children, Larbert.—Very little is being done for the children. An attempt is made to keep their mouths clean. The better class patients have their mouths attended to by a local dentist as private patients; but the pauper cases have nothing done in the way of fillings, only the same dentist occasionally does necessary extractions.

Reformatory and Industrial Schools.—Dentists are appointed to and visit many of these schools; in some instances the children are sent to a dentist only as necessity arises.

The Elementary Schools in Edinburgh.—Formerly, in the case of infants examined, notices were sent only when the extent and nature of the decay seemed likely to interfere with the child's general health. About 30 per cent. of the cases notified received some attention—nearly all extractions.

A Government grant has been allocated to Scotland, and the School Board have decided to give the portion

due to them to dental treatment, but only on the condition that the rates be not involved in the expenditure. Four dentists have been appointed, and treatment is to be restricted to children from 6 to 8 years old.

Glasgow Elementary Schools.—Eight part-time dentists have been appointed. Two centres are fully equipped, the larger containing two sets of apparatus. At each centre there are, in addition to a waiting-room, a room for operations and one for recovery. Nurses also have been appointed.

Glasgow Parish Council.—Arrangements have been made with various dentists in the districts where children are boarded out to examine and rectify any irregularities by extraction or otherwise. It is proposed to examine the children again in six months.

Aberdeen.—A dental clinic is being conducted in connection with the School Board's Medical Inspection Department. Treatment is to be confined to children whose parents and guardians are in necessitous circumstances. Children requiring dentures will be supplied with them, and such attention will be given to the teeth of the children as is necessary to put them in a healthy condition.

Dundee.—Nothing is being done at present for the elementary school children, but the authorities are preparing to initiate a small clinic, in which there will be a dental department presided over by a qualified dentist.

Renfrew.—The School Board have decided that the grant of £50 from the Education Department for medical treatment shall be devoted to dental treatment. This treatment is to be reserved in the first instance for necessitous children whose parents are willing that they should receive it. Thereafter, it is to be extended to those whose parents have not attended to the notification sent them by the medical inspector, but who are willing that their children should receive dental treatment, a scale of charges being drawn up by the Board for such cases.

At *Kirkcaldy* and *Cowdenbeath,* Fifeshire, clinics have been organized.

A special case was brought before the Court of Session, and it was decided that the public rates could not be used for the purpose of furnishing in 1912

medical and dental treatment to elementary school children.

The number of public elementary schools is 3,369. These schools provide accommodation for 1,077,289 children; the average number of scholars on the registers is 755,988.

Dunfermline.—Here the medical clinic of the Carnegie Trust has been in operation for several years, and the institution of a dental clinic was first advocated by the former medical officer of the Trust—Dr. Bridge—who had become convinced during the medical inspection of the school children that attention to oral hygiene was absolutely necessary for the general health of the children. The Carnegie Trust was thus the first to establish a public school dental clinic in Scotland. The clinic was started in September, 1910, two apartments, a surgery and a waiting-room, being provided in the old baths. At the present time plans have been passed for a special building to house both the medical and dental clinics. The surgery is fitted out with the most modern appliances, so that the work is facilitated in every way. I give twelve hours (three half-days) per week to the work. Systematic inspections are made at the schools, and are confined to the children of ages 5 to 10 in the primary departments. I think it best to restrict inspection to the children just entering school and to those in the primary departments, as then one can watch the results of treatment as time goes on and as the child progresses in its studies from year to year. Inspection results were entered on British Dental Association charts. The card system is now used, but notification circulars are sent to the parents or guardians, so that they may allow their children to attend at an appointed hour if they wish them to benefit from the clinic. Further, this notification form is useful, as it gives one authority from the parents to do what one thinks necessary, and has even proved of value when parents themselves interfere as regards treatment. On the appointment cards the age, name and address of the patient are written, and also the day and hour of the visit. If anæsthetics are required, a special form is sent out. Many children between the ages of 4 to 15 come of their own

accord. In these cases the same cards are used, but no notification is sent to the parents. For them appointments are made as vacancies occur, the children examined at the schools being given preference. Tooth-brushes and powder are supplied at the clinic at a nominal price. There is no lack of material, as is shown by my report for the period from the middle of August to December 22, 1911. Attendances at the clinic totalled 1,834—739 boys and 1,095 girls, whose ages varied from 4 to 15.

			Boys	Girls	Total
In August	2 weeks	... ...	85 ..	113 ...	198
,, Sept.	4 ,,	... ...	203 ...	344 ...	547
,, Oct.	4 ,,	... ...	139 ...	171 ...	310
,, Nov.	4 ,,	... ...	176 ...	266 ..	442
,, Dec.	3 ,,	... ...	136 ...	201 ...	337
	17 ,,	(of 204 hours)	739 ...	1,095 ...	1,834

On analysing these attendances, I find that there were :—

21	attendances	at	4	years of age
158	,,	,,	5	,, ,,
315	,,	,,	6	,, ,,
314	,,	,,	7	,, ,,
244	,,	,,	8	,, ,,
224	,,	,,	9	,, ,,
148	,,	,,	10	,, ,,
155	,,	,,	11	,, ,,
110	,,	,,	12	,, ,,
100	,,	,,	13	,, ,,
14	,,	,,	14	,, ,,
2	,,	,,	15	,, ,,

In 29 the ages were not specified.

Thus most attendances were given between 6 and 9 years. The number of individual patients was 693. The number of fillings and dressings was 1,196—738 in girls and 458 in boys.

The extractions numbered 750 :—

2	at	4	years of age	39	at	10	years of age
37	,,	5	,, ,,	40	,,	11	,, ,,
136	,,	6	,, ,,	29	,,	12	,, ,,
181	,,	7	,, ,,	20	,,	13	,, ,,
151	,,	8	,, ,,	0	,,	14	,, ,,
100	,,	9	,, ,,	0	,,	15	,, ,,

In 15 the ages were not stated.

Again it may be noted that the ages of the greater number of those having extractions varied from 6 to 9. Eight permanent teeth were extracted.

Inspection.—The following table gives the result of the inspection of 252 children in the primary department of one only of the schools, but may be taken as fairly representative of the results obtained in the other schools :—

CONDITION OF THE TEETH AT VARIOUS AGES.

Age	Number Sound		Number Carious								
			1—4		5—7		Over 7		Totals		
	M.	F.*	M.	F.	M.	F.	M.	F.	M.	F.	Number of children at each age
4	—	—	2	0	2	0	2	0	6	0	6 at 4 years
5	4	4	10	7	6	5	4	7	24	23	47 „ 5 „
6	5	2	13	13	8	7	11	10	37	32	69 „ 6 „
7	—	3	9	10	9	17	11	16	29	46	75 „ 7 „
8	—	—	6	7	2	8	4	8	12	23	35 „ 8 „
9	—	3	1	2	3	3	2	3	6	11	17 „ 9 „
10	—	—	—	—	—	1	1	1	1	2	3 „ 10 „
	9	12	41	39	30	41	35	45	115	137	
	21		80		71		80		252		252

* M. = Male. F. = Female.

Of these 252, 231 required treatment—or 91·5 per cent.

Thirty-eight per cent. of the total number examined said they used tooth-brushes.

Twenty-one cases (nine boys, twelve girls) required no attention, as their teeth were all sound—that is 8·2 per cent. of the whole number.

For the whole of the school year 1911 the total number of visits to the clinic was 3,083; number of fillings and dressings, 3,135; number of extractions, 1,192, nearly all of temporary teeth; number of *individual* patients treated, 1,368.

Dental Clinics in Ireland.

School dentistry in Ireland has made but little progress. Statistics of the Lough Cutra National Schools are alone procurable, and the inspection in 1909 showed the teeth of the children (about 200 in number) to be apparently worse than those of English children of the same class. The Board of National Education is most sympathetic towards the movement, and have received from the Irish Branch of the British Dental Association a report as to the best mode of procedure. Amongst the districts which are discussing schemes of school dental treatment are the following (the approximate number of children between 3 and 15 years old being shown in each case): Belfast, 98,701; Dublin, 69,001; Limerick, 9,492; Athy, 863; Bushmills, 800. The total number of children in the schools controlled by the Board of National Education in 1910-11 was 699,945. The only districts in which school dentistry is actually in operation are Lough Cutra and Kilkenny, where the total cost is contributed privately, the funds being sufficient to admit of all the children being treated.

Residential Benevolent Institutions.—The Masonic Orphan Schools, Royal Hibernian Marine and Military Schools, Female Orphan School, Dublin, Loughrea Convent of Mercy Orphanage, Birds' Nest, Kingstown, Sir Otto Jaffe's School, Belfast, and several others have the children's teeth regularly inspected and the necessary

treatment given. In other cases the children are sent to a dentist when necessary.

Poor Law Institutions.—Only two Boards of Guardians have appointed dentists for regular treatment. The Belfast Workhouse Schools, with about 400 children, are regularly visited, and, in addition, about 100 boarded-out children are treated at the dentists' private surgeries. Treatment includes children up to 15. Caries is found to be present in about 80 per cent. of the new cases. The workhouse school children in the South Dublin Union also are similarly treated. The total number of resident and boarded-out children is about 430. In some other cases the school children receive dental treatment when necessary.

Industrial Schools.—Of these there are 58. In several, such as the Balmoral Industrial School, Belfast, the Meath Industrial School, Bray, Newtonforbes Industrial School, co. Longford, the children are regularly inspected and treated.[1]

Methods of Combating Dental Caries on a National or Municipal Basis.

The evil is thus recognized. How is it to be attacked? The Education Act imposes the duty of inspection of the teeth upon local authorities, leaving treatment optional. Some advocate the establishment of a State Dental Service, and maintain that it would not be detrimental to the profession for the following reasons: (i) It would provide for a class who never seek the services of a dentist, or, when they do, obtain them at the expense of a dentist at a hospital under the guise of charity. (ii) It would provide for those members of the profession who dislike the commercialism of private practice, or who are specially interested in investigation or from other causes prefer the public service. (iii) It

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[1] The foregoing matter in regard to Great Britain is taken from "Objects and Aims of the School Dentists' Society." Published by John Bale, Sons and Danielsson, Ltd., 83-91, Great Titchfield Street, Oxford Street, W. 1913. Price 1s. net.

would educate the public to the need for and importance of skilled dentistry. (iv) It would create in the working classes a demand for skilled treatment in the future, and for a service which would be characterized by cleanliness of method and careful manipulation, and impress upon them from their earliest years the need for oral hygiene. Instead of militating against the demand for skilled and modern methods of conservative dentistry, it would strengthen the position of the best type of qualified practitioners (Lawson Dodd).

The establishment of such a service would require to be safeguarded by some scheme founded upon a contributory basis, and this would prove an insurmountable barrier. In some of the small towns in Germany a fee of 1s. per head per annum is charged for each child treated, with a reduction in the case of large families.

The second method is that which I have been considering for the greater part of this chapter—the school clinic. These should be established in every centre of elementary education, thus attacking the evil through the children as representing the coming generation. Children should be submitted to regular compulsory inspection of their mouths, and caries treated as soon as detected. The necessity for cleanliness of the teeth as preventive of caries should be emphasized. This is not difficult, as even young children can be readily taught to use the tooth-brush. The inspection should be carried out by a dentist. In New York it was found that examination by medical officers detected only one-eighth of the defects found by the qualified dentist.

Prevention is much less costly than cure, and as Mr. J. G. Turner says, "In a few years the decrease in sickness of dental origin might reasonably be expected to lead to a substantial decrease in poor rates, and set free for more useful purposes a large amount of charity now used up in attempts to rehabilitate the wrecks of humanity."

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XIX

OPEN-AIR SCHOOLS AND RESIDENTIAL SCHOOLS FOR DEFECTIVE CHILDREN.

BY

LEWIS WILLIAMS, M.D., D.P.H.

Medical Superintendent, City of Bradford Education Authority.

THE consideration given to the physical condition of school children during the past few years has resulted in an attempt on the part of education authorities to classify and differentiate the children according to their physical and mental condition. It has been found necessary, for instance, to make special provision for teaching children who are deaf, blind or crippled, and also for those who are mentally defective. These groups of scholars obviously needed something more than the ordinary elementary school could supply. The advent of the school doctor has brought to light still another group of children who urgently need special provision, and the necessity for this provision is probably more urgent and more important than for the ones already enumerated, inasmuch as the defects are more varied in character; that in the large majority of cases not only one single organ of the body is affected but the whole constitution is in danger of being wrecked, and that the number affected is far greater than in any other group of "special children." It is probable that at least 10 per cent. of all elementary school children are in urgent need of open-air treatment. Moreover, it may be confidently hoped that a much better return will accrue by the supplying of special provision in the case of this particular class than has been the case with regard to other classes of "defectives."

In the deaf, blind, crippled and mentally defective child, the damage to the physical or mental condition is irreparable, and, in spite of all we can do, we can expect ultimately only a defective and incomplete product. On the other hand, we can safely affirm that a large majority of the children included in the group under consideration, though they are seriously damaged and more or less defective in some way, can, by means of special treatment, be brought up to something approaching, if not altogether, a normal condition.

Many of the children who are suitable for treatment at an open-air school do not suffer from any definite disease, they are merely delicate or debilitated, and such children become an easy prey to diseases of various kinds. For these the open-air school may be looked upon more as a preventive than a curative measure. The more definite physical defects which can advantageously be treated include one or more of the following: Tuberculosis in all its varieties—the most frequent form being phthisis in its early stages; anæmia, which, though in itself not a fatal disease, is a common precursor of more serious complaints; enlargement of lymphatic glands; chronic bronchitis and other chest complaints; heart disease; rickets; certain diseases of the nervous system, such as chorea, mild epilepsy, stammering and malnutrition, with which is so often associated mental dulness.

A perusal of the Annual Reports of the Chief Medical Officer of the Board of Education and of the reports of local medical officers reveals an appalling number of children who are classified under the conditions already named. The following list indicates the most noteworthy percentages of children who suffer from the defects stated:—

Form of Defectiveness	Percentage
Malnutrition ...	... from 1 per cent. to 31 per cent.
Tuberculosis ...	... about 1 ,,
Heart disease ...	... ... 0·2 ,, to 3·7 ,,
Adenoids ...	... about 8 ,,
Bronchitis ...	... ... 2 ,, to 10 ,,
Rickets ...	... ... 2 ,,
Enlarged glands	... ... 4 ,,

For all children afflicted with ailments such as the above the ordinary school is not suited, the environments are unsatisfactory and the curriculum is not suitable. In a report upon the first open-air school Dr. Rose says: "The school doctor insisted on the necessity of open-air treatment, suitable surroundings, careful supervision, feeding and exercise. The teacher modified the ordinary school curriculum to meet the altered conditions. He lowered the hours of formal instruction by about a half, and reduced the classes to about twenty-five per teacher. He proposed, further, to abandon some of the mere memory ballast in the elementary curriculum and to impart his instruction in a more concrete manner, bringing it into touch with actual outdoor conditions. It is a new type of school where sick children are to be cured and taught at the same time. If such children are to be kept in ordinary schools they may be instructed, but their ailments will not be removed. If they are treated in convalescent homes only, their instruction suffers. The open-air school solves the difficulty."

The Evolution of the Open-air School.

The home of the open-air school is in Germany, where at Charlottenburg, in 1904, the first such school was established. The school was built in a simple manner; it consisted of: (1) a plain shed for wet weather use, for teaching purposes, or for the "resting" period. (2) A more substantial building for very cold or rough weather. (3) Large sheds for meals, and (4) a number of small sheds for teaching purposes during unfavourable weather conditions. Other schools on the same principle were quickly established at Mulhausen, Elberfeld, and Cologne. The London County Council started the first open-air school in this country in 1907, the Board of Education agreed to its certification under the Elementary Education (Defective and Epileptic Children) Act, 1899, which not only allows of a larger grant, but gives more freedom regarding the curriculum. Moreover, it restricts the number of children to a maximum of twenty-five per teacher. The following year three similar schools were opened in Norwich, Halifax, and Bradford.

Planning and Construction of School Buildings.

The site of an open-air school should of necessity be situated as far from the town as is conveniently possible, elevated, and yet protected from prevailing winds; as, for example, by a wood or rising ground. The school building should be simple in construction, and though the building itself should be used as little as possible, it should contain provision for resting and teaching in bad weather. The classrooms, which should be of the classroom veranda type—a movable partition separating the room proper from the veranda—should be well lighted and efficiently cross ventilated, the verandas being provided with movable partitions or roller screens on the weather side, so that teaching may, as far as possible, be given in the veranda even in bad weather. Ample accommodation for resting in stormy weather and for dining can be made by means of large sheds provided with roller screens on one side. For the preparation of meals, &c., a kitchen, scullery, and storerooms are necessary, these to be situated near to the dining shed.

A large plot of ground, preferably partially wooded, surrounding the school premises is essential to an open-air school for gardening purposes, for physical exercises, for teaching in fine weather, and for Nature study. The furniture will include single desks or small tables and chairs, all light in weight, as to be easy of carriage from and into the rooms. For resting purposes, simple stretchers of wood and canvas are necessary, and a couple of rugs for each child. It is further desirable that some extra garments should be provided for school use during winter, *e.g.*, thick woollen jerseys. Each child should be provided with a separate towel, toothbrush, and the girls each with a brush and comb.

The situation of the school has necessarily to be some distance from town and therefore the scholars have to be conveyed to and from the school by tram-car or other means.

The Teaching Staff.

The teaching staff should be selected with very careful consideration; they should be bright in disposition,

patient in their duties, and sympathetic in their bearing towards the children ; those teachers are preferable whose comprehension of what teaching should be is of the broadest and most elastic nature, and who, in spite of having been carefully trained, long to break away from the trammels of discipline, percentages, and purely educational results. Experience in teaching manual work, domestic subjects and gardening is very desirable, and lastly, a faculty for correlating these subjects with those of the ordinary school curriculum. The staff of the school will also include a cook or cooks and caretakers, preferably a man and wife, who can conveniently be allowed to assist at bathing, gardening, &c.

The Time-table of an Open-air School.

This should allow room for much elasticity. No hard and fast rules are permissible, work and play must be more or less blended, and the time-table must be capable of easy adjustment, for instance, to suit unusual weather conditions. Roughly speaking, not more than three to three and a half hours per day should be given strictly to lessons, fifteen minutes daily for physical exercises, the remainder of the time will be occupied with meals, play, and rest. The following has been found to be a good average programme for the day :—

Time Table.

9 a.m.		...	Breakfast.
9.45	to	10.45	School work.
10.45	,,	11.0	Games.
11.0	,,	12.0	School work.
12.0	,,	12.30	Play.
12.30	,,	1.0	Dinner.
1.0	,,	3.0	Rest.
3.0	,,	4.30	School work.
4.30	,,	5.0	Play.
5.0	,,	5.0	Play.
5.30	,,	6.0	Games.

It must be remembered that children attend an open-air school on account of their physical condition, and this consideration must always have first place in whatever pertains to the school. In order that the instruction

shall be given out of doors every subject should be presented in as concrete a manner as possible; full advantage must be taken of the materials to hand in the shape of surrounding objects which abound in the fields and woods. A capacity for the adaptation of these natural objects to the teaching of school subjects is invaluable.

Many subjects can be taught in this concrete manner. For instance, geography can be taught by allowing the scholars to construct relief maps in sand or cement, and the majority of geographical definitions can in this way be suitably illustrated; a little ingenuity on the part of the teacher, together with some clay and water, and behold a real river, lakes, islands, peninsulas and mountains. Quite a variety of subjects can be correlated with gardening. Arithmetic can be taught, for instance, by measurement and area of plots, paths, and seed beds, calculations of amount of seed, cost, weighing, and market value of the produce; making out bills, profit and loss accounts, estimation of cost of labour, rent, upkeep and repairs. Nature study, drawing, meteorological observations, &c., are subjects which are easy of adaptation to the curriculum of an open-air school.

Domestic subjects can very appropriately be taught to the girls, who may take turns in assisting at the preparation of meals, in dish washing, cleaning of cutlery, laying and waiting at table. They can also make such things as serving aprons, hand towels, brush and comb bags, sun bonnets, and many other articles which are in daily use at the school, besides repairing various things when necessary. Whilst the children are doing all this work the teacher should take every opportunity of correlating any subject he or she thinks advisable. The practical application of school subjects in this way must awaken the interests of the children and will give them a much more intelligent idea of their utility.

Rest.

After dinner two hours should be devoted to absolute rest. The children should roll themselves up in blankets and lie down on specially constructed stretchers, arranged in rows in the resting sheds, the sides of which are fitted with revolving shutters, which can be drawn

down when necessary in order to obtain protection from the wind or rain, or both. In fine weather the stretchers should be placed out in the open field or in the adjoining wood. The value of this enforced rest cannot be overestimated. For children such as attend an open-air school, it is, perhaps, as important as good food or fresh air.

At playtime the children should be allowed to romp or roll about just as they please. At times the teachers will supervise and organize games, every effort being made to see that the children thoroughly enjoy themselves with the minimum amount of rough play, and the maximum amount of fairness and consideration for one another. Not only at play, but at meals, and while travelling to and from the school, the older and more robust ones should be taught to consider it a part of their duty to assist and give preference to the weaker ones.

Baths.

Each child should be bathed at least once a week under supervision, not necessarily with a view to cleanliness alone, but also as an object lesson in personal hygiene, and as a powerful restorative to their jaded constitutions. This is best done by means of shower baths, which should provide for bathing several children at once, the whole being controlled with valves, to which is attached a thermometer, for mixing hot and cold water. The bathing arrangements should include a set of dressing cubicles heated by hot-water pipes.

Another important feature of the curriculum is physical exercise. Systematic drill should be taken for a short time, at least once a day, and probably what is of still more vital importance, the children should be taught breathing exercises. In a very simple but effective manner they can be taught to imitate the normal act of respiration, and these exercises are to a great extent responsible for the marked increase in lung capacity which has been noted in the children after several weeks' treatment. Some of the children will be allowed to take part in breathing exercises only and others will take no exercise at all.

The Dietary of an Open-air School.

An adequate supply of nourishing food is necessary. It must be plain, wholesome, and well cooked, easy of assimilation, and its quality and ingredients suitably adapted to the needs of growing children. In the selection of food count must be taken of the period of the year. Fruit and vegetables will predominate in summer, and fatty foods in winter. The following has been found to be an arrangement which provides meals which are palatable, digestible, and nutritious.

Breakfast.—Oatmeal porridge, treacle, half a pint of milk, bread and butter.

Dinner.—Two courses chosen from the following:—

First Course: Scotch barley broth, tomato soup, meat and vegetable soup, haricot bean or lentil soup, meat and potato hash, shepherd's pie, gravy and green peas (or carrots and turnips); Yorkshire pudding with gravy and green peas; cottage pie (meat and potato with crust) and green peas; stewed beef and onions, carrots and turnips; stewed fish, parsley sauce, mashed potatoes and green peas. *Second Course:* Sultana or jam roly-poly pudding, fruit tart, boiled fruit pudding (plum or apple), milk pudding with stewed fruit, boiled rice and sultanas, cornflour, blancmange.

Tea.—Half a pint of milk, bread and margarine or jam, and occasionally wholemeal cake.

Selection of Children for Open-air Schooling.

It must be clearly understood that the open-air school is provided for children who are suffering from certain physical disabilities, and just as in other special schools admission is regulated by the condition of the eyesight, hearing or mental condition, irrespective of a child's social position, so in the case of the open-air school the presence in a child of one or more of the defects which render him suitable for admission should be the passport to the school. It has been found that a great number of children who attend ordinary schools irregularly on account of ill-health are very suitable cases for attendance at the open-air school. Before admission to the school, each child's parent should be interviewed by

the school medical officer and advice given regarding the home treatment of the child.

After admission each child will be carefully examined and its condition entered on a health schedule, details of physical defects, height, weight, lung capacity, and the condition of the blood entered up; from time to time re-examinations will be made for purposes of comparison with the results of the examination on admission. Where necessary defects such as tonsils and adenoids, running ears, defective vision and decayed teeth, should be treated prior to admission or soon after admission. The head teacher, having access to all the information contained in the health schedules, modifies the school curriculum as is indicated in each case.

The school should be visited regularly, say once a week, by a medical officer, and the children and the entire arrangements for their treatment and education kept under strict supervision, so that any change in the management of individual children may be effected without delay.

The duration of attendance at the school will depend entirely upon the physical condition of each child; three months may be taken as the minimum period for simple cases, such as anæmias, &c.; others will remain in attendance for six to twelve months before the maximum benefit has been reached; a few will be found unfit ever again to attend any but an open-air school. No child ought to be discharged until the school medical officer is satisfied that it has obtained all the benefit which the treatment can supply.

Varieties of Open-air Treatment of School Children.

(1) *Country Holidays.*—These are for the most part of a voluntary nature. In most large towns there are facilities for sending away to the country or seaside a large number of the poorer scholars. Excellent as is this arrangement, it provides only a very inadequate amount of the fresh air which the children require.

(2) *Country Schools.*—For the reception of children chosen on account of their delicate health for a few months in summer time. Debilitated children can

obtain a large amount of benefit by such an arrangement, whilst they are also able to continue their educational work. Such a school has been established by the Leicester Education Committee and has proved to be an unqualified success.

(3) *Playground Classes.*—Either in the school playground or in playing sheds. Accommodation may be made in this way: (*a*) For selected children from all standards who are delicate. (*b*) For all the standards who will use the accommodation in rotation.

(4) *Open-air Classrooms.*—These may be arranged for in the rooms of an entire school in which provision is made for throwing open the whole of the south side of each room, as at York and Brynaerau, or may consist of specially constructed open shelters attached to the school building.

(5) *Day Open-air Schools.*—Educational establishments of this class exist at Birmingham, Bradford, Halifax, Sheffield, and other large centres. The results obtained at these schools have been remarkable, the best results being obtained in those schools which are kept open all the year round.

(6) *Residential Open-air School.*—Few such schools of this class unfortunately yet exist, though this form of school is the only efficient means of treating many delicate children, who cannot be satisfactorily dealt with unless they are completely removed from their home environment; this applies especially to tuberculous children and those who have been exposed to infection in tuberculous homes.

(7) *Sanatorium School.*—For certain classes of children the sanatorium school is essential where treatment and education can be carried on coincidently. An increasing number of this class are coming into existence.

Results of Open-air Education and Treatment.

The open-air school as a special school differs from all other forms of special schools in that it cannot be considered to be a permanent establishment. It was instituted in the first place as an experiment, but is now rapidly becoming an object lesson in school manage-

ment. It has established a high standard of educational efficiency to which it is hoped that all schools will aspire, and when the principles which govern the open-air school have been applied to all schools the need for the existence of open-air schools, as such, will probably cease.

Upon the evidence that the open-air school provides a rational and efficient form of education, it is suggested that the time has arrived when all our schools shall be managed on lines more nearly approaching those of the open-air school. That this is highly desirable will be admitted if we consider the contrast between the two types of schools.

In the open-air school there is abundance of health-giving fresh air, whilst in too many of our ordinary schools the conditions of ventilation, lighting and heating are in direct contravention of all the laws of health. The facilities for washing and bathing in many old type schools are practically nil, and where they do exist they are often totally inadequate; the educative value of, for instance, the supply of one towel between a hundred or more children is sufficiently obvious.

More advantage might also be taken of the provision of school meals—not only for the so-called necessitous children, but for a large number of children who, though they obtain sufficient food at home, obtain only a sufficiency of unsuitable food.

The physical results of open-air treatment are measured in improvement in nutrition with increase in weight, increase in lung capacity, and in the hæmoglobin estimate. Added weight and increased percentage of hæmoglobin and expanded chests are all valuable and nearly constant signs of health regained.

The evidence of school medical officers is overwhelmingly convincing that nearly all children who attend an open-air school derive considerable benefit thereby, and many are discharged from the school in a perfectly sound physical condition. Moreover, this improvement is, for the most part, maintained after the children resume attendance at an ordinary school. Apart from the purely physical benefits derived the children improve in many other respects. Dr. Rose, in one of his

reports to the London County Council, says: "All teachers agree in noticing a considerable increase in the attention and mental alertness of the children during the hours of instruction; their reports show that in the great majority of cases the results were satisfactory. Three months after the return of the children to their various schools in town reports were sent in from the head teachers of the schools in question, showing that in almost all the cases the children were able to continue in a normal manner the instruction with their former class; in a few cases their progress was even more satisfactory than before their attendance at the open-air school. No less important than the above results was the great improvement in the moral tone of the children. Their behaviour showed great improvement, especially with regard to order, cleanliness, self-help, punctuality, and good temper." An opinion must be given as to the permanency of the results. In this connection special reference may be made to the Bradford open-air school, the records of which are the only ones available to the writer. A review of the work of this school since its inception indicates that the improvement in the physical condition is a lasting improvement in a great number of children; but, unfortunately, in some cases the benefit obtained has only been of a transitory nature, and it has been found necessary to readmit to the school a certain number of children after varying periods of attendance at ordinary schools.

Of the total number of children who have attended during the last five years, about 8 per cent. have relapsed after readmission to an ordinary school, and have consequently been retransferred to the open-air schools. The diseases from which these particular children suffered were as follows:—

Disease	Percentage
Tuberculosis	3 per cent.
Anæmia	2·6 ,,
Bronchitis	1·0 ,,
Chorea	0·8 ,,
Heart disease	0·5 ,,
Rickets	0·1 ,,

These more or less disappointing results indicate that the open-air (day) school falls short of the requirements of some delicate children, and it is obvious that nothing short of residential provision for such is adequate. It is much to be regretted that so large a number of these children relapse. The causes are probably: Firstly, that these particular children are badly affected with the disease from which they suffer, and secondly, that it would appear well-nigh impossible for many of them to obtain suitable environments at home. Conditions conducive to good health are absolutely impossible in some of the homes in which they live.

Financial Considerations.

The cost of an open-air school is somewhat higher than the cost of an ordinary school, but against this it must be remembered that the school earns a higher grant per child from the Board of Education, and, further, the expenditure is financially a sound one, for the children treated are for the most part cured and rendered physically fit to become ultimately self-supporting and independent citizens, whereas they would otherwise become physical wrecks and a burden to the community. The cost of their support and treatment in sanatoria, hospitals and workhouses would be infinitely greater than the cost of prevention, such as has been indicated. In a recent report issued by the Public Health Service of the United States it is stated that "In the outdoor school is found one of the cheapest, simplest, and most efficient remedies for the cure and prevention of tuberculosis among school children. It is beyond the stage of experiment, and is recognized as one of the standard remedies."

General Conclusions.

The outstanding features of open-air school life are: (1) The constant provision of fresh air; (2) wholesome food; (3) rest; (4) cleanliness; and (5) medical supervision. It is more than a mere coincidence that these features, which are undoubtedly the principal adjuncts to good health, should be the most striking characteristic of an open-air school.

Apart from such a school it would seem difficult for many of our elementary school children to obtain them. Their homes and their home life preclude their chances of getting fresh air. Their opportunities of regular bathing at home are remote, for the houses of the working classes rarely contain facilities for bathing. The large number of children suffering from malnutrition suggest that suitable and proper feeding for some reason or other is all too rare. The crowding of bedrooms so common in large cities must necessarily be followed by rest and sleep which is much disturbed. It is, therefore, very obvious that the very things our growing children most need are not available for them. It is impossible to make provision for all school children in open-air schools, but it should not be impossible to apply the principles of an open-air school, principles which have been proved to be sound and beneficial, in their school life and in their home life. Moreover, these principles applied in the cases of healthy children would result in the prevention of much disease and suffering. If the open-air life will revive the constitutions of debilitated and diseased children, if it will cure disease, it will most surely prevent it.

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XX

SCHOOLS FOR CRIPPLE CHILDREN.

BY

R. C. ELMSLIE, M.S., F.R.C.S.

Orthopædic Surgeon to St. Bartholomew's Hospital; author of "The Care of Invalid and Crippled Children in School."

Crippled children form a group for whom sympathy is easily elicited, and for whom much has been done by sporadic effort in the past. It must be evident to all that one who is severely handicapped physically is unfitted to mix in an ordinary school with healthy boys and girls, is certain to miss a great deal of his education through periods of ill-health, and, further, will require a special education leading to a skilled trade if he is to be enabled eventually to earn his own livelihood. But such education as was obtained in the past for cripples has been sufficient to embrace only a small proportion of the total number of children affected.

General Considerations.

Until recently, when the education authority assumed the responsibility for the education of children classed as physically defective, it was by no means uncommon even in London to find a crippled child who, at the age of 16, had never been to school, and had never learnt the rudiments of reading and writing. It is to be hoped, for the sake not only of the children, but also of the community at large, that this will not be so in the future, but rather that all these children will be given not merely an ordinary education, but also an introduction to such a trade as they are able to carry on in after years.

Apart from the mere physical defect, there is another reason why these cripples are unable in most cases to profit by the instruction in ordinary elementary schools.

Crippling is in most cases the result of some chronic disease, necessitating prolonged treatment by medical or surgical means, and this treatment, whether carried out in hospital or in the home, is apt to interfere for very long periods with school attendance. About one half of the crippled children in London are affected with tuberculous disease of the spine, bones, or joints. Of the remainder, a great many suffer from infantile or some other form of paralysis, others from deformities acquired as the result of accident or acute illness, and only a comparatively few have been crippled from birth.

Tuberculous disease of the bones and joints is acknowledged to be the chief cause of crippling in all European countries. This disease is of a very chronic nature, arises usually at an early age, and requires prolonged treatment. It comparatively seldom causes death, but very often indeed leaves the child much deformed. Its treatment requires that the part affected should be rested for long periods, and in the case of disease of the hip and spine, the two most common situations, this necessitates treatment in recumbency. It is thus not uncommon to find that a child who suffers from tuberculous disease of the hip joint has been kept recumbent for a period of three, four, or more years. Such prolonged treatment is ideally carried on in a hospital situated in the country, but unfortunately at the present time, owing to a lack of sufficient accommodation in such hospitals, many of these children have to be treated in splints in their own homes, with occasional periods of stay in the country, and with the addition of treatment for a short period in one of the larger hospitals when some acute symptoms or perhaps an abscess require it. Even when the disease has been arrested the child still requires treatment by support to the affected part, and the disease, although apparently cured, is really only arrested, to break out again at very slight provocation as the result of some slight injury, or simply as the result of a little failure in the general health. It thus comes about that these children require not only prolonged treatment, but also after supervision for a considerable number of years. Further, many of them are left permanently crippled, so that in after life they are

unable to compete in ordinary trades with their healthy fellows, and unless some special occupation is found for them it is likely that they will break down.

It will thus be seen that these tuberculous children, affected early in life, are apt to miss much schooling during the period of their treatment, require special supervision after recovery to prevent injury, and also require eventually to be trained to a suitable occupation if they are to be enabled to earn their livelihood.

Nor do the requirements of other cripples differ much from these. Infantile paralysis and the other forms of paralysis which are common in children are slow in their recovery, and often require to be actively treated for many years. They may leave the sufferers disabled, so that for them to mix with healthy boys and girls in school may be dangerous, and so that eventually they also will require a special skilled occupation. The same may be said of a large proportion of the causes of physical disabilities in children.

Legislative Powers.

In England the Elementary Education (Defective and Epileptic) Act of 1899 gives permission to education authorities to establish special schools for children who, by reason of physical defect, are incapable of receiving proper benefit from the instruction in an ordinary public elementary school. At present this is a permissive and not a compulsory Act, and only comparatively few education authorities have taken advantage of it. In London special schools for physically defective children were at first established through charitable assistance. These first schools were taken over by the London School Board in 1900, their methods of organization have been in the main kept in subsequent development of additional schools, and have been largely copied in other towns. The system of such special day schools may, in fact, be described as the London system.

In London at the present time there are about forty such schools. Each serves an area extending for a distance of a mile or a mile and a half from the school, most of the children being collected in the morning and

taken home at night in ambulances. Some of the children walk a short distance and meet the ambulance at a point, others walk the whole distance. The school hours are from 10 to 12 in the morning, and from 1.30 to 3 in the afternoon, but some of the children arrive at 9.30, and some do not leave until 3.30. At 12 a dinner is served, for which each child pays twopence. This meal is arranged for by a Dinners Committee, which is prepared to provide a meal free or at half price in cases of poverty. Each school has a nurse in attendance throughout the day; she takes charge of one of the ambulances and so meets many of the parents, and she has complete control over the children outside the class-rooms. Couches are provided sufficient in number for those children who are obliged to lie down, and also to provide for necessary occasional rests for other children.

Children are passed into these schools at special medical visits held at each school once a month. At these visits also any child attending the school may be shown to the doctor by the nurse or head-mistress if considered necessary. Additional medical visits are paid from time to time for the examination of the children in attendance at the school. The Board of Education requires that these children shall be medically examined once a year; they are, however, actually seen rather more often.

This London system of day schools enables crippled children to gain a good general education; they are kept at school until the age of 16, and the elder boys are taught a certain amount of carpentry, tailoring or shoemaking; the elder girls in some cases get special instruction in fine needlework, so that a small amount of technical instruction is given. But, apart from the education provided, this system is of use in other ways. Through the regular supervision by the school nurse and doctor proper medical treatment is made certain. As already mentioned, the treatment of these cripples is often lengthy, and without some stimulus the parents of poor children are apt to abandon it in the middle. There is no doubt that these schools, through the watch which can be kept upon the children who attend them, have done a very great deal to improve the general level

of treatment of cripples in London. A good school nurse and head-mistress and a few energetic managers, co-operating with outside agencies for the care of invalid children, can do an enormous amount in securing the full benefits of medical, surgical, and general treatment.

Residential Schools for Cripples.

But much good as this system undoubtedly does, there are still many children for whom it cannot provide at all, and there are others for whom it does not provide all that is wanted. Attention has already been called to the fact that much of the treatment of crippled children is, or should be, carried out in residential institutions, preferably situated in the country, which will receive the child, carry out the necessary medical treatment, and keep him as long as is necessary up to a period of several years. Such institutions, owing to the length of stay required, must be incomplete if they are not schools as well as hospitals. Institutions of this sort are increasing in number in England; as good examples may be cited Sir William Treloar's Hospital for Cripple Children at Alton, the Alexandra Hospital for Hip Disease, St. Vincent's Home at Northwood, and the Liverpool Country Hospital for Children at Heswell. In addition, the Manchester Education Committee have such a special residential school, and several other local authorities are engaged in providing them at the present time. An increase in the provision of this sort, amounting to many times that at present in existence, will, however, be necessary before there is sufficient to take all the crippled children requiring such institutional treatment. When this provision is sufficient, however, the gain to the community resulting from the physical and educational improvement in the children who would otherwise be severely crippled will be enormous.

Vocational Training.

Another important point in the education of crippled children is the necessity for a close scrutiny of the occupation which it is proposed that the child shall take up for life. It is obvious that a child who is to go

through life with some permanent disability must be given some skilled occupation, and cannot be expected to compete in manual labour with healthy fellows. In the London system of day schools an attempt is made to provide for this by means of an After-Care Committee, to whom children are referred when they are about to leave school, who do their best to find a suitable occupation, and who are able, through the supply of funds by charity, to pay for the apprenticeship of a certain number of the children. This system is able to deal with a limited number of cripples; it could deal with them more easily and more effectually if they were trained whilst at school in the elements of the business or trade which they are subsequently to take up. It is for this reason that attempts are made, and must be continued, to supply a technical education to cripples. This attempt is the oldest of all efforts to educate cripples, residential trade schools for cripples having been in existence many years ago. At the present time there are several such in England, including the colleges at Alton, and at the St. Vincent's Home in connection with the hospitals already mentioned, Wright's Lane School for Boys in Kensington, and the Heritage School of Arts and Crafts at Chailey. But these can deal with only a very small proportion of the cripples, and have only touched upon the fringe of the question. A separate attempt has been made to solve the problem of trade education for cripples by the establishment of day trade schools or of trade classes in the ordinary day schools for cripples. The difficulty here is that the number of children who are cripples and who are fitted for a training in one special subject is so small that the school must collect from a very wide area in order that a class of sufficient size may be made up. For this reason it appears probable that trade training for cripples will have to be carried out in residential institutions, although a proportion of the less severely crippled will be capable of attending ordinary trade classes at a polytechnic or technical school. At the same time it is most important that manual classes should not be abandoned in the ordinary day schools for cripples, for these teach the children a certain

amount of manual dexterity, even though they cannot teach them a trade.

The Need for Hospital Schools.

Looking at what has already been done, it may be said that the education of cripples in England is already well advanced in the establishment of principles as the result of experimental work, but that a very great deal remains to be done before these principles are carried out upon a scale sufficient to provide for anything like all the crippled children of the country. In the first place, many additional institutions of the nature of hospital schools are required, in which the medical and surgical treatment of the children can go on hand in hand with their education, and in which the children will be kept until there is not only no immediate necessity for further treatment, but also no likelihood of a breakdown requiring further treatment later on. In the second place a completion of the system of day schools is required at least for the large towns, so that all cripples may be discovered, kept under observation, and educated under circumstances which are not likely to interfere with their health. And, in the third place, much additional accommodation is required for the technical education of cripples, so that they may be placed in an occupation which will enable them to earn their living. And this trade education, at least in a considerable proportion of the children, will have to be carried on in residential institutions.

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Information relating to cripples will be found in the "Annual Charities Register and Digest" of the Charity Organization Society, Denison House, 296, Vauxhall Bridge Road; published by Longmans, Green and Co., 39, Paternoster Row, London, E.C., 5s. net.

Those interested in the care and training of any cripple child should always communicate with the education authorities of the district in which the child resides.

In "Trades for London Boys and How to Enter Them" and in "Trades for London Girls and How to Enter Them," compiled by the Apprenticeship and Skilled Employment Association 36 and 37, Denison House, 296, Vauxhall Bridge Road, London, S.W., and published by Longmans, Green and Co., 39, Paternoster Row, London, E.C. (price 9d. net each), particulars are given of possible trades for physically handicapped cases.

Various societies and institutions assist in the care of crippled children, and among them may be mentioned the following :—

The Invalid Children's Aid Association, Denison House, 296, Vauxhall Bridge Road, London, S.W.

The Guild of the Brave Poor Things, Bermondsey Settlement, London, S.E.

The Association for the Care of Catholic Crippled Children, 29, Eccleston Square, London, S.W.

The After-Care Committee for Blind, Deaf and Crippled Children, Parliament Mansions, Smith Street, Westminster, S.W.

The National Children's Home and Orphanage, 104-122, City Road, London, E.C.

The National Industrial Home for Crippled Boys, Wright's Lane, Kensington, London, W.

The Lord Mayor Treloar's Cripples' Home and College, Alton, Hampshire.

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XXI

DEFECTIVE SCHOOL CHILDREN IN SCOTLAND.

BY

GEO. ARBUCKLE BROWN, B.Sc., M.B., D.P.H.Cantab.

Principal Medical Officer, Govan Parish School Board; late Assistant to Chair of Forensic Medicine and Public Health, Glasgow University; late Medical Officer of Health Burgh of Partick, &c.

AND

KATE FRASER, M.D., B.Sc., D.P.H.

Deputy Commissioner to the General Board of Control, Scotland; late Assistant School Medical Officer, Govan Parish School Board, &c.

The Education (Scotland) Act, 1908, provided the legal powers necessary for the establishment of medical inspection of school children throughout the length and breadth of Scotland. That Act came into operation in January, 1909. As a matter of history it is interesting to note that medical inspection of school children had been initiated in two places in Scotland prior to the commencement of the Act. The Carnegie Dunfermline Trust appointed a medical officer in 1906. Medical inspection was carried out by arrangement with the School Board, and the "First Annual Report on the Medical Inspection of School Children in Dunfermline" was issued in 1907. Govan Parish School Board was the first in Scotland to establish medical inspection on a comprehensive scale. Eleven part-time school medical officers were appointed in June, 1907, and every school within their district was visited at least every alternate week. The first Report was issued on the completion of the work in 1907. In the Glasgow Board Schools a

system of inspection of the eyesight of the children by a well-known ophthalmic surgeon was instituted, but there was no general medical inspection as we now understand it.

In 1909, in consequence of the commencement of the Education Act, there was a general awakening of the school boards, in rural as well as urban districts, to the importance of instituting efficient medical inspection in the schools. That Scotland as a whole was fully alive to the necessity for systematic medical inspection is amply demonstrated by the fact that within a short period medical staffs had been appointed and inspection seriously begun in practically every district in Scotland. During the past four years the system of medical inspection has been fully developed in all directions in accordance with the needs of the districts, whether urban or rural. The recent grant of £7,500 which was made by the Treasury as Scotland's share towards the treatment of defective school children has rendered possible the establishment of treatment clinics in many places in Scotland. The more recent amendment of the Education (Scotland) Act, whereby powers have been given to school boards to draw upon the school funds for the purposes of treatment, has placed the administrative provisions for the treatment of defective school children on a secure and permanent financial basis.

In 1912 in Scotland there were 790,592 school children in average attendance, out of a total of 850,480 on the school registers. The figures in the following pages refer to the results obtained in the medical examination of 74,344 school children in the large urban areas, out of a school population of 247,467 children.

In the limited space at our disposal it is manifestly impossible to do more than set out in the briefest manner the available statistics. The statistical records have been carefully compiled from the annual reports of the school medical officers for the following areas: Glasgow, Edinburgh, Govan Parish, Dundee, Paisley, Leith and Greenock. It has been found impossible at this time to obtain comparable figures for the country districts because of the varying standards operating in different districts, and the lack of uniformity in tabulating the

statistical returns. We have, therefore, confined our attention to the figures relating to the urban areas which seem to us to be most reliable, although even here allowance must be made for variations in the figures owing to the different standards existing in different districts. These facts should be borne in mind when comparing one district with another.

Cleanliness of School Children.

The great crusade against dirty and verminous conditions is one of the outstanding features of the work of the medical inspectors and of the school staffs. Much good and useful work is being accomplished in this direction throughout the different districts of Scotland. In several places special attention has been given to this question, and by careful organization, thorough and efficient inspection, encouraging results have been already obtained. The industrial communities, generally, contain a large proportion of dirty and verminous children. This is more especially the case in urban areas in which a large percentage of the mothers are employed in the mills and factories during the greater part of the day. In such circumstances one can readily understand the apparent neglect of the children and the undesirable conditions of head, body and clothing which are discovered on inspection. Dr. Kidd, of Dundee, for example, in discussing this question, writes: "When one considers the fact that 54·6 per cent. of the married women under 20 years of age, 41·1 per cent. of the married women from 20 to 24 years of age, and 25·2 per cent. of the married women from 25 to 44 years of age are employed in various industries, the difficulty of proper attention being given to the children is easily understood."

The average condition of the children respecting cleanliness of head and body (apart from verminous conditions) is shown in the following table, the returns being expressed in percentages. The figures given are the only available returns in which the standards adopted and the classification of the statistical returns are approximately comparable.

TABLE INDICATING DEGREE OF CLEANLINESS AMONG SCOTTISH SCHOOL CHILDREN.

	Head			Body		
District	Good	Average	Bad	Good	Average	Bad
Glasgow	80·4	18·5	1·0	80·3	18·6	1·0
Govan Parish	78·4	20·2	1·4	78·3	20·0	1·6
Dundee	79·9	16·8	4·3	79·8	16·2	4·0
Edinburgh	—	—	—	—	—	1·0

The cleanliness of clothing and the condition of the footgear of the children are set out in percentages in the next table.

TABLE INDICATING CLEANLINESS OF CLOTHING AND CONDITION OF FOOTGEAR IN SCOTTISH SCHOOL CHILDREN.

	Cleanliness of Clothing			Condition of Footgear		
District	Good	Average	Bad	Good	Average	Bad
Glasgow	74·9	23·0	2·1	73·8	13·0	2·1
Edinburgh	—	—	1·6	—	—	—
Govan Parish	84·2	14·2	1·6	87·1	10·6	2·3
Dundee	—	13·1	—	—	—	2·4
Paisley	—	—	4·9	—	—	6·9
Leith	—	—	6·5	—	—	—
Greenock	—	—	6·3	—	—	—

VERMINOUS CONDITIONS OF SCHOOL CHILDREN.

The following table shows under each heading the percentage of children found to be verminous in the different urban areas. These figures apply as a general rule to the results obtained from the routine examination of the children.

TABLE INDICATING PREVALENCE OF VERMINOUS CONDITIONS AMONG SCOTTCH SCHOOL CHILDREN.

	Head		Body	Total
District	Nits	Pediculi	Pediculi	Ped. Cap. et Corp.
Glasgow	17·4	0·7	5·2	5·9
Edinburgh	9·6	1·0	1·7	2·7
Govan Parish	8·6	1·2	1·4	2·6
Dundee	14·5	1·3	5·8	7·1
Paisley	30·7	1·2	4·2	5·4
Leith	9·4	2·6	1·1	3·7
Greenock	10·7	2·4	5·3	7·7

In only a few districts are figures available which show the actual condition of the whole of the school children in the district. In Govan Parish in 1911 a school nurse was appointed to devote most of her time to the

work of visiting our poorest schools without previous notice being given, and in examining every child present respecting cleanliness of head and body. In this way reliable figures were obtained for the schools visited. The following table gives the number of children examined, and the number of verminous cases found in 1911, 1912 and 1913 :—

TABLE INDICATING PREVALENCE OF VERMINOUS CONDITION AMONG SCHOOL CHILDREN IN GOVAN PARISH.

Year	Number of children examined		Percentage of verminous cases			Total percentage
			Head	Nits	Body and clothing	Pediculi
1911	11,599	Ordinary routine examinations	1·8	10·6	1·4	3·2
1912	13,700	Special examinations	1·2	8·6	1·4	2·6
1913	22,333	Special examinations	0·5	3·1	1·6	2·1

In 1911 the special nurse had just started duty, and no figures were available other than those obtained by the school medical officers during routine medical examination. The total number of routine medical inspections in that year was 11,599, and altogether 13·8 per cent. of verminous cases were found as detailed in the table. In 1912 the first complete figures were obtained relating to 13,700 children examined, and the number found verminous was 11·2 per cent. In 1913 the special nurse examined 22,333 children, and the total percentage of verminous children was 5·2. If we examine the percentages in detail, it will be noted that the percentage of cases of verminous heads was 1·8 in 1911, 1·2 in 1912, while in 1913 it had fallen to a figure as low as 0·5. Similarly, the percentage of cases suffering from nits in the hair was 10·6 in 1911, then 8·6 in 1912, and only 3·1 in 1913. The percentage suffering from infection of the body and clothing was 1·4 in 1911, 1·4 in 1912, and 1·6 in 1913.

In Aberdeen special arrangements have been entered into by the School Board and the Public Health

Authority in order to obtain not only the cleansing of the children but also of the adults, and of the house and its contents. Thus during the year 1912 the number of persons removed to the cleansing station was 1,074. Of these 422 were adults, 469 school children, and 183 were under school age.

In this section reference should be made to the question of the provision of baths.

In Glasgow there are swimming baths belonging to the Corporation. These are made use of by the school children. In addition, spray baths are provided in at least ten of the Glasgow schools and in two schools foot-baths are installed. In two of the day industrial schools vermin destroyers for the sterilization and cleansing of the children's clothes have been provided.

In Govan Parish eight large swimming baths have been provided by the School Board for the use of the children. In each of these, foot-baths have been provided. In addition, six spray baths are in use. All children attending the junior and senior departments in the schools have the privilege of attending the baths once a week free of charge. After school hours any pupil may attend on payment of a nominal fee of one halfpenny. Each bath is under the care of a bath-master and bath-mistress. The school classes attend at stated times and are under the general supervisory control of their class teacher. The bath master or mistress, as the case may be, instructs the children in the art of swimming, life-saving, &c. Certificates of competency in distance swimming, life-saving, and so on, are granted to all pupils who attain a certain degree of proficiency after fulfilling the necessary conditions and passing the tests. The baths have been very popular since the first one was opened twenty-three years ago. Many successful competitions and swimming galas are held throughout the session. During 1913, 4,139 boys and 2,383 girls, a total of 6,522 day pupils, made 116,610 attendances in classes. 1,125 certificates of competency in swimming and 237 in life-saving were granted by the Board. In addition 52,800 attendances were made by the children after school hours, making a grand total of 169,410 attendances during the year.

In Dundee arrangements have been made with the Municipal Authorities by which the school children have the use of the swimming baths.

The Carnegie Dunfermline Trustees have provided magnificent baths for the use of the public. The school children have also the use of these baths.

Condition of the Teeth.

The following table shows the condition of the teeth of the school children as a percentage in each district.

Table showing Condition of Teeth.

District	None decayed Per cent.	One to four decayed Per cent.	Five or more decayed Per cent.	Total decayed Per cent.
Glasgow ...	15·1	60·7	24·1	84·8
Edinburgh ...	14·7	60·0	25·1	85·1
Govan Parish ...	11·6	58·8	29·5	88·3
Paisley ...	7·2	54·3	38·2	92·5
Leith ...	14·2	65·0	19·7	84·7
Greenock ...	15·3	64·6	19·9	84·5

In several districts in which a detailed analysis of the amount of dental decay present at each age has been made it seems to be well established that approximately 70 per cent. of the children from $5\frac{1}{2}$ to $7\frac{1}{2}$ or 8 years of age are in urgent need of dental treatment. If we take the percentages of children at all ages showing all stages of dental caries, it will be seen that it varies from 84·5 to 92·5. The immensity of the problem of dental treatment is well known to all school medical officers, and the question most urgently calling for solution is the best and most efficient method of initiating and extending dental treatment. In Glasgow, Edinburgh, Govan Parish, Paisley, Greenock, &c., part-time dentists have been employed for the dental treatment of necessitous school children.

From the experience gained it would appear that the most beneficial results are likely to be obtained by concentrating on the early years of school life. Since the aim of dental treatment, in the main, should be conservation of the permanent teeth, attention should be principally directed to the "six-year molar" period—

that is from 6 to 8 years of age. During the age period 5 to 7 years, the teeth are almost wholly temporary, and these are carious in the great majority of cases. During the period 6 to 8 years the permanent molars and incisor teeth appear. If the mouth of the child contains carious temporary teeth during this period the permanent teeth are very liable to become carious by direct infection. The bulk of the dental work in school children will, therefore, fall on the 6 to 8 year period of school life, and the largest return for the time and money expended in dental treatment is most likely to be obtained by concentrating on this age period.

The question of the measures likely to prevent the onset of caries by appropriate dieting, tooth-brush drill, &c., is too wide for discussion here, but is one which is worthy of the serious study of all school medical officers. In several of the special schools in Scotland tooth-brush drill has been instituted with good results, but unfortunately the practice is not general throughout the schools.

Diseases of the Nose and Throat.

The prevalence of these conditions is indicated in the percentages given in the table.

Table indicating Existence of Naso-pharyngeal Defects.

District	Nasal obstruction	Tonsils: Slightly enlarged	Tonsils: Markedly enlarged	Adenoids
	Per cent.	Per cent.	Per cent.	Per cent.
Glasgow ..	0·9	7·4	3·6	1·6
Edinburgh	1·3	23·2	2·7	1·3
Govan Parish	1·2	26·1	3·5	1·6
Dundee ...	—	22·3	2·5	0·7
Paisley ...	—	—	1·4	4·0
Leith ...	—	9·4	7·9	4·2
Greenock	—	—	6·4	1·1

The percentage of children suffering from nasal obstruction in the three largest urban areas averages 1·1; while the average suffering from adenoids is 1·5. In Govan Parish the percentage of children returned as suffering from adenoids was, in 1910, 3·4; in 1911,

3·0; in 1912, 1·9; and in 1913, 1·6. Similarly the figures for the same years for markedly enlarged tonsils have fallen from 6·4 in 1910 to 4·6 in 1911; 4·1 in 1912 and 3·5 in 1913. The operative treatment of enlarged tonsils and adenoids has not yet been undertaken by any of the school boards. In Dunfermline arrangements have been made for the treatment of these conditions by the medical staff. In the large urban areas most of this work is done by private practitioners for those who can afford it. The poor, as a rule, are attended to at the out-patient departments of the local infirmaries.

Diseases of the Eyes.

The prevalence of the common inflammatory diseases of the eyes is given in the following table:—

Table indicating Prevalence of External Diseases of the Eyes.

District	Percentage of children suffering from			
	Blepharitis marginalis	Conjunctivitis	Corneal Ulcers, &c.	Squint	Total
Glasgow ...	1·4	0·8	0·1	2·1	4·4
Edinburgh	2·3	0·5	0·3	2·2	5·3
Govan Parish	1·2	1·0	0·6	2·4	5·2
Dundee ...	1·5	1·0	0·9	2·4	5·8
Paisley ...	2·7	0·1	0·8	3·2	6·8
Leith ...	1·9	—	—	2·3	4·2
Greenock	1·3	0·5	0·8	2·2	4·8

The figures for the various areas show a marked uniformity and constancy so far as strabismus is concerned. The average percentage is 2·4. The approximate average percentage for external diseases of the eye is 5. At the present time there is considerable difficulty in obtaining figures showing in detail the different diseases of the eye from which the children are found to be suffering.

We have made an analysis of the results of the examination of 920 children presented to the medical officers in Govan Parish on account of disease of the eye or defective vision during the year 1913. The actual numbers found to be suffering from the different conditions and the percentages to the total are shown in the following table:—

TABLE INDICATING PREVALENCE OF LESIONS OF THE EYES.

Disease or defect	Number		Per cent.
Strabismus convergens ...	243		
,, divergens ...	4		
	247	...	26·4
Blepharitis marginalis	88	...	9·5
Conjunctivitis and ophthalmia ...	102	...	11·0
Corneal ulcers	50	...	5·4
Keratitis	11	...	1·1
Corneal opacities	107	...	11·6
Cataract	11	...	1·1
Iritis	1	...	0·1
Nystagmus	10	...	1·0
Trachoma	2	...	0·2
Slight optic neuritis	282	...	30·6
Atrophy of optic nerve	3	...	0·3
Choroiditis	3	...	0·3
Coloboma	3	...	0·3
Total ...	920		

The table indicates in a very general way the diseases likely to be met with in the detailed examination of the eyes of school children. Under the heading "Slight optic neuritis" we have placed 282 children who were presented for examination because of defective vision. On ophthalmoscopic examination in these cases varying degrees of swelling of the optic nerve and of obscuration of the edge of the disc were discovered. This condition was associated as a rule with the higher degrees of refraction error and often occurred in underfed, poorly nourished, anæmic children. The condition is one worthy of further investigation by school medical officers.

DEFECTIVE VISION.

The next table gives the percentage of "good," "fair," and "bad" visual acuity in four of the large urban areas:—

TABLE INDICATING PREVALENCE OF REFRACTIVE ERRORS.

	Good 6/6		Fair 6/9 and 6/12		Bad 6/18 or worse	
District	Boys	Girls	Boys	Girls	Boys	Girls
Edinburgh:—						
9 years old ...	72 ...	70 ..	18·6 ...	20·6 ...	8·9 ...	9·1
14 ,, ,, ...	76 ...	70 ...	19·7 ...	21·1 ...	7·9 ...	8·6
Govan Parish ...	56·7 ...	50·3 ...	32·9 ...	37·4 ...	10·1 ...	12·2
Greenock ...	79·0 ...	69·9 ...	8·9 ...	9·8 ...	11·1 ...	21·3
Dundee ...	47·8 ...	39·4 ...	36·0 ...	39·6 ...	16·1 ...	20·8

The want of uniformity in the returns and of the standards of visual acuity adopted in different districts detracts from the comparative value of the figures. In the results given above, however, the percentages are fairly comparable, and seem to be in accordance with the results which one would expect to find in these districts.

In all instances a greater percentage of defective vision obtains among the girls, and this is most strikingly brought out under the heading of "bad" visual acuity.

Space forbids setting out in detail the results of the visual acuity tests for each age in the case of boys and girls, but from a detailed study of the visual acuity tests obtained in the examination of over 5,000 children in Govan Parish in 1910 the following results were found :—

Good Vision (6/6).—During the sixth and seventh years the percentage of good vision is 78; then follows a somewhat considerable and rapid fall in the eighth and ninth years, which continues, and reaches a minimum of 52 per cent. in the tenth and eleventh years. During the twelfth, thirteenth and fourteenth years an average of 62 per cent. is maintained.

Fair Vision (6/9 and 6/12).—Fair vision began at 18 per cent. in the sixth and seventh years and rose abruptly to 33 per cent. in the eighth year. This figure was maintained approximately till the eleventh year was reached, when a fall to 26 per cent. took place at the twelfth year, and this was continued to the fourteenth year.

Bad Vision (6/18, or worse).—This group represents the most serious aspect of visual defect, and is, therefore, worthy of careful consideration. At 6 and 7 years of age approximately 3 per cent. of the children have seriously defective vision. In the eighth year this proportion is more than doubled, rising to 7·8 per cent. This figure shows a gradual rise to a maximum of 13·1 per cent. in the eleventh year. From the ninth to the fourteenth years an average of 12 per cent. of the children suffer from seriously defective vision.

The boys at all ages show a higher percentage of good vision. Both boys and girls begin school life with a

comparatively small amount of grave visual defect. Bad vision rises markedly towards the end of the eighth year, after which a more gradual but steady and continuous increase goes on towards the end of school life. In an interesting, exhaustive and detailed examination of the eyesight of over 3,000 school children in Govan Parish, Dr. W. B. Inglis Pollock arrived at similar results.

A summary of the principal findings of that investigation may be given. In a detailed analysis of the errors of refraction Dr. Pollock found the following average results :—

Defect in refraction	Percentage
Emmetropia	43·29
Hypermetropia	45·27
Mixed astigma ism	4·82
Myopia	6·61

In discussing the prevalence of the different refraction errors during school life he found the following results :—

Emmetropia.—There was an almost continuous rise in emmetropic eyes from the age of entrance to school up to 14 years, from 38·5 per cent. at age 5 years, to 51·7 per cent. at 14 years. This increase was in direct association with the growth of the eyeball.

Hypermetropia.—At 5 years of age 54·9 per cent. of the children were hypermetropic, but from this age the percentage steadily declined to 37 per cent. at 14. This decline continued to 31·2 per cent. at the eighteenth year of age.

Myopia.—This refraction error is one which claims our most serious attention. It was found that myopia showed a steady and progressive increase at each age period during school life. At 5 years only 1·7 per cent. of the children had myopia; thereafter the rise was found to be steady and practically uniform till 7·5 per cent. was reached at 14 years of age. A rapid increase occurred during the succeeding years to a maximum of 25 per cent. at 18 years. This abrupt increase after 14 was attributed by the investigator to "the withdrawal from school at that age of almost all the non-studious children. Those remaining, in board

schools at any rate, are more or less intent upon intellectual progress, and the majority of those examined were preparing for the university or training colleges."

As to the degree of myopia, the following statement may be made: The results given in the foregoing summary show that the number of myopic children constantly increases throughout school life. Dr. Pollock arranged the myopic and mixed astigmatic eyes into three groups according to the degree of myopia; the first group included all cases with less than one dioptre of myopia; the second, those between one and four dioptres; and the third group, all over four dioptres. In the case of myopic astigmatism the average was taken and entered in the corresponding group. When these were set out in curves it was found that the curve of the first group exhibited a distinct and progressive decrease.

Commencing at 100 per cent. at the age of 5 years, it fell to 50 at the age of 12 years, and to 0 at the age of 18 years.

The second group increased in an irregular manner during the first two-thirds of school life to 45 per cent. at 12 years, thereafter it maintained its position. The third group, consisting of fairly high degrees of myopia, presented an almost continuous rise. It does not appear till the age of 7 years is reached, which apparently means that two or three years of school life have been sufficient to produce this rapid development of myopia. At 16 years almost 20 per cent. of the myopic eyes were included in this group.

There is, therefore, distinct evidence that the number of eyes with the higher degrees of myopia increases at each age period of school life and also that the majority of children who have become myopic during their school career show a continual increase in the degree of their myopia.

It is impossible to describe even in outline the points to be attended to by the school medical officer in the prevention of myopia. They are well known to medical inspectors. Attention and careful study should be given to the following principal points, namely: School buildings and lighting of classrooms; the type of desks

and the posture of the child; type in school books; writing; colour and texture of the paper; nature and surface of blackboards; sewing and all fine near work; hours of study and recreation for myopic children; home work and the conditions detrimental to the eyesight of the children in the homes in which such work must be done. The complexity of the points to be attended to is sufficiently indicated.

School clinics have been established in nearly all the large towns in Scotland. At these clinics detailed examination is made of all cases of defective vision, refraction errors are diagnosed, and appropriate glasses are prescribed. In the case of any necessitous child, glasses may be provided free of cost, and in most towns a system of payment for glasses by instalments is in operation. The external diseases of the eyes receive treatment from day to day in the clinics wherever these have been established.

Treatment and treatment clinics are dealt with in another chapter.

Ear Diseases and Defective Hearing.

The percentage of children suffering from otorrhœa and other diseases of the ear, as well as those with defective hearing, are given in the following table:—

Table indicating Prevalence of Ear Defects.

District	Otorrhœa	Other diseases of the ear	Deafness: Slightly deaf	Deafness: Very deaf	Total defective hearing
Glasgow	0·7	1·3	2·6	0·62	3·22
Edinburgh	1·2	5·5	3·0		3·0
Govan Parish	1·0	4·1	2·3	0·8	3·1
Dundee	1·6	5·5	1·8	0·1	1·9
Paisley	1·5	2·5	4·0		4·0
Leith	1·2	—	0·8	—	—
Greenock	1·7	—	2·9	1·2	4·1

Children suffering from otorrhœa and other diseases of the ear are now receiving treatment to some extent in the treatment clinics which have been established. Cases of chronic otorrhœa receive daily treatment and

attention from the clinic nurses under the direct supervision of the medical staff.

Deaf-mute classes are doing good work. Most of the deaf-mutes in Scotland are provided for by the school boards under the provisions of the Education of Blind and Deaf-Mute Children (Scotland) Act. Under that Act the children are maintained and educated in various institutions by the school boards. In the following urban districts special classes for oral instruction of deaf-mute children have been established, namely: Glasgow, Govan Parish, Aberdeen, Dundee, Paisley and Greenock. There are at present 162 deaf-mute children attending these special classes.

The School Board of Glasgow last year appointed a teacher to visit the homes of the young deaf-mute children between the ages of 3 and 5 years. The object of this special appointment is to instruct the mothers in the methods to be followed in teaching their children at the earliest possible age, so that when the children reach the age of entering school they may benefit to the fullest extent from the instruction provided for the production of speech and in lip-reading. Not only is special instruction in voice production and speech and in the art of lip-reading provided for the children in these special classes in Govan Parish, but evening classes are also provided for adult deaf-mutes who wish to continue the instruction given in the day schools during their school life. These classes have been very successful and are much appreciated by the adults.

Defective Speech.

The proportion of children found to be suffering from defective speech, such as lisping, stammering, &c., is shown in the following table:—

Table indicating Prevalence of Speech Defects.

District	Percentage defective	District	Percentage defective
Glasgow	3·9	Paisley	2·4
Edinburgh	1·3	Leith	1·4
Govan Parish... ...	2·1	Greenock	2·0
Dundee	2·9		

In Dundee a voluntary class for children suffering from defects in speech was instituted by the School Medical Officer. He gave the lessons, and the class was held outside the school hours. Good progress was made by the children, but the voluntary nature of the class and the fact that it was held after school hours gave rise to difficulties in regular attendance of the children and want of the necessary practice in the lessons given. In some districts special attention is given to individual children in the ordinary day schools, but this plan is not satisfactory.

Heart and Circulatory Diseases.

The relative prevalence of organic valvular heart disease, of functional heart murmurs, and of anæmia found among the school children examined is given in the following table, in percentages:—

Table indicating Prevalence of Cardio-vascular Defects.

District	Organic valvular disease	Functional heart murmurs	Anæmia
Glasgow	0·5 ...	0·04 ...	1·3
Edinburgh	0·6 ...	0·5 ...	0·9
Govan Parish ...	0·5 ...	0·8 ...	0·8
Dundee	0·5 ...	0·6 ...	—
Paisley	0·8 ...	0·9 ...	—
Leith	0·4 ...	0·7 ...	—
Greenock	0·6 ...	0·8 ...	—

Organic Heart Disease.—It is impossible from the nature of the statistical returns to give a detailed statement of the relative frequency of the heart lesions diagnosed. In an analysis of 28 cases in one district it was found that the heart lesions were fairly equally distributed between boys and girls. Mitral incompetence was the most frequent lesion present, and was found in 19 cases; mitral stenosis in 1; mitral stenosis and regurgitation in 2; mitral and aortic incompetence in 4. Congenital heart disease was found in 2 cases.

Functional Heart Disease.—In addition to the definitely diagnosed organic heart lesions many conditions were returned under the category of functional heart

murmurs. No exact details are available as to the relative frequency of these conditions, but in several reports mention is made of the auscultatory characteristics—irregularity of rhythm, bradycardia, tachycardia, accentuation of second aortic sound, reduplication of sounds, and so on. The importance of these functional conditions of the heart would appear to consist principally in the necessity of excluding from this category cases which, on further examination and observation, should be transferred to the class of organic heart lesions. The irregularities and purely functional conditions, when unaccompanied by signs of muscle impairment or failure of cardiac efficiency or signs of dilatation, need not be, and in most cases in children are not, inconsistent with perfect health.

Anæmia.—Many cases of functional heart disease are also returned under the heading of anæmia, but in addition cases of anæmia occur apart from functional heart murmurs, and are not associated with recognizable pathological causes. These are returned for the most part under the general heading of anæmia.

The treatment of the heart conditions in the different urban areas is mainly directed to drafting all cases of congenital heart disease and the more serious cases of organic heart lesion into the special schools for physically defective children. From these schools the children in most districts can be sent to country homes for longer or shorter intervals. Such arrangements have been made in Glasgow, Edinburgh, Govan Parish, Dundee and Greenock. In severe cases of functional heart disease and in cases of anæmia similar measures of treatment are available. In the other less severe cases arrangements are made in the ordinary day schools, whereby all influences likely to affect the heart condition are minimized.

The prevention of these diseases, so far as organic heart lesions are concerned, is to some extent involved in the prevention of the acute exanthemata and in preventing, as far as possible, the conditions likely to result in permanent heart injury. In addition, the instruction of the teachers, parents, and all concerned in the welfare of the children on the importance of recognizing the

early indications of rheumatism, such as so-called "growing pains," recurrent sore throats, quinsy, and so on, must form part of the preventive measures to be adopted. The early recognition of the onset of rheumatic symptoms, or of chorea, or of the other causes of heart disease must be made familiar to those responsible for the health of the children.

Diseases of the Lungs.

Bronchitis.—The prevalence of bronchitis and bronchial catarrh is indicated in the following percentages :—

Glasgow	2·5	Paisley	2·0
Edinburgh	2·8	Leith	6·5
Govan Parish	2·4	Greenock	2·3
Dundee...	0·6		

Pulmonary Tuberculosis.—The difficulty of detecting pulmonary tuberculosis in its early stages in the school child is too well known to require emphasis here. The figures given below indicate approximately the prevalence of the disease discovered during the ordinary routine examination of the children. The number of cases missed is an unknown quantity, so that the actual prevalence of the disease in any district, as represented by the following figures, is a question which is still unsolved. The percentages given in the statistical returns for the different districts are :—

Glasgow	0·2	Dundee...	0·8
Edinburgh	0·4	Paisley	0·7
Govan Parish ...	0·33	Greenock	0·4

In all of the urban areas, and in many of the rural districts, bacteriological examination of the sputum is carried out free of cost by the Local Public Health Authorities. Pulmonary tuberculosis was made compulsorily notifiable by Regulations issued by the Local Government Board of Scotland in 1912. There are several institutions in which children are treated for this disease. For example, Quarriers Homes at Bridge of Weir provide a certain amount of accommodation for the treatment of children.

Early cases, free from infective sputum, are also received in many of the convalescent homes for children

which are situated in healthy country districts. But, needless to say, the demand is far in excess of the actual accommodation provided. In Glasgow the Public Health Authority have acquired an estate of 200 acres in the country and at a suitable altitude. On this estate it is proposed to erect a large sanatorium for the accommodation of adult patients.

In addition, it is proposed to erect an open-air residential school for the accommodation of pre-tubercular school children drawn from the schools within the City of Glasgow. There are five farms on the estate from which the milk supply will be obtained. The farms will also provide suitable employment for the adult patients according to their working capacities, and it will probably be found that a certain amount of outdoor instruction will be provided for the children as well. The children will lead a healthy outdoor life during their residence, and will receive suitable educational instruction in the school.

In Edinburgh, arrangements have been made with the Edinburgh Children's Holiday Fund to accommodate school children at the Humbie Homes. These Homes represent the ideal country homes and open-air schools required for the treatment of all children suffering from debility, anæmia and pre-tubercular conditions, and also for the children suffering from the earliest stages of pulmonary tuberculosis.

In Glasgow and Govan Parish school children requiring residence in the country are sent to the convalescent country homes at Prestwick, Dundonald, Aberfoyle and other places.

In Aberdeen similar arrangements have been made. Last year 164 children were sent by the school board to Linn Moor.

The Prevalence of Rickets and its Consequences.

The percentage of children found to be suffering from various degrees of rickets is shown below.

Glasgow	7·0	Paisley	5·6
Edinburgh	0·8	Leith	2·3
Govan Parish	5·8	Greenock	4·8
Dundee	4·1		

Rickets is admittedly a disease of young children living in large industrial centres, and is for the most part confined to the poorest section of the community. The disease is most prevalent among the children living in those areas of large cities in which the living conditions are unhygienic, where the houses are old and defective, often damp, badly lit and ill-ventilated. The income per head is small, and employment of the wage-earners irregular and uncertain. The diet provided both for adults and children is often unsuitable in quantity and in quality, ill adapted to the nourishment of the young child. Artificial feeding in the early months of life, especially in those towns in which the mothers are largely employed in factories and mills during the day, is responsible for much of the rickets which is met with in these places. The deficiencies in the diet of the poor would seem to consist principally of the want of the necessary quantity of animal fats, earthy phosphatic salts, and the requisite proportion of proteid. When one is familiar with the adult dietary usually provided in the homes of the poor in our large city—consisting principally of bread, tea, sugar and potatoes, and to a lesser extent of lean beef of poor quality, milk, and sometimes vegetables—it is not surprising that the dietary of infants and young children should fail to provide the constituents which are necessary for the healthy nurture of the growing organism. It has been found by actual experiment that the diet so constituted is ofttimes less than the recognized minimum of 3,000 calories of energy value. We are far from undervaluing the contributory causes relating to housing and the unhygienic conditions mentioned above, but undoubtedly the great cause of rickets is defective diet and perversion of nutrition apparently consequent thereon. This view is supported to some extent at least by the marked improvement which takes place in the condition of many of the rickety children attending our special schools for physically defective children. In these schools the children lead a healthy life in clean, wholesome, well-lit and well-ventilated rooms. They receive regularly a substantial midday meal, and in addition milk and cod-liver oil are provided.

The prevention of this widespread disease calls for many different lines of action. The housing conditions must be improved so that the children may get as much fresh air and sunlight as possible. The mother should suckle her child whenever possible. The diet of the young child must supply the constituents essential for building up the bone and tissues of the body. A liberal supply of animal fats, good milk, porridge and the necessary amount of phosphates, and proteid foods in accordance with the age of the child must be supplied.

These measures of prevention assume that the income per head is sufficient to pay rent for a house which will be simple yet hygienic, that the constituents of the family dietary are intelligently and economically marketed, and that the parents know the food values of the different articles of diet. Information respecting these points should be given to the parents of the children, and the children in the higher classes should be taught the different food values, their prices, and the necessary quantities per head to satisfy the physiological requirements of the body. Much useful work is being done throughout our schools by domestic classes established for that specific purpose.

Provision of Meals for Necessitous School Children.

Legal Powers.—Since the legal provisions for the supplying of meals to school children in Scotland differ from those in England, it may be useful to quote the provisions of the Education (Scotland) Act, 1908.

Section 6, sub-section (i) of that Act, put shortly, is as follows: "When, as the result of medical inspection or otherwise, it is brought to the notice of the school board *that a child attending school within their district . . . is unable by reason of lack of food or clothing, to take full advantage of the education provided, it shall be the duty of the school board,* after due warning, to summon either or both parents of such child to appear before them to give an explanation of the child's condition, and if the school board shall find that such explanation is not forthcoming, or is insufficient or

unsatisfactory, and that the condition of the child is due to neglect, they shall transmit a copy of such finding to the parent or guardian of the child and to the Procurator Fiscal, and it shall be the duty of the Procurator Fiscal to institute a prosecution . . .

"*Provided* that if it shall be shown to the satisfaction of the school board or the Sheriff *that such parents or guardian are unable by reason of poverty or ill-health to supply sufficient and proper food or clothing . . . the school board,* if satisfied that the necessities of the case will not be provided for by voluntary agencies, *shall make provision for the child out of the school fund* . . . while the child is under obligation to attend school."

It will be seen that the duty of the school board towards any child who is unable, by reason of lack of food or clothing, to take advantage of the education provided under the specific terms of the section is clear and imperative.

The organization for the supplying of meals in Glasgow, Edinburgh, and Govan Parish is similar to that in operation in many of the large English towns, and need not detain us.

In each of these urban centres large, modern, well-equipped central kitchens have been provided. From these the meals are distributed to the dining halls which serve the outlying districts.

In Glasgow, during the session 1912-1913, nineteen centres for distributing dinners to necessitous children were opened, and 135,844 dinners were supplied. In addition, 3,040 children were supplied with either boots or clothing according to the necessities of each case.

In Edinburgh during 1912 free meals were supplied to certain children from the beginning of October to the end of the session. The largest number of pupils on the free food roll was 1,060 during the last week of April. At the close of the session the number had been reduced to 416. The number of pupils who received free meals during the whole or part of the session was 1,517. The number of meals produced at the cooking centre was 383,680, and the average cost per meal was 1·7d. The dinners are served at the schools with one or

two exceptions. In all cases the teachers supervise the dinners, and in each school monitors assist in waiting at the tables.

The following table shows the number of children granted dinners, the number of dinners, and the number of pairs of boots supplied during the past three years in Govan Parish :—

TABLE INDICATING PROVISION FOR NECESSITOUS CHILDREN.

Session	Number of children granted dinners	Number of dinners supplied	Boots supplied
1910-11 ...	2,375	145,799	2,666
1911-12 ...	983	94,057	1,885
1912-13 ...	784	77,574	1,471
Totals ...	4,142	317,430	6,022

The large number of children receiving dinners during the session 1910-11 is accounted for by the great industrial distress which prevailed during that year. The increasing prosperity of the district is shown by the decrease in numbers during the two following sessions.

The cost per meal during the past three years is given in the next table :—

TABLE INDICATING COST OF FEEDING SCHOOL CHILDREN IN GOVAN PARISH.

Session	Cost per meal in pence		
	For food only	For administration	Total
1910-11 ...	0·737	0·533	1·270
1911-12 ...	0·650	0·590	1·240
1912-13 ...	0·769	0·840	1·609
Average ...	0·718	0·654	1·372

The above figures do not take into account capital expenditure or charges on capital, but are based on the ordinary expenditure necessary for the actual supplying of meals apart from capital charges. The expenditure on which the above figures are based is : cost of food materials, wages of superintendent, cooks, and cleaners; also the expenditure for the conveying of food from the cooking centre to the various dining-halls, and all small repairs to cooking utensils, &c.

Schools for Mentally Defective Children.

Special schools for mentally defective children have been established in Glasgow, Edinburgh, Govan Parish, Paisley, and Aberdeen. In most places the classes are held in the buildings provided for the physically defective children. In some instances a special class for mentally defective children is held in the ordinary schools. In Govan Parish the first special class for mentally defective children was opened in 1905, and Summerton special classes for physically and mentally defectives were instituted in 1908. In 1914 it was found necessary to provide extra accommodation, and a separate building at Summerton was opened with 100 places for mentally defectives. This is the first special school, as a separate building for mentally defective children, which has been provided in Scotland. Children are admitted to these special schools and classes after careful examination by the school medical officer approved by the school boards for this purpose.

Training in handwork is a special feature in the education of the mentally defective in these schools. Under this special tuition very considerable improvement is made in the mental condition of many of these children. For example, in Edinburgh the progress is reported as good in 46 per cent., fair in 35 per cent., and little progress in 19 per cent.

The following table shows the percentages of school children given in the reports and attending the special schools for the mentally defective under the different boards :—

Glasgow		Edinburgh		Govan Parish		Paisley
0·88	...	0·32	...	0·42	...	0·82

These figures do not give an accurate estimate of the number of mentally defective children in each district, owing to the fact that all mental defectives are not at present attending the special schools. Some of the less obvious cases of mental defect are at present retained in the ordinary schools in many districts because of the want of special accommodation.

Classes for mentally dull and backward children are held in some of the ordinary day schools in Glasgow, Edinburgh, Govan Parish, and Dundee.

Special Schools.

Schools for Physically Defective Children.—These have been established in Glasgow, Edinburgh, Govan Parish, Dundee, and Aberdeen. The children are conveyed to these schools by ambulances. In Paisley, where the school is situated on the direct tramway route, the less severe cases are brought by car under the care and supervision of lady guides.

Open-air sheds are attached to several of the schools, and when the weather is suitable the children receive their lessons out of doors. In one of the Edinburgh schools the whole of one side of the school can be thrown open, thereby practically converting it into an open-air school.

The children are weighed and medically examined on admission, and at regular intervals thereafter. Dinners are supplied, for which the parents pay a small sum, and most of the children are given cod-liver oil. Many of the cases require surgical dressing, which is done by the nurse who is in daily attendance at all the schools.

The following table shows the number of children in the special schools and the percentages of the different defects :—

Table indicating Attendance at Special School.

District	Number in school	Rickets		Tuberculosis		Diseases of nervous system		Other conditions	
		Number	Per cent.	Number	Per cent.	Number	Per cent.	Number	Per cent.
Glasgow ...	1,259	588	46·7	192	15·2	128	10·2	351	27·8
Edinburgh ...	134	22	16·4	46	34·3	17	12·9	49	36·5
Govan Parish...	290	134	46·2	68	23·4	49	16·8	39	13·4
Paisley ...	154	74	48·0	39	25·3	19	12·3	22	14·2
Dundee (1910-11)	80	16	20·0	24	30·0	26	32·9	14	17·5

Under the heading " Other Conditions " are included cases of heart disease, anæmia, congenital malformations, deformities due to accidents, defective speech, defective hearing, defective vision, chronic bronchitis, and pre-tuberculous disease.

Many of the children remain in the special schools till they reach the age of 16 years, but some benefit from the improved conditions to such an extent as to be able to return to the ordinary schools. Thus in Paisley,

during the session 1912-13, thirty-three children left the special school. Of these eight, or 24·2 per cent., were transferred to the ordinary schools by the school medical officer.

Similarly, in Glasgow 356 children, or 28·2 per cent., were transferred from the schools for physical defectives to the ordinary schools during the session 1912-13.

School for Skin Disease.—A special school for pupils suffering from favus and ringworm was started in Edinburgh on January 22, 1911. At the end of July of that year there were sixty-seven pupils on the roll, eighteen cases of favus, and forty-nine of ringworm. The treatment of these cases is carried out by the school nurse under medical supervision. Dinners are provided at the school, and the average attendance is 92·5 per cent.

Average Heights and Weights of Scottish School Children.

The following tables will be found of service for reference as giving data for purposes of comparison :—

Table indicating the Average Height in Inches of Scottish Boys.

School Board	Age 5	6	7	8	9	10	11	12	13	14
Anthropometric Committee's Standard	41·0	44·0	46·0	47·1	49·7	51·8	53·5	55·0	56·9	59·3
Glasgow ...	38·9	40·9	43·2	45·9	47·3	49·6	50·7	51·9	—	—
Edinburgh	41·4	43·3	45·3	47·2	49·1	50·7	53·1	54·2	56·2	—
Govan Parish	41·0	42·2	43·5	45·7	48·1	49·8	51·2	53·0	54·6	56·2
Aberdeen	40·9		44·8		—	—	—	—	56·2	
Dundee ...	40·9	43·1	45·1	46·4	48·8	50·2	51·9	52·9	54·5	—
Paisley ...	40·9	42·3	44·5	46·4	48·3	50·3	51·8	53·7	55·7	—
Greenock	40·7	42·7	43·6	—	—	—	—	—	55·2	56·9

Table indicating the Average Height in Inches of Scottish Girls.

School Board	Age 5	6	7	8	9	10	11	12	13	14
Anthropometric Committee's Standard	40·8	42·6	44·5	46·6	48·7	51·1	53·1	55·7	57·8	59·8
Glasgow ...	39·6	40·8	43·5	45·9	47·4	49·2	50·5	51·8	—	—
Edinburgh	40·9	43·0	44·9	46·9	48·7	50·5	53·1	54·7	57·8	—
Govan Parish	40·1	41·7	43·3	45·4	47·7	49·5	51·0	52·6	54·2	57·6
Aberdeen	40·4		44·7		—	—	—		56·9	
Dundee ...	40·5	42·3	44·5	46·0	46·4	50·4	52·0	53·3	54·6	—
Paisley ...	40·5	42·1	44·6	46·1	47·6	49·7	51·3	53·9	56·2	—
Greenock	40·0	42·3	43·7	—	—	—	—	—	55·5	57·2

TABLE INDICATING THE AVERAGE WEIGHT IN POUNDS OF SCOTTISH BOYS.

School Board	Age 5	6	7	8	9	10	11	12	13	14
Anthropometric Committee's Standard	39·9	44·4	49·7	54·9	60·4	67·5	72·0	76·7	82·6	92·0
Glasgow ...	37·4	41·3	45·4	49·7	55·7	59·3	61·9	67·2	—	—
Edinburgh	41·1	44·5	48·3	52·6	57·0	61·4	66·9	72·1	79·3	—
Govan Parish	39·6	41·3	44·7	49·4	54·2	58·8	63·4	68·5	74·1	84·5
Aberdeen	39·2		46·7		—	—	—	—	79·3	
Dundee ...	39·5	42·8	47·4	48·5	49·5	58·3	64.07	71·28	72·5	—
Paisley ...	40·1	42·5	46·6	51·5	56·0	61·0	65·5	71·4	78·8	—
Greenock...	39·5	42·8	44·9	—	—	—	—	—	77·2	84·3

TABLE INDICATING THE AVERAGE WEIGHT IN POUNDS OF SCOTTISH GIRLS.

School Board	Age 5	6	7	8	9	10	11	12	13	14
Anthropometric Committee's Standard	39·6	42·4	46·7	52·2	55·5	62·0	68·1	76·4	87·0	96·7
Glasgow ...	37·4	40·3	42·6	48·6	52·2	57·2	61·9	67·2	—	—
Edinburgh	39·9	42·7	46·7	50·9	55·5	60·0	65·0	73·1	81·7	—
Govan Parish	38·3	41·1	43·8	48·0	53·4	57·0	63·1	66·1	75·2	81·8
Aberdeen	37·1		45·3		—	—	—	—	80·0	
Dundee ...	38·2	40·9	46·1	48·3	50·7	58·9	62·7	68·9	75·9	—
Paisley ...	38·7	41·1	46·5	49·5	53·6	58·4	63·6	70·6	80·4	—
Greenock	37·6	40·9	44·2	—	—	—	—	—	79·0	84·2

REFERENCES.

For further particulars regarding the condition of children in elementary schools in Scotland see such official returns and reports as the following :—

"First Report on the Medical Inspection of School Children in Scotland." By W. Leslie Mackenzie, M.A., M.D., LL.D. London : Wyman and Sons, Ltd. 1913. 6d.

Annual Reports of the School Medical Officers for the various Districts of Scotland.

Annual Reports of the Local Government Board for Scotland.

Annual Reports of the Medical Inspectors of School Children in Dunfermline (Carnegie Trust).

Annual Reports of the Scottish Education Department.

See also the following works and articles :—

MACKENZIE, W. L., and CRUICKSHANK, L. W. (Editor) : "Problems of School Hygiene." Edinburgh and London : William Hodge and Co. 1914. 2s. 6d.

MACKENZIE, W. L. : "Medical Examination of Schools and Scholars in Scotland." Chapter xix in "Medical Examination of Schools and Scholars." London : P. S. King and Son. 1910. 10s. 6d. net.

POLLOCK, W. B. INGLIS : "The Eyesight of School Children, being a Record of the Examination of over 3,000 School Children in Govan Parish." *Transactions of Royal Philosophical Society of Glasgow,* December, 1905.

XXII

THE DEFECTIVE CHILD IN IRELAND

BY

JAMES ALEXANDER LINDSAY, M.D., F.R.C.P.

Professor of the Theory and Practice of Medicine in the Queen's University of Belfast.

UNTIL recently little was done in Ireland for the classification or treatment of "defective" children. No official cognizance of this class, as distinguished from idiots and imbeciles, was taken, and the need for such differentiation was not recognized. The Royal Commission upon the Care and Control of the Feeble-minded has been the occasion for the collection of much valuable material on this subject, and the reports of Dr. W. R. Dawson, Government Inspector of Lunatic Asylums in Ireland; Dr. R. A. L. Graham (the late), formerly Assistant Medical Officer of the District Lunatic Asylum, Belfast; Dr. Fitzgerald, Resident Medical Superintendent, Cork District Asylum; and Dr. John Mills, Senior Assistant Medical Officer, District Asylum, Ballinasloe, must form the basis of any future action. Practical reforms are still in an inchoate condition, but the information upon which such reforms must rest is now available.

MENTAL DEFICIENCY.

Before entering upon the subject of "defective" children it may be well to indicate how Ireland stands as regards the general question of insanity. The Irish insanity rate (1909) was 5·52 per 1,000 of the population, as compared with a rate of 3·61 per 1,000 for England and Wales. The rates in the four provinces work out as follows:—

Ulster	4·2	per 1,000.
Connaught	5·2	,,
Leinster	6·0	,,
Munster	6·1	,,

Waterford, Kilkenny, Westmeath, and Monaghan, in this order, showed the highest rates, while Down showed the lowest rate, followed at some distance by Londonderry, Fermanagh, Kerry, Tyrone, Mayo, and Antrim. The statistics do not suggest any definite relation between the prevalence of insanity and race: thus Kerry and Mayo have rates practically identical with those of Londonderry and Fermanagh. Nor can any relation be clearly traced between the insanity rate and density of population, proportion of aged persons, death-rate, tuberculosis, or drunkenness. Dr. W. R. Dawson attaches great weight to pauperism. Dr. J. Mills emphasizes the influence of emigration depleting the stock of many of its best elements; of the penury, privation and the hard struggle for life which is the lot of many; of innutritious food, and of the increased number of persons who become parents after an attack of insanity. As regards the influence of emigration, Dr. W. R. Dawson finds that "of seventeen counties yielding the largest proportion of emigrants fourteen stand high in the insanity scale; but Kerry, which heads the emigration list, is nearly at the bottom as regards insanity; and Leitrim and Mayo, high in the former, are low in the latter scale, while Clare is high in both lists, and Donegal low in both lists."

The causes of the high insanity rate in Ireland constitute too large a subject to be dealt with adequately here. The evidence seems to suggest that poverty and its corollaries—privation, mental anxiety, and insufficient nourishment—constitute a large part of the explanation. In spite of some curious fluctuations in the statistics, it is hardly doubtful that emigration is an important factor. Tuberculosis, which has been blamed, is probably an effect of the same causes as insanity rather than a direct cause of the latter. Alcoholism, though an important contributory cause of insanity in Ireland as elsewhere, does not account for the exceptionally high insanity rate in Ireland—only 10·3 per cent. of the admissions to Irish asylums are officially ascribed to alcoholism—and the amount of alcoholism in the various counties, so far as that can be ascertained, bears no relation to the prevalence of insanity.

Dr. Fitzgerald thinks in-breeding an important cause of insanity.

"Defectiveness" in Children.

The following statistics give some idea of the number of "defective" children requiring care and control in Ireland :—

(A) Dr. W. R. Dawson's investigations in the Dublin area give the following returns :—

(*a*) Number of public elementary schools examined 182
Number of scholars examined 33,570
Number of "defective" children : Boys 270, Girls 199 ... ... total 469

(*b*) Poor Law institutions—workhouses, schools, &c.—
Number of inmates 6,461
Inmates under the age of 16 106
"Defective" children : Boys 32 ; Girls 42 ; total, 74

(*c*) Homes, orphanages, training schools, &c.—
Number of institutions examined 22
Number of inmates 1,124
"Defective" children : Boys 13 ; Girls 16 ; total, 29

Dr. Dawson also collected information regarding reformatory and industrial schools outside the Dublin area with the following results :—

(*d*) Number of schools examined 46
Number of children examined 1,812
"Defective" children : Boys 21 ; Girls 24 ; total, 45

(B) Dr. Graham's investigations in the Belfast area give the following returns :—

(*a*) Public elementary schools examined ... 305
Number of children on rolls 64,019
Number of children examined 48,462
"Defective" children : Boys 148 ; Girls 81 ; total 229

(*b*) Poor Law institutions—
Number of children examined 576
"Defective" children : Boys 9 ; Girls 8 ; total, 17

(*c*) Industrial schools—
Number of children 1,202
"Defective" children : Boys 4 ; Girls 14 ; total, 18

(*d*) Reported from various sources—clergymen, missionaries, nurses, police, &c.—
"Defective" children : Boys 27 ; Girls 27 ; total, 54

(C) Dr. Fitzgerald's investigations in the Cork area give the following returns :—

(*a*) Number of schools examined 135
Number of scholars examined 14,748
" Defective " children : Boys 38; Girls 18; total, 56

(*b*) Poor Law institutions—
Number of children examined 181
" Defective " children : Boys 1; Girls 3; total, 4

(*c*) Reported from various sources—
" Defective " children : Boys 7; Girls 5; total, 12

(D) Dr. Mills's investigations in the Galway area give the following returns :—

(*a*) Number of schools examined 315
Number on rolls 26,387
" Defective " children : Boys 182; Girls 123 ... ... total 305

(*b*) Poor Law institutions—
Number of inmates 1,054
" Defective " children : Boys 10; Girls 5; total, 15

(*c*) Industrial schools—
Number of children 613
" Defective " children : Boy 1; Girls 7; total, 8

(*d*) Reported from various sources—
" Defective " children : Boys 16; Girls 7; total, 23

These reports make it clear that " defective " children are found in the most diverse types of institution—elementary national schools, industrial schools, reformatories, workhouses, training homes, and various charitable institutions. The provision for their recognition, segregation, and separate treatment seems to be of the most meagre description. Most of the witnesses report many of these cases as " needing immediate provision."

The contrast between the proportion of " defectives " in the various areas is striking. The low figures in the Cork area and the high figures in the Galway area are not easily explained in the light of the fact that Connaught has a decidedly lower insanity rate than Munster.

Classification, Segregation, and Treatment.

Dr. Dawson thinks that " defective " children might be allowed to remain in the ordinary infant classes until they reach about 6 years of age, when the question of

special classes or schools would arise. He finds a strong body of opinion to the effect that special schools would not suit the conditions in Dublin, parents being likely to show a decided repugnance to the stigma which would attach to their children attending a special school for "defectives." "Special classes," he holds, "under specially trained teachers do not present this difficulty in the same degree, would fulfil all necessary conditions, and would render easier the transfer of pupils from the ordinary classes, and back again to them in cases where sufficient progress had been made." He further believes that, "in order to give the 'defectives' of the destitute class a fair chance more than classes would be required, and it would be necessary to have boarding institutions where such children, and perhaps those who fail to make any progress in the special classes, would be entirely provided for."

Dr. Graham was of opinion that "defective" children would never approach the ordinary educational standard of their age, no matter what care was bestowed upon them. He favoured the idea of special schools, where manual and elementary technical training would hold the chief place, and would be imparted at an early age, the idea being "to remove, as far as possible, the handicap which Nature had placed to their credit by giving them an earlier start."

Dr. Fitzgerald thinks that special institutions for "defectives" could be established at a moderate cost, as parents would be reluctant to hand their children over, and the number requiring treatment would not be large. He thinks such institutions should have a pay department attached to them.

Dr. Mills doubts whether, if special schools were provided for "defective" children, they would be used to any considerable extent, owing to the reluctance of parents to acquiesce in separation. He adds that "any effort to educate them on the ordinary lines cannot result in benefit to them, and will only involve expenditure without result."

General Conclusions.

It is evident that the whole subject of the recognition and management of "defective" children in Ireland is

still in a somewhat nebulous condition, but in this respect Ireland does not stand alone. It is not difficult to formulate a few of the obvious conclusions which a survey of the present condition of this question naturally suggests :—

(1) Some machinery is needed for the early recognition of "defective" children and for bringing home to the minds of the people, especially of the ignorant, that "defectives" are not idiots or imbeciles, that something useful may be made of them, and that they should not without effort be allowed to become useless and helpless members of society.

(2) That "defectives" require special treatment and special training, and that it is for the experts to decide whether this can be more successfully given in special institutions or in special departments of existing institutions.

(3) That any measures taken for the benefit and management of "defectives" should not be allowed to imperil the interests of normal children.

(4) That the causes which tend to produce "defectives" should be thoroughly elucidated, and the information thus gained made as public as possible.

REFERENCES.

Many of the references given at the end of the writer's chapter on "Medical Examination of Schools and Scholars in Ireland," in "Medical Examination of Schools and Scholars," will be found of service.

The reports of the medical officers referred to in the chapter should also be consulted, together with the following :—

Annual Reports of Commissioners of National Education (Ireland).

Annual Reports of the Inspector of Reformatory and Industrial Schools (Ireland).

See also articles in *Slanté*, the organ of the Women's Health Association of Ireland, edited by the Countess of Aberdeen.

Consult also the following work :—

PLUNKETT, H. : "Ireland in the New Century." London : Murray. 1905. 1s. net.

XXIII

DEFECTIVE CHILDREN IN CANADA.

BY

HELEN MACMURCHY, M.D.

Inspector of the Feeble-minded, Department of the Provincial Secretary for Ontario.

THE number of defective children in Canada should not be as great as in older countries. Probably it is not. Still, the problems connected with the care and education of defective children, as well as the necessary permanent provision for them, particularly in the case of the mentally defective, are becoming urgent already in Canada. Nearly all the provinces are taking some steps to ascertain the actual numbers of such children and the best methods of caring for them.

PHYSICALLY DEFECTIVE CHILDREN.

In the larger cities, such as Montreal, Toronto, Winnipeg, there are a number of children with vision so defective that they cannot be taught by the ordinary schoolroom methods. For these, special facilities are necessary. In Toronto upwards of thirty children at present attending the Eye Department of the Out-Patient Clinic at the Hospital for Sick Children require this provision, that is, there should be, and it is hoped that soon there will be, a special class in Toronto for children with seriously defective vision.

No doubt similar provision will be made in Montreal and other cities. There are valuable residential institutions for the blind in Brantford, Ontario, and near Halifax, Nova Scotia, where children are educated and taught trades with the object of making them self-supporting. For the totally blind institutions are necessary; but for those who have partial sight it is undesirable that children should be taken away from

home if it can be avoided. In an institution they become institutionalized, and so rendered more or less useless for life in the world of men and women.

The number of children with defective hearing is probably larger than of those who have defective sight. So far as can be ascertained, from 5 per cent. to 15 per cent. of the school population in Canada have more or less defective hearing. There are excellent institutions for the deaf and dumb in Belleville and other places in Canada, but the above remarks on institution life apply more strongly to deaf children than to blind children. Deafness should not, and does not, mean dumbness. Lip-reading is being well taught in the Belleville Institution, especially of late years. But what is needed is the establishment of classes for lip-reading in connection with our public schools. Far more do we need, as Dr. Macleod Yearsley has pointed out, to bestir ourselves to prevent deafness. Every case of measles, scarlet fever, &c., is an urgent call to us to preserve the hearing of the little patient intact, and there is probably no better way of doing this than having aurists on the school medical staff and in connection with isolation hospitals.

Children who are disabled by loss of the power of locomotion are not commonly seen in Canada, where rickets is a rare condition, and where tuberculosis is being vigorously fought. We have, alas! too many victims from recent epidemics of poliomyelitis. There are many, too, when all are counted up, from tuberculosis. The writer once saw four cases of hip disease in a group of forty children who were writing for the High School Entrance Examination. That, of course, was a mere coincidence, but still it meant something. No class is yet started for physically defective children, but it is coming, and should come soon. We should have such a class in each of our chief cities.

Mentally Defective Children.

Of mentally abnormal children there are perhaps not so many in Canada as in other countries, but they are increasing at a truly alarming rate, and in spite of all precautions taken at our seaports, unquestionably the

number is pretty largely augmented by the admission of immigrants, some of whom are certainly unfit mentally. The figures given in the last Report of the Minister of the Interior show that of those actually stopped because they were feeble-minded about half were afterwards admitted, on account of pressure received from one quarter or another.

A league for the care and protection of the feeble-minded has been formed in Nova Scotia, and the question is being actively taken up in Winnipeg in connection with the Children's Aid Society and the public schools, and also in Alberta, where those interested in neglected and dependent children are fully aware of the gravity of the problem.

In Ontario the need of institutions, preferably training schools of the farm colony or village type, for the permanent care and control of the feeble-minded is fully recognized by all who are interested in schools, juvenile courts, the administration of justice, charitable institutions, hospitals, refuges, reformatories, &c. In 1912 the Provincial Association for the Care of the Feeble-minded was formed in Ontario, the inaugural meeting being held in Toronto. It is hoped that this association will greatly enlighten public opinion and hasten the time when the provision necessary for the care of the feeble-minded will be made.

In Toronto classes for feeble-minded children in the public schools have been established for almost three years, and in Ottawa similar classes have just been opened, with good prospects of usefulness. The only institution in Ontario for the care of the feeble-minded is the Hospital for the Feeble-minded at Orillia, a large building to which additions are now being made. The institution is beautifully situated in four hundred acres of ground on the picturesque shores of Lake Couchiching, about two miles from the town of Orillia. One of the benefits of the British North America Act in 1867 was that it enabled each province to act at once in accordance with its needs to establish mental hospitals, or asylums as they were then called. This Orillia Institution was opened on September 25, 1877, and though the Government year ended five days later in

that five days fifty-nine patients were admitted, almost enough to crowd the institution. Forty-two of these came from the London Asylum, fifteen from gaols, and two from private houses. Every year since has overcrowded it more. Its accommodation now is only for about 782 inmates, but there are about 820 in residence, and there is a waiting list of some hundreds. Orillia Hospital for the Feeble-minded was founded partly in consequence of representations by Mr. Langmuir, then Inspector of Asylums and Prisons, who says in 1876: "I would therefore most urgently recommend that a training school for young idiots should be founded and maintained as one of the public institutions of the Province. None of the institutions that have come into existence since Confederation was more urgently required than the one now proposed." Numerous additions have been made to the building since it was first opened, chiefly under the guidance of Dr. A. H. Beaton, who, though not appointed at the opening, took charge during the first year, and remained in charge till August 1, 1910, when he resigned. He did a great deal for the institution, organizing classes, developing industries, training the younger inmates, and introducing modern methods. He frequently pointed out the necessity of careful classification, better care for feeble-minded women, the industrial training of every worker, and the provision of additional buildings and larger grounds. Larger grounds have been secured during the last few years, so that now about four hundred acres are available. Two new buildings are being erected, a large part of the construction being done by the inmates. Mr. J. P. Downey, the present Superintendent, has ably administered the affairs of the institution for the past three years and made many improvements.

REFERENCES.

Annual Reports of the Hon. the Minister of Education for Ontario, 1875, *et seq.*

The Annual Reports of the Deaf and Dumb Institute at Belleville, and of the Institute for the Blind at Brantford.

See also "The Feeble-minded in Ontario." Seven Annual Reports. By Helen MacMurchy, 1906, *et seq.*

XXIV

DEFECTIVE CHILDREN IN THE UNITED STATES.

BY

WALTER S. CORNELL, M.D.

Director of Medical Inspection of Public Schools, Philadelphia; Director of Psycho-pathic Clinic, House of Detention and Juvenile Court; author of "Health and Medical Inspection of School Children."

THE object of this chapter is to present an outline of the medical and social work looking toward the betterment of the physical health and mental health of children which is now being carried on in the United States. In the small space here allotted it is impossible to do more than touch upon the most important phases of the subject. The last five years have been marked by great progress. The most notable single step has been the establishment of a National Children's Bureau at Washington, under the direction of Miss Julia Lathrop, formerly identified with social service work in Chicago. The function of this new Bureau is as yet limited to the gathering and publishing of information on subjects relating to infant hygiene and mortality, but its organization is looked upon as the first step toward the creation of a national department of health. In many of the States legislation has been enacted providing for school medical inspection, custodial care for the feeble-minded, and prohibition of marriage of the degenerate and diseased. In the municipalities, particularly the larger ones, there has been a remarkable recognition of the importance of social medicine evidenced by the creation of official departments to conduct the work hitherto carried on and financed by private philanthropy. New York City has evolved the most comprehensive system in a Bureau of Child Hygiene. The annual appropriation by New York City to this Bureau is over

$600,000. The work includes among other activities, the following: (1) Social service work by visiting nurses at the homes of expectant mothers. (2) The regulation of midwives. There are many of these in the great foreign-speaking immigrant section of New York City, transplanted from south-eastern Europe. (3) The prevention of blindness in newborn babies by administrative, social and educational work. (4) The establishment of depots for the distribution of pure milk and modified milk. (5) Supervision of infants' boarding homes and nurseries. (6) The medical inspection of school children. (7) Physical examination of children under 16 years, applying for employment certificates.

The New York Bureau of Child Hygiene under Dr. L. Josephine Baker has done all this work well, but has excelled particularly in the infant saving work, again to be mentioned. With a possible addition of two other activities (examination and deportation of mentally deficient children, and sanitary inspection of schools and orphanages) which in New York City are cared for by other municipal departments, it furnished a model programme of work for other cities.

Infant Life Protection.

The conservation of young infant life bids fair to materially affect the size of our population, since in the past some 40 per cent. of infant deaths have occurred in children under 1 year of age. The remarkable work of New York City just mentioned has produced marvellous results in decreasing infant mortality, the death rate of infants under 1 year of age dropping from 144 per thousand in 1907 to 107 per thousand in 1914. The comprehensiveness of the work in New York City is shown not only by the scope of the programme already described but by the proportion of New York children with which the Bureau of Child Hygiene comes into contact. Last year about one-half of the 135,000 babies born in New York City were handled in some degree by the municipal nurses or allied agencies. This large American city, crowded with over five million population, a large proportion of whom are poor immigrants form south-eastern Europe, has the second lowest death rate of the ten largest American cities. Dr. Baker

attributes her success to the working rule that "community health is purchasable," and directly to generous appropriations, to her preventive policy of taking care of the well children, and to proper publicity. Public opinion has steadily supported New York's budget for baby-saving work, including the appropriation of over $600,000 in 1913 before mentioned.

The effect of this baby-saving work upon the physical and mental vigour of the future population is as yet uncertain. There is a slight possibility that by saving the relatively unfit we are interfering with the natural plan of selection whereby the least hardy and vigorous succumb before the age of reproduction. This, however, is not likely. There has been no evidence to show that the babies heretofore dying in early infancy (except newborn babies who are not affected by this programme) are different from other babies. The chief factors in urban infant mortality have resided in the milk supply—weaned babies and unmodified infected cow's milk. The very opposite argument—that infantile marasmus may produce subsequent physical and mental stunting, is just as liable to be true, and if true makes the infant conservation work an influence for physical betterment rather than for degeneracy.

School Medical Inspection.

Some seven hundred cities and towns in the United States provide school medical inspection. Certain States, notably Pennsylvania, New Jersey, and Massachusetts, have enacted laws providing for medical inspection in every school district. The public inspection in Philadelphia, with which the writer is connected, may be briefly described. The work includes principally the correction of physical defects, the prevention of contagious disease, and the maintenance of sanitary conditions in the school houses. There are also, however, special activities such as the medical inspection of classes for crippled, tuberculous, anæmic and mentally deficient children, a psychopathic clinic for mentally deficient children, the vaccination of school children, the physical examination of teachers and janitors, and social work by the school nurses, particularly instruction of grammar school girls in the care of babies. Allied with the Division of School Medical Inspection in Philadelphia

are municipal dispensaries (two eye and four dental) for poor school children. Several thousand children are treated each year, and in the eye dispensaries they are provided with free eye-glasses. School medical inspection is now entering upon the second stage of its development, whereby it is becoming an integral part of the educational system. Instruction in personal hygiene, and in the noting and evidence of the common physical defects of eye-strain, nasal obstruction, carious teeth, &c., are supplanting the old non-applied physiology. Instruction in sanitation, emphasizing water supply and ventilation, educational campaigns on the care of babies and milk, the prevention of tuberculosis, and the danger of the house fly, are now being carried on in the schools. These are given from an applied and practical viewpoint, largely through the assistance and co-operation of school physicians. A noteworthy result of the progress made in school medical inspection has been the establishment of open-air classes in some seventy American cities. Another has been the particular attention paid to mentally deficient children. These activities show the present ability of the educational system to grasp the fact that such large numbers of children suffer from certain defects and diseases that special provision on a comprehensive scale may well be made in the school system for them.

The work done in the course of routine school inspection may be learned from the Philadelphia Report for 1913:—

TABLE GIVING GENERAL SUMMARY OF WORK DONE BY INSPECTORS AND NURSES.

Number of pupils in elementary schools	182,238
Number of pupils in high schools	12,643
Number of school buildings	298
Visits made by supervisors	2,732
Visits made by assistant inspectors	39,481
Pupils sent to inspectors by teachers	145,200
Routine physical examinations by inspectors ...	145,145
Special examinations by inspectors. (Rapid examinations, mostly by classes)	305,968
*Number of physical defects recommended by inspectors for treatment	158,974
Physical defects and diseases handled by school nurses	42,001
Advisements and local treatments at schools by nurses	180,550

* Not including about 3,000 recommendations accompanying exclusions for pediculosis, non-vaccination, &c.

Advisements at homes and children taken to dispensaries	16,789
Proportion of physical defects corrected consequent to recommendations	415
Number of exclusions from school by inspectors	9,144
Time lost from school by reason of exclusions (in days, minor contagious diseases only) ...	6,204
Number of throat cultures taken by inspectors	3,910
With positive results	230
Vaccinations performed by inspectors	5,639
Number of schools disinfected ... ... (On school days, 126; Saturdays, 155; also 54 classrooms scrubbed and cleaned on account of contagion)	281
Number of sanitary defects reported to Board of Education	107
Children seen at special clinic for mentally deficient children	225
Children placed in open-air classes	204
Children visited at their homes at request of Bureau of Compulsory Education	221
School janitors (applicants physically examined)	21
High school students (competitors in athletic games specially examined)	901
Children placed in special class for cripples ... (Fifty additional ready for placement.)	25

The proportion of defects corrected as a result of the work of the school physicians and nurses would be materially greater if more free dispensary facilities for the treatment of carious teeth were in existence. The fact that the correction of dental decay is mechanical work, arduous and time-requiring, has militated largely against the establishment of free dental dispensaries. Since medical inspection has been instituted there has been an appreciable decrease in the proportion of children reported to be physically defective. This has been due to the correction of a large proportion of the physical defects which previously existed uncorrected for years. In Philadelphia in 1905 the grammar schools in one of the better portions of the city showed only 3 to 4 per cent. of the children wearing eye-glasses. At the present time in the majority of the Philadelphia schools the proportion is from 10 to 12 per cent.

Mental Deficiency in Children.

Intense interest has been shown in this subject evidenced by the recent provision by many States of suitable institutions for the feeble-minded, the provision by school boards of special classes for mentally deficient

children, the provision by colleges for special training of teachers of deficient children, the passage of laws based on eugenic principles, the publication of extensive heredity researches by large agencies for social investigation, the institution by certain orphan institutions of a programme of selection of candidates based on nentality tests, and the institution of a system of mental examinations of immigrants at the great American ports of entry.

In 1912 there were in the United States eighty-one institutions, large and small, private and State, for the care of the feeble-minded. Of these, the State institutions numbered forty-two, and were found in thirty-two of the then forty-seven States in the Union. The population of all the institutions for the feeble-minded cannot be given accurately, but is approximated at 28,000. The latest available figures, collected in 1910, give 23,856 defectives cared for in twenty-five of the different States, and since then there has been an increase in the capacity of many institutions and the establishment of new State institutions in Maryland, Oklahoma, North Carolina, Rhode Island and Colorado.

Illustrative of these activities are the 150 special classes for defective children in the school system of New York City and eighty special classes in the school system of Philadelphia. The New York schools possess forty-six centres, instituted for the examination of deficient children with physicians, psychologists and social workers. The eugenics laws just mentioned have varied from the prohibition of marriage of the feeble-minded (in twenty-two of the forty-eight States) to permission for the sterilization of the feeble-minded and criminal and even for the custodial commitment of persons judged to be feeble-minded by psychological tests. Most of these laws, however, with the exception of the first named, have been declared unconstitutional when an attempt has been made to put them in operation, on the ground of the infliction of cruel and barbarous punishment, impracticabitity, &c. In the State of Wisconsin the endeavour to limit the production of the race to healthy offspring has caused the passage of a famous law making mandatory the furnishing by the contracting parties of a medical certificate that no venereal or other disease exists. Unfortunately for this law it provides a fee of $3.00

intended to cover a thorough physical examination including a blood test for specific disease, with the result that no physicians have been found ready to make the required examination. The consequent impossibility to secure the medical certificates at the price fixed by statute has caused the law to be declared impractical.

The causes of the great interest in the subject of mental deficiency, which in its broadest aspect is synonymous with degeneracy, comprise principally the awakening of the public to matters of social welfare, the translation into English of the Binet-Simon graded scale for measuring the intelligence of children, and certain heredity researches showing the transmission of feeble-mindedness. Whatever may be the differences of opinion among workers on the subject of mental deficiency concerning the exact application of the laws of heredity to feeble-mindedness, and the exact diagnosis of feeble-mindedness by a simple, brief system of intelligence tests, the fact remains that the publications of Henry H. Goddard and Charles B. Davenport, and the social work of Edward R. Johnstone and Walter Fernald, have been the most powerful single agencies in stirring up American educators, sociologists and psychologists to the importance of the subject.

From the last paragraph it may be rightly judged that the most productive work has been done by social investigators and educational psychologists. Certainly our knowledge of the social and educational aspects of feeble-mindedness has increased much more than our knowledge of the pathology of the degenerate or defective nervous system.

Dr. Goddard, of the Training School at Vineland, New Jersey, has published a history of a degenerate family[1] rivalling the story of the notorious Jukes family told by Dugdale, of the New York Prison Association, in 1875. Dr. Davenport, Director of the Eugenics Record Office at Cold Springs Harbour, New York, has published a similar history of another degenerate family ("Nam" family). The psychology of feeble-mindedness has been studied at the Training School at Vineland, New Jersey, the State Institution at Faribault, Minnesota, the Uni-

[1] GODDARD: "The Kallikak Family: A Study in the Heredity of Feeble-mindedness." London and New York: Macmillan Co.

versity of Pittsburg, and also at numerous universities and institutions, but nothing much of scientific importance has been brought forward except the claim that the Binet-Simon test scale may be used alone to infallibly determine the existence of feeble-mindedness in any child. This claim, generally regarded as erroneous, comes however so near the truth that many studies have been made and many controversial papers published, with consequent increased interest in the subject by everyone. The truth concerning the relation of the Binet scale to the diagnosis of inherent mental deficiency appears to be expressed in the views of the writer published in 1912, that the scale is too easy in the earlier years and in the later years is too difficult; that it ignores the influences of child health and environment which certainly affect the mental attainments to a notable degree from the fourth to the tenth years of life, but that it is nevertheless a valuable help to the examiner in spite of its limitations. The beneficial influence upon the public school system of this simple method of testing intelligence has been remarkable and has been equalled only by the beneficial influence of the Montessori method of child training. The idea in both systems is simple and has its inspiration in the principle or viewpoint that exactness of knowledge greatly enhances its value. Binet endeavoured to definitely measure the knowledge already attained by the child; Montessori endeavours to impart knowledge by definite means and increments.

Progress in our knowledge of the pathology of feeble-mindedness has been slight. Several studies of the presence of the Wassermann reaction in feeble-minded children have been made, but these, although significant and showing generally about 20 per cent. of cases positive, have been inconclusive for various reasons. The great prevalence of myopia, or flat foot, and of indicanuria in feeble-minded children has been demonstrated and in the Mongol type the remarkably low blood pressure and occasional leucopænia have been commented upon. The average increase of 1 mm. in the head circumference of imbeciles over idiots, and high grade feeble-minded over imbeciles has been pointed out. The under average height of the feeble-minded has been shown by statistical studies. The relation of feeble-mindedness to degeneracy has been studied, particularly

by Dr. William J. Healy, of the Psychopathic Institute in Chicago, and by the writer at the Philadelphia Juvenile Court. Dr. Healy has published two excellent monographs giving test methods and results. The writer has reported the finding of undoubted feeble-mindedness in 4 per cent. of the delinquent children brought to the Philadelphia House of Detention, with mental deficiency of the "border line" type in another 9 per cent., and a neurotic constitution associated with fair intelligence in another 1 per cent. Dr. Healy has found and emphasized that 6 per cent. of the delinquents seen by him in Chicago are epileptics. Our experience in the Philadelphia House of Detention (Juvenile Court) is different, as very few epileptic delinquents have been observed by us. A poorly controlled temper unaccompanied by any history of major or minor seizures has not been considered as evidence of epilepsy.

The subject of juvenile delinquency cannot be concluded without reference to the application of the Binet scale to delinquent children. It has been found that most of these children (their physical ages are 10 to 15 years inclusive) test 9, 10 and 11 years mentally; their emotional natures, however, varying greatly. The application of the Binet diagnosis rule (the claim that children more than 3 years retarded are feeble-minded) would class the great majority of delinquent children as feeble-minded, an obviously incorrect viewpoint. A study of the influence of social grade and of nativity upon the answers to the scale, has shown that delinquent children who are mostly 11 years or more of age answer most of the test questions influenced but little by the environmental conditions just mentioned. The fact that practically all of these children are physically older than their mental ages, indicates that time has levelled the early advantages given by better environment.

Defective Eyesight in Children.

Blindness in infants, which is usually due to specific infection of the eyes at the time of birth, has noticeably decreased during the last few years owing to the general adoption by the medical profession of the practice of instilling nitrate of silver solution in the eyes of new-

born infants. In New York City, where one-half of all the babies born and practically all the babies in the poorer sections of the city are seen by visiting nurses controlled by the city, blindness from ophthalmia neonatorum occurred in only eight children in 1913.

Much has been done by those interested in the education of the blind by the dissemination of literature printed in Moon and in Braille type. In the schools early attention to the eyesight of children has almost eliminated the existence of internal squint. While no definite figures are at hand, it is very possible that myopia has been prevented in many cases by the early procuring of eyeglasses, since myopia is usually secondary to a neglected hyperopia. The establishment of free eye dispensaries for school children has been already mentioned.

Defects of the Nose and Throat in Children.

Although no discoveries have been made in this field, the medical profession and many of the laity have come to the realization of the practical importance of facts previously appreciated only by a few; namely, that adenoidal nasal obstruction depends principally upon infantile poor nutrition and poor ventilation, that almost all ear diseases result from diseases of the nose and throat, that diphtheria and tuberculosis occur very frequently in those who suffer or have suffered from nasal catarrh and adenoids, that we should be somewhat more conservative in the matter of excising the tonsils, and that adenoidal obstruction is a definite but not absolutely retarding influence in mental development. Because of the direct or indirect causation of adenoidal nasal obstruction, of diphtheria, tuberculosis, suppurating ears, flat chest, irregular teeth, poor nutrition, functional nervous disorders and mental retardation, the condition is rightly looked upon as one of the most serious defects from which children can suffer.

Defective Teeth in Children.

The now universally recognized vital relation of mouth hygiene to bodily health has been reflected in the efforts to properly care for the teeth of children. In the work of school inspection over one-half the children have been

shown to possess one or more carious teeth, the number sometimes reaching ten carious teeth in one mouth, and therefore in the course of this administrative work probably a million parents' notices are now issued each year. In Philadelphia alone 50,000 such notices were sent out by the school inspectors in 1913. The popular education conferred by these notices, which in many cities, at least, are accompanied by circulars describing the effect of dental decay upon the system, and the corresponding popular education through energetic advertisers of tooth powders, have revolutionized the public attitude in the matter of mouth hygiene. At the present time in our larger cities some 30 per cent. of the carious teeth which have been the subjects of parents' notices are treated subsequently by dental surgeons. That a larger proportion is not treated is due to a lack of knowledge by the general dental profession of the best surgical procedure in the case of children's teeth, and to the lack of free dental dispensaries for the poor. Both of these drawbacks are being overcome, the dental surgeons adjusting themselves to the new conditions and demands created by the greater number of children going to them, and the various municipalities taking steps to furnish free dental treatment. The Municipal Dental Dispensaries in Philadelphia are a good example of the last-named enterprise. In Boston a philanthropist, Mr. Forsythe, recently bequeathed $2,000,000 for the establishment of a free dental dispensary in Boston. The free dental dispensary for children in Philadelphia in 1913 treated 12,218 school children, the work consisting of 9,965 fillings, and also of extractions and of treatments of alveolar abscesses.

Modern dental surgery in children emphasizes the cognizance of the inter-relation of nasal obstruction, high narrow palate and irregular teeth, and the necessity of both nasal surgery and orthodontia to restore health. Also the profession has become alive to the danger of oral sepsis and to the greater prevalence of dental decay among children with irregular teeth and children of a starch eating habit. The importance of the integrity of the first permanent (6 year) molars has become well known. In the municipal dental dispensaries for school children the most efficient methods combining elimination of oral sepsis and production of sound, regular

adult teeth, consist in the careful conservation of the 6 year molar, the grinding to the gum level of badly decayed temporary teeth with cauterization of the ground down stumps and the cure of all chronic alveolar abscesses.

Nutritional Defects in Children.

This most important defect depends on such a variety of causes that a corresponding variety of efforts to correct it have come into existence. The eugenists are endeavouring to produce healthy children by selection of the stock, the sanitarians by better ventilation of the school houses and homes and by proper provision for recreation, and the sociologists by the improvement of general home conditions, partly through education of the parents and partly through betterment of their condition. The efforts of the eugenists as shown by prohibitory legislation have been already mentioned in the treating of mental deficiency. The movement for better ventilation has been evidenced by mandatory provision in the school laws of various States regarding the cubic air space and window illumination provided for each school class and by the establishment of open-air schools in some eighty-six American cities. Some of these cities have made great progress in this particular work, New York having twenty-four, Minneapolis twenty, and Chicago eighteen open-air classes in the school system. The attempt to improve poor nutrition in children by means of school lunches has made considerable headway in some of the larger American cities, as a rule under subsidy by private philanthropies. In New York the work is under the supervision of the Association for the Improvement of the Condition of the Poor, in Philadelphia under the Home and School Association. In Chicago the McCormick Foundation conducts some eighteen open-air classes, which work includes the feeding of the children. The value to children of good nourishing food is undoubted, and the condition of the children in the poorer sections of our larger cities justifies every legitimate means to improve their nutrition. While it must be admitted that the school lunch programme has so far proved rather expensive and an exact demonstration of physical improvement has been shown more conclusively

through the agency of fresh air than by provision of proper food at noon time, it must be acknowledged, nevertheless, that special measures are required to meet special conditions, and the school lunches are certainly justifiable not only as factors in improving the nutrition of the children but in preventing tuberculosis and in educating the ignorant concerning the most economical food stuffs. The headquarters in the United States for information on this subject may be stated to be the Home Economics Association, address Chicago. This Association took an active part in the International Hygiene Congress in Buffalo in the summer of 1913.

There is still much to be learned concerning the causation and cure of poor nutrition. It is reasonable that many of the children of the poor are inherently of inferior physique and are not improvable beyond a certain point. From the observation by the writer of many school children this condition is apparently the case among children whose parents have lowered their physical vigour working in mills and factories. On the other hand the wonderful improvement in the physical condition of the American-Jewish population one generation after immigration from Russia is a striking example of the reaction of the body to improvement in living conditions and the enjoyment of political freedom.

Prevalence of Physical Defects among American School Children.

The prevalence of physical defects among American children no doubt corresponds to conditions found in European countries, since both people and social conditions are beginning to approximate conditions found at least in many parts of Europe. The statistics so far gathered and brought to wide public attention are those depicting conditions in the large cities. There are, unfortunately, no reliable statistics at hand, known to the writer, giving the results of thorough medical inspection of a large number of children in rural districts. The assumption that country children are physically superior to city children is not altogether a safe one, particularly since the great cities have expended large sums of money for recreation parks, physical education and school

medical inspection, and have safeguarded child workers by regulation of hours of employment. The differences which the English or German reader might observe between statistics concerning the defects found in American children stated in this article and statistics concerning English or German children would certainly be no greater than the differences which are found when comparing different American studies with each other. One of the striking features, indeed, of any survey of statistics bearing on the defects of children is the great difference which exists in the reported prevalence of each of the physical defects, a difference in part due to personal equation in the examiner, and in part to actual differences in children due principally to age and social condition. We have all come to realize that the decrease in the power of accommodation with increase in age causes more older children than younger children to need eye-glasses. The children of the poor, living in unsanitary conditions and poorly nourished, show nose and throat defects in twice the proportion that children of a better social class show these defects. Poor nutrition is, of course, much more prevalent among children of the poor, and skin diseases are found in many times greater number among children of the poor and ignorant.

Really the only item worthy of attention of the European reader is the reported prevalence of trachoma among the North American Indians, who live on reservations, supervised by the United States Government, in various localities in the western parts of the country. From this fact, rather startling to those who have associated trachoma with south-eastern Europe only, we may possibly conclude that trachoma is a disease more or less constantly associated with dirt and lack of soap and water. The great decline in the number of trachoma cases reported among New York City children is due, no doubt, in great part, to the work of the authorities, but it is very possible that a large measure of improvement has been due to better diagnoses, the inculcation of hygienic habits among the children and the absolute cure of cases.

For the above reasons the *average figures* here quoted, from the writer's book on "Health and Medical Inspection of School Children," must not be taken to signify anything more than general guiding figures set down

after a study of some eight or ten of the most important reports issued in the year 1911.

	Per cent.
Eye-strain (sufficient to warrant glasses)	28
Enlarged tonsils (varying directly with poverty and indirectly with age)	6 to 12
Nasal obstruction (usually adenoid, varying indirectly with poverty and indirectly with age)	12 ,, 24
Defective hearing (varying directly with poverty and indirectly with age)	2 ,, 5
Decayed teeth, primary grades (decreasing with age until 10 years)	50 ,, 75
Decayed teeth, grammar grades (increasing with age)	10 ,, 30
Nervous disorders	5 ,, 20
Orthopædic defects :—	
Noticeable stoop shoulders (increasing with age and more prevalent among girls)	0 ,, 20
Spinal curvature (increasing with age and more prevalent among girls) :—	
Noticeable	3
Actually existing in some degree	23
Skin diseases :—	
Eczema (varying directly with poverty, malnutrition, and dirt, and inversely with age)	1 ,, 15
Pediculosis (depending upon race and social condition, almost entirely in white girls)	0 ,, 67

REFERENCES.

For fuller discussion of the subject of this chapter, *see* "Health and Medical Inspection of School Children," by Dr. Walter S. Cornell. Philadelphia: F. A. Davis Company, 1912. 12s. 6d. net.

Catalogues and descriptive literature on training courses for school teachers in mental deficiency, child hygiene, &c., may be obtained on application to the following centres: Training School, Vineland, N.J.; University of Pittsburg; Harvard University; Columbia University; University of Pennsylvania; University of Michigan; University of Chicago; Training School, Lapeer, Mich.; New York University.

For reports on school feeding, see publications of the following: American Home Economic Association; Philadelphia Home and School League; New York Association for the Improvement of the Condition of the Poor; Elizabeth McCormick Memorial Fund for Open-air Schools and School Feeding, Chicago.

The following Journals and Transactions of societies may be consulted with advantage :—

The Survey (leading magazine on social work).
Journal of Home Economics.

Transactions of the American School Hygiene Association.
Transactions of the Fourth International Congress of School Hygiene (Buffalo, 1913).
Transactions of the American Association for the Study and Prevention of Infant Mortality.
American Journal of Public Health.
Journal of the American Medical Association. (*See* reports and literature of the Council of Public Health of American Medical Association.)
Journal of Psycho-asthenics.
Journal of Education and Psychology.
Psychological Clinic.
Training School.

Numerous publications by United States Government, for sale for a few cents each, by the Superintendent of Documents, Washington, D.C.

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XXV

DEFECTIVE CHILDREN IN FRANCE.[1]

BY

LOUIS DUFESTEL, M.D.

Médecin-Inspecteur des Écoles de la Ville de Paris, Secretary-General of the Third Congrès International d'Hygiène Scolaire at Paris, Joint Secretary L'Association Internationale des Médecins-Inspecteurs des Écoles.

In France abnormal children are divided into two large groups: (1) the educable abnormals, whom it is possible to improve and to bring into such a condition that they are able to care for themselves, and (2) the un-educable abnormals, who have to be cared for and controlled. These latter, especially all idiots, cretins and imbeciles whom it is impossible to improve, are generally dealt with in institutions such as the asylum which has been established by Dr. Bourneville in connection with the hospital at Bicêtre.

The abnormal educable children comprise two distinct classes: (1) the physiologically abnormal who present serious conditions of hearing and eyesight, and (2) the so-called educationally abnormal or backward scholars.

Such defective children as deaf-mutes and blind are taught in special schools distributed throughout France.

The educationally backward children are those who attend school without benefit to themselves and with great inconvenience to their teachers. There are false and true educationally backward children. The false ones are those who are shown by the ordinary school examination to be distinctly backward, but who reveal nothing special on mental examination. These are the children who

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[1] Dr. L. Dufestel's chapter has been translated from the original French into English by Mrs. T. N. Kelynack, M.B., Ch.B.—EDITOR.

attend school irregularly or who suffer from defects of sight and hearing, such as myopia or partial deafness, which are unsuspected before their medical examination. When these sensory defects are discovered and treated the child can usually be placed in a suitable class, where he rapidly makes up for his previous backwardness. In this class must also be placed those whom Dr. Legendre calls the temporary abnormal, children suffering from dilatation of the stomach or other alimentary insufficiency. In the same category are the myxœdematous and those suffering from thyroid insufficiency. These are really conditions which proper treatment will improve or, perhaps, cure. We shall consider here the true psychically backward children, those who present serious troubles which are revealed by the medical examination following the school examination.

In 1905 a special commission instituted by the Minister of Public Instruction made an inquiry through the municipalities and educational authorities with the object of ascertaining the number of abnormal children. According to the terms of the inquiry the educationally backward were not to be considered as abnormal. In a population of 5,015,416 children between the ages of 2 and 13 years there were 31,791 abnormal, classified as follows:—

Defect	Total	Boys	Girls
Blind	1,858	1,068	790
Deaf-mutes	4,349	2,164	2,185
Medically abnormal ...	7,984	4,696	3,288

In this category were placed idiots, cretins, imbeciles, epileptics, the hysterical, choreic, paralytic and hemiplegic, as well as children with perverted instincts:—

Defect	Total	Boys	Girls
Backward	14,200	8,336	5,864
Unstable	3,400	1,855	1,545

This inquiry, however, was incomplete, as a number of towns or communes only gave inconclusive results. The figures supplied by the inquiry at Lyons gave an average of 1·37 per cent., but Abadie, who made a thorough investigation at Bordeaux, and Binet in Paris, give 5 per cent. as the average of abnormal children in the schools. The law of April 15, 1909, completed by

the order of August 17 of the same year, deals with the question of backward children, and it is by this law that classes and special schools for the instruction of these children have been established.

Organization of Classes and Special Schools for Defective Children.

These special classes and schools are arranged by the departments or communes. The classes are attached to elementary public schools and only deal with day-scholars. The special schools, on the other hand, may take day-scholars, day-boarders, or resident pupils. The classes in connection with public schools receive children from 6 to 13 years of age; autonomous schools may prolong the period to 16 years, because they give professional instruction at the same time. Usually only those children whose education cannot be attended to in their own homes are received as boarders. The classes only include children of one sex; the special schools may take pupils of both sexes, but in separate divisions. As a general rule the children are selected by the master and submitted to an examination by the school medical officer before being sent to the committee which is responsible for deciding admissions. This committee consists of a primary inspector, a director or master of a special school, and a doctor. A member of the family is always asked to be present at the examination.

The Examination of the Child.

To ascertain if a child is backward it is subjected to a series of tests which reveal not only the degree but the cause of the backwardness. On these tests the subsequent treatment depends. The child, first of all, undergoes a school examination and then a medico-psychological investigation. The school examination is based upon the average knowledge of children of the same age. The classes in French primary schools are arranged in three groups: the elementary class, the intermediate class, and the upper class. According to the investigations of Binet, backward children scarcely ever pass the elementary class; a few reach the intermediate class, but this is quite the exception. According to Binet's statistics the least backward stage is that at 3 years

of age. The tests usually employed for ascertaining educational backwardness are those of Binet. Binet and Simon put the children through three tests : reading, calculating, and spelling. In the purely psychical examination known tests are used. These are simple questions, prepared beforehand and suitable to the age of the child.

Following on this, the doctor endeavours to ascertain the cause of the backwardness. He devotes attention not only to the external characteristics, but to everything which concerns the memory, power and attention. States of emotion, affection, and voluntary activity are subjected to searching investigation. He examines the skeleton and then proceeds to test motor power, general sensibility, and the secretory glands. Hereditary vices and stigmata of degeneration are carefully noted. After this examination the children are divided into two classes, the asthenic and the unstable. The former show almost complete mental inertia, whilst the latter, on the other hand, are unable to control their reactions. This division has practical importance, for in certain towns, such, for example, as Bordeaux, two distinct classes have been established to deal with the asthenic and the unstable respectively. These two groups, however, may show intermediate conditions, which it is often exceedingly difficult to classify. The teachers in the special schools are chosen from among the staff of the primary schools, having undergone a special examination. They receive a special salary.

Schools for Abnormal Children.

For the benefit of the blind, Paris has two institutions, the National Institution for Young Blind Persons, and the Braille School which belongs to the Department of the Seine : for deaf mutes there are the National Institution for Deaf Mutes and the Departmental Institution of Asnières ; for idiots, imbeciles and epileptics there are the asylums of the Salpêtrière, Bicêtre, and Vaucluse. There are eleven special classes attached to the primary schools in Paris, two at Levallois-Perret (Seine), seven at Lyons, three at Bordeaux, two at Tours, and one at Poitiers.

It is difficult at present to give exact results regarding the children taught in the special classes, as statistics vary with the different school authorities. Binet says that in

Paris, where he has been able to follow up the results, 76 per cent. of the abnormal children have been placed in situations and are able to earn their own living.

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XXVI

DEFECTIVE CHILDREN IN GERMANY.[1]

BY

KONRAD BIESALSKI, M.D.

Director of the Berlin and Bradenburg Cripple Hospital and Training Institution.

GERMANY was the first country to institute a systematized care for defective children. In 1832 a private citizen named von Kunz founded a training school for crippled boys in Munich, and from this school has sprung the Royal Bavarian Central Training Institute for Crippled Children of to-day. In the North of Germany a solitary institution of this nature was founded in 1866 and owed its origin to the inspiring example afforded by the work of Pastor Kundsen in Copenhagen.

CRIPPLE CARE IN GERMANY.

In 1906, an official census was taken of all the crippled children of the elementary school class in Germany. This census disclosed the fact that Germany numbered at least 100,000 cripples under 14 years of age among its 56 million inhabitants, or 14·8 per 10,000. Of these 100,000 children, 56,000 were considered by medical experts to be cases calling for institutional care, and of these cases 11,000 pronounced their willingness to submit themselves to such treatment. But in 1906 the 39 cripple homes in Germany only offered accommodation to 3,971 children. Of these 56,000 crippled children 15,000 suffered also from nervous disorders, 11,000 from

[1] This chapter has been translated into English through the kindness of Mrs. E. V. Kanthack de Voss.—EDITOR.

tuberculosis, 11,000 were rachitic, 37,000 were epileptic, 344 were deaf-mutes and 226 were blind. Ninety-seven per cent. of all the children were mentally normal. There was a considerably greater proportion of cripples in the towns and industrial centres than in the open country.

The care of crippled children in Germany is conducted on two distinct lines. Those who are not suitable cases for admission to hospitals receive advice and treatment at clinics, dispensaries, special departments of general hospitals and similar institutions. This line of treatment, which is essentially preventive in its policy, is rapidly gaining ground in Germany.

The cripple homes and hospitals deal with cases in urgent need of institutional care. The following definition of a "suitable institution case" (*heimbedürftig*) has been officially recognized: "A crippled child is in need of institutional care when, in consequence of a congenital or acquired nerve, bone, or joint disease, he is hampered in the natural use of his limbs to such an extent that his physical disabilities bring him into total disharmony with his environment; and when his removal to an appropriate institution offers the only chance of so training and developing his remaining faculties as to procure for him the best possible conditions of health and independence, the institution in question being specially adapted to deal with his individual physical and educational requirements." This definition also indicates the proper functions of a cripple home. To be efficient, it must be at one and the same time an orthopædic clinic, a special school for defectives, and a trade and crafts school. In Germany we do not separate the curative treatment and the purely educational training. Both are carried on simultaneously under one roof.

There are now 53 cripple institutions in Germany, the total number of beds being 5,932. One half of these are undenominational. The largest institution has 500 beds, the average number of beds being 99.

There has been a very rapid increase since 1906, when there existed only 39 institutions.

An ideal scheme would provide one home with 200

beds for every million of the population. Fifty such homes would be required, and they would provide accommodation for 10,000 children. The rest of the cases could be treated as out-patients in clinics, &c.

All the homes are under the skilled supervision of medical experts, and among these are to be found some celebrated names. Many of the institutions are supplied with medico-mechanical and Röntgen-ray laboratories and orthopædic workshops, and several of them have polyclinics attached. In the school section the teaching is conducted on the same lines as in the elementary schools. Some homes have special classes for mentally deficient children, others have continuation schools attached. In the workshops over 50 different trades are taught. The boys remain in the institutions until they have passed the State apprenticeship examination, the girls until they have completed their course of training, which stretches on the average over three years. The cost of maintaining the children in these institutions is borne by the local authorities in the large communities, by the Poor Law boards in other localities, or by churches or by private charity.

The German Association for Cripple Care (*Deutsche Vereinigung für Krüppelfürsorge*) knits up all the various institutions which devote themselves to the welfare of the cripple. Its central office is in Berlin, S. 10, Fontane Promenade.

Mentally Defective Children.

In Germany the organized provision for mentally defective children is of a much earlier date than the care for crippled children. The mentally defective child has long ceased to be regarded as a mere object of charity, and the conviction that the proper and scientific treatment of such cases was a social necessity soon made headway. At the present day the treatment of the feeble-minded is not conducted on the lines of haphazard charity, but is directed towards guarding the community from the evils that threaten it from the presence of such members in its midst, and also towards training and educating these persons in such a manner

that they may not only cease to be a burden on the community but may even become useful to it.

The first school for cretins was formed in 1816 in Hallein, near Salzburg, by a pedagogue called Guggenmoos, nearly a hundred years ago. Since then the social efforts centring on the mentally defective child have steadily increased until we have now a widespread system of efficient control over and care of the feeble-minded. The first German step in this direction was the establishing of an idiot asylum by Kern, an elementary school teacher in Eisenach, in 1842. Kern published a book entitled "On the Combined Medical and Pedagogic Treatment of the Feeble-minded," which indicated the appropriate methods to be adopted, and these methods have been largely adhered to ever since. In the second half of the last century the number of institutions increased very rapidly. The first statistics on the subject were published by Dr. Lähr in 1874, and were continued after 1889 by Sengelmann. There are now about 150 institutions for the feeble-minded and epileptics in Germany, partly philanthropic enterprises, partly private or municipal or provincial undertakings. In addition to these, there are in very many German towns special schools or special classes for mentally backward or defective children. Nor are the adult defectives, who may be ranked as children in all but years, neglected. A large number of continuation schools, workshops, garden colonies, asylums, welfare societies, and so forth have been established for their benefit, and the list is steadily increasing.

The following data will give a short summary of the development of the "special school" system in Germany. In 1874 there were 30 such schools, with 115 teachers and 110 classes, in which 1,280 boys and 1,010 girls, giving a total of 2,290 children, were instructed. In 1898 their number had increased to 56, with 225 teachers, 202 classes, 2,408 boys, and 1,881 girls (total, 4,289). In 1901 there were 98 special schools with 326 classes dealing with a total of 7,871 children. In 1904 the number had reached 174, with 10,000 children, and in 1909 there were 230 schools, with 14,800 children.

In 1908 the Frankfort Central Bureau for betterment

schemes affecting feeble-minded children instituted a private inquiry into the various ameliorative measures provided by individual communes. This inquiry was followed by the establishment of provincial associations for assisting mental defectives to maintain themselves after leaving school.

In 1906 the Prussian Kultus-Minister, in conjunction with the Secretary for War, issued an important enactment enforcing an obligation on all superintendents of special schools to notify the local authorities every year of the names of all pupils completing their training and leaving the school, at the same time enclosing their leaving certificate and furnishing any special details of importance bearing on the case. All the data thus received are forwarded to a large State central bureau.

The special school teachers have also not stood still. Since their initial Congress on April 11, 1898, the Association of Special School Teachers (*Hilfschullehrer Verband*) has developed rapidly. It now numbers some thousand teachers, publishes its own official organ, and incorporates within itself a large number of small associations. The superintendents and teachers of idiot asylums have their own association (*Konferenz für das Idiotenwesen*), and meet every three years.

Epileptic Children.

In 1910 there were 26 institutions which sheltered and educated epileptics, some being established exclusively for the reception of these cases, others being general institutions with a special department for epileptics. In addition to these there are also schools attached to institutions for the treatment of nervous diseases (*Nerven-heilanstalten*) in which epileptics are taught.

Blind Children.

For a long time past the care of the blind has been one of the duties undertaken by the State. In 1905 there were in the German Empire 996 blind children from 5 to 7 years of age. Of these 283 were in asylums (28·4 per cent.). The high percentage of those not in asylums is due to the fact that all children under 6 and

all the blind mutes, deaf, and deaf-mutes were excluded. In 1910 there were in the Empire 340 blind deaf-mutes, 64 of whom were between 5 and 20 years of age. The total number of blind children between 10 and 15 amounted to 1,344, of which 750 (54·3 per cent.) were in asylums. The total number of all blind persons in the Empire amounted to 34,344.

It is satisfactory to note that since the General Census of 1871 the number of blind persons has diminished as much as 30·53 per cent. But there still remains a very large field of work for the eye-specialist to cover.

The education of the blind has reached a high level in Germany. The plan of study closely corresponds to the routine of the elementary school, and, in addition to this, music is taught as a special and important subject. The blind schools also aim at the efficient training of their pupils in various arts and crafts, the following having been found to be the most suitable: Straw-plaiting, basket-making, rope-making, and brush-making.

The guiding principle in the care for the blind is that the blind are not only to be trained to become efficient workmen, but shall also have their intellectual powers developed to their utmost capacity. On these lines the continuation schools take up the work of the ordinary schools. The training institutions never lose sight of their discharged pupils. Though many of these became independent in the course of time, there must always remain some who will permanently stand in need of guidance and protection.

It is interesting to note that about 10 per cent. of the blind are also feeble-minded. These receive instruction in the special classes above alluded to.

An institution for blind deaf-mutes has been established at Nowawes, near Berlin, which has good results to show. This institution harbours the majority of persons in Germany who possess only one sense (the sense of touch).

Deaf-mutes.

In Germany there are 9·6 deaf-mutes to every 10,000 of the population. As in the case of the blind, the State has made the deaf-mutes its care. Special schools

and trade schools are provided for them, and the State further assists them to gain an independent livelihood. It can, therefore, be safely taken for granted that every deaf-mute child in Germany can command a special school training suitable to his needs.

During school age the special schools follow the ordinary teaching-plan of the elementary school. In Germany the special schools do not, however—as is done in some countries—combine educational teaching with manual training, but content themselves with adopting such measures as will form a useful preparation for the trade school of a later period.

Of the male deaf-mutes engaged in industrial occupations in 1910, 68 under 25 and 80 per cent. between 25 and 50 were reported as being independent wage-earners. Efforts are now being made to establish homes for aged deaf-mutes.

Deaf Children.

For children afflicted with extreme deafness provision is made in nearly all larger towns in the form of special school classes. Berlin, for instance, in 1910, had 14 such school classes for cases at the conclusion of school age. Facilities for industrial training are available for these children, and their further progress and welfare are promoted in every possible way.

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School Medical Officers in Great Britain desirous of studying German methods for the care of defective children will find the following references of service :—

The German Association for Cripple Care publishes a quarterly journal called the *Zeitschrift fur Krüppelfürsorge*, edited by Dr. Konrad Biesalski, 12 marks yearly to non-members.

The subject of cripple care in Germany has been exhaustively dealt with in a work entitled "Umfang und Art des jugendlichen Krüppeltums und der Krüppelfürsorge in Deutschland" ("The Scope and Nature of Juvenile Deformity and Cripple Care in Germany). This book was published after the census of juvenile cripples in the German Empire, mentioned in the preceding chapter, and contains 316 pages of statistical tables.

It also presents a very complete bibliography enumerating 237 works in different languages. The book is the work of Dr. Konrad Biesalski, and is published by Leopold Voss, of Hamburg, 1909. 30 marks.

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Die Fortbildungsschule.
Die Gesundheitswarte der Schule.
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Zeitschrift für Jugendwohlfahrt.
Zeitschrift für Kinderforschung.
Zeitschrift für orthopädische Chirurgie.
Zeitschrift für Schulgesundheitspflege—Der Schularzt.
Zentralblatt für chirurgische und mechanische Orthopädie.
Zentralblatt für Neurologie.

XXVII

DEFECTIVE CHILDREN IN HUNGARY.

BY

E. DEUTSCH, M.D.

Chief Medical Officer to "Gouttes de Laits," Member of Committee of "L'Association pour la Protection des Mères et des Nourrissons," Physician to l'Hôpital des Enfants Stèphanie, Budapesth, &c.

In the following article I shall endeavour to give an account of the movements in Hungary for the study of child life and for the teaching of defective children. I am much indebted to Messrs. S. Adler, G. Jablonkai, P. Ranschburg, and Martini, who have kindly provided me with information.

Child Study in Hungary.

In 1890, under the influence of the various movements for child study in other countries, Dr. L. Felmers wrote a book laying stress on the great importance of this subject, which, however, met with no encouragement. Six years later, at the meeting of the Second National Congress for Universal Teaching, T. Waldapfel read a paper dealing with the different movements for child study, and a committee was appointed to inquire into the matter. This committee never met. In 1898 a series of articles and a book on the same subject were published by T. Pethes and L. Dorner. In 1900 five professors were sent by the Government to attend the holiday courses in Jena, and on their return they suggested that the German Society, "Deutscher Verein für Kinderforchung," should be made international. This proposal did not meet with

approval, but the following year a society for child study was established under the chairmanship of Count L. Teleki, and in 1903 a public conference was held to popularize the movement. The first theoretical and practical courses were held in 1905 under the guidance of L. Ranschburg, and as a result of these a new pedagogic section was established, and the Royal Hungarian Physiological and Pedagogical Laboratory was started under the supervision of P. Ranschburg.

An attempt was made in 1903 by L. Nagy to arrange for a children's art exhibition, and the society was represented at congresses at Giessen, Rome, and Berlin. In 1907 a section for the collection of statistics was founded, the most important publications of which have been: "The Effect of Punishment on Children," by M. Schmidt; "Children's Spelling," by Z. Déri; "Children's Language," by T. Vertesi; and "Children's Designs," by L. Nagy.

At the meeting of the Hungarian Pedagogical Society, a lecture was given by L. Nagy on the "Growth of Curiosity in Children," and this was afterwards published in the *Zeitschrift für Experimentelle Pädagogy*. Another lecture by Z. Déri before the same society, on "Experimental Pedagogy," provoked a lively discussion between the followers of the old and new schools of thought. In 1907 the first monthly paper of the society, *A Gyermek* (The Child), appeared.

The work accomplished by the Royal Hungarian Physiological and Pedagogical Laboratory has been described in P. Ranschburg's book, "The Mind of the Child," and the results of experiments on the memory of children were published in the journal, *Klinik für Psichiatrie und Nervkrankheiten* (vol. ii). The society also took part in the exhibition held in Vienna.

Lectures on child welfare have been delivered as follows: T. Balassa, "The Progress in Speech of Blind Children who were also Deaf and Dumb"; K. Decsi, "Influence of Sickness over Mortality in Children"; Z. Déri, "The Moral Life of Children;" L. Dorner, "The Æsthetic Feelings of Children"; M. Eltes, "Morally Depraved Children"; O. Eperjessy, "The Knowledge of Children before School Age";

E. Deutsch, "Suicide of Children"; G. Gross, "Physical Development of Children and Abuses in their Education"; B. Lazar, "Children's Imagination"; M. Lanz, "The Importance of Manual Work in Elementary Schools"; L. Nagy, "Methods and Views of Child Study"; P. Ranschburg, "Mental Work for Children and Smaller Abnormalities in Children"; A. Sarbo, "Causes of Defective Speech in Children"; M. Schmidt, "The Effect of Punishment on Children"; H. Schuschny, "Causes of Nervousness in Children"; A. Arestman, "Children's Drawings"; G. Kinisi, "The Growth of Self-consciousness in Children"; M. Mohr, "The Child's Eye."

The Education of Defective Children in Hungary.

According to the last Census, taken in 1900, the number of defective children in Hungary amounted to 65,267. Of these 16,428 were blind, 22,126 deaf and dumb, and 26,659 mentally defective.

The numbers of these who were of school age (*i.e.*, 14 years) were as follows: Blind, 1,163; deaf and dumb, 5,351; mentally defective, 5,380. By the end of 1908 a large number of these children had been under instruction, viz., 592 blind, 1,329 deaf and dumb, and 351 mentally defective, as in most countries the teaching of the deaf and dumb children had been undertaken first. More than seventy-five years previously, soon after the liberal-minded Abbé de l'Epée had opened an institution for the deaf and dumb in Paris, a similar institution was started in the town of Vác by Judge Chazar de Jolèst. For three-quarters of a century this was the only one until a great philanthropist, A. Fochs, left a bequest of 800,000 korona (1 korona=10d.), by means of which the National Institution was founded. It directed the attention of the Government and the general public to the abandoned condition of the deaf and dumb child, and strenuous endeavours were put forth to make good the losses of the last seventy-five years. Classes were held to instruct pupil teachers in the methods of dealing with the deaf

and dumb, and also of teaching defective children in the same schools with normal pupils. This, however, proved to be a complete failure, for the teacher obtained only a very superficial knowledge of the necessary methods, and it was also found impossible to conduct classes of defective and normal children together. It was very soon discovered that deaf and dumb children could be more effectively taught in schools set apart for their exclusive use, and thirteen such schools were therefore started in the following towns: Temesvár, Arad, Kolozsvár, Budapest, Kaposvár, Kecskemét, Szeged, Tolsoa, Debrecen, Körmöcbánya, Sopron, Ungvár, and Pozony. As regards the maintenance of the special schools, the National Institution for Deaf and Dumb Jews is provided for entirely by its own funds. Of the other schools, one is supported by the State, another by the State and the Municipality of Budapest. In the remainder the teachers' salaries are provided by the State, while all other expenses are met by the municipality of the town in which the school is situated. Seven of these institutions are of the boarding school type, with a total of 434 resident pupils. Some of the children who live at home, to the number of 747, are assisted by the school funds. There are 172 teachers, and each school is governed by its own Board, which obtains the necessary means of support by public subscription.

Phonetic teaching is adopted in all the schools. At Vác the pupils were at first taught to speak both phonetically and also by means of signs. The necessity for this arose from the fact that the pupils had to learn both in Hungarian and in German. Since 1872, however, when Hungarian was adopted as the universal language, the teaching has been entirely phonetic. The course of instruction lasts for eight years, and is carried out according to the programme prescribed by the Minister of Public Instruction. The results are eminently satisfactory. The power of speech is considerably developed, pronunciation is good, and reading from the mouth is quick. In the early days the schools were provided with classes for handicrafts, and at Vác there used to be a printing works; but owing

to the changes which have taken place in the industrial life of Hungary these classes have been abandoned.

Great importance is attached to the teaching of drawing and handiwork, and most of the pupils who have passed out of the schools have entered some industrial profession. In five towns—Budapest, Kolozsvâr, Körmöcbánya, Debrecen, and Temesvár—there are schools for apprentices, and at the end of 1908 these were being attended by thirty-eight deaf and dumb youths. The National Society also maintains in Budapest a work in which ten deaf and dumb girls earn their livelihood.

The instruction of blind children was begun in Hungary in 1826, when the first school for the blind was opened by Archduke Josef. The following year the school was transferred to Budapest, funds being obtained for the purchase of the ground and erection of the buildings by means of a lottery and public subscription. In 1873 the State undertook the responsibility of the institution and considerably improved it; but no new schools for the blind were started until 1900, when one was opened in Kolozovai. It is maintained by the State and Municipality of the town. Three years later, in 1903, T. Wechselmann and his wife, S. Neuschloss, left a bequest of 1,400,000 korona for the foundation of another school for the blind. This is under the supervision of the Jewish community at Budapest, maintains itself by the income from its own funds, and is not allowed to accept gifts. Two other schools were started at the same time in Szeged and in Szombathely, both aided by the State, and these are attended by pupils over 14 years of age.

Thirty-five teachers are employed in these five schools, and at the end of 1908 312 pupils were in attendance. Of these pupils, 292 were inmates, and 18 out of the remaining 25 were assisted by the schools.

The aim and object of this instruction of the blind was to fit them for the demands of life, to teach them to earn their own living and to become useful members of society. With this end in view great attention was paid to the physical development of the pupils, and Hungary was the first country to include gymnastics in

the curriculum for its blind scholars. The teaching given in the schools is in accordance with the syllabus prescribed by the Minister of Public Instruction. The course of instruction extends over eight years, the first five being devoted to theoretical studies, and the remaining three to industrial work and to the repetition of certain classes. The theoretical instruction includes all the subjects taught in the ordinary schools, and the practical work comprises basket-making, wicker chair-making, brush-making, stocking knitting by machine, and piano tuning. The piano and violin are also taught to those pupils who show any talent or inclination for the studies. Each school is provided with a Braille library, and there is a movement to start, in addition, a central library for the use of the blind. Special efforts are made to find employment, not only for the pupils of the schools, but also for those who may develop blindness in later years. The National Society for the Welfare of the Blind maintains works in Budapest, Temesvár, Szeged, and Szombathely, where 358 blind persons earn their living.

The teaching of the mentally defective has only been started during recent years. The first school was opened in Budapest in 1877 as a private enterprise, but was taken over by the State in 1897. The second school began in Borosjenö in 1904, and since that date three more have been started, two of them being supported by charitable societies and the third by private funds. At the end of 1907 there were 227 resident pupils in these five schools. In addition to these institutions there are five auxiliary schools in Budapest, Eger, Csonzrád, Keiskemét, and Debrecen, and these were being attended at the end of 1907 by 295 pupils. The State maintains a special school for training teachers for work among defective children. All these schools are under the supervision of the National Pedagogic Board.

The teaching of defective children has made grea progress during the last twenty years. The failures of the past have had to be amended, while at the same time efforts have been made to keep abreast of the progress made abroad. For the success which has attended our work thanks are largely due to Dr. S.

Narai-Szabo, Councillor in the Ministry for Public Instruction.

REFERENCES.

Most of the reports and official documents dealing with child welfare and the care and control of defective children in Hungary are hardly likely to be of much service to English-reading school medical officers, and references to these are therefore not given.

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