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DEAF MUTISM

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DEAF MUTISM

A Clinical and Pathological Study

BY

JAMES KERR LOVE, M.D.

AURAL SURGEON TO THE GLASGOW ROYAL INFIRMARY
HONORARY AURIST TO THE GLASGOW DEAF AND DUMB INSTITUTION

WITH CHAPTERS ON THE EDUCATION AND TRAINING OF DEAF MUTES

BY

W. H. ADDISON, A.C.P.

PRINCIPAL OF THE GLASGOW DEAF AND DUMB INSTITUTION



Glasgow
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PREFACE.

THE present work attempts to deal with Deaf Mutism in a broader and more comprehensive way than it has been dealt with hitherto in this country. It originated in a desire to found a scientific classification of the deaf for educational purposes. The Clinical and Pathological section (Chapters I.-VIII.) is the work of Dr. J. Kerr Love, and the Educational portion (Chapters IX.-XIV.) is by Mr. W. H. Addison. The two sections have not been formally separated, but it must be understood that each author is responsible for the facts and opinions of his own section only. There is, however, no divergence in the teaching of the two parts.

It was the want of English medical literature on the subject which prompted the authors to undertake this work. It is therefore a special pleasure to thank teachers of the deaf in this country for the help they have given by supplying statistics and expressing opinions with regard to the points raised in the circular addressed to them. Individual mention must be made of Mr. Howard, of Doncaster, who has supplied important matter for both sections of the work, and of Mr. Barrett, of Margate, who wrote that part of Chapter VIII. which deals with British Censuses. Dr. Love is responsible for the colonial

and foreign figures. Thanks are also due to the following gentlemen for having revised the proofs: Dr. William Frew, of Kilmarnock, who revised the Medical section; Dr. David Buxton, of Manchester—now a veteran educator—who revised the Educational section; and the Rev. Dr. Corbett, one of the directors, and Mr. Haycock, one of the teachers of the Glasgow Institution. Most of the engravings are the work of Mr. John MacDougall, Glasgow, to whom also the authors are indebted.

Glasgow, January, 1896.

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DEAF MUTISM

INTRODUCTION.

DEAFNESS may exist in any degree. In the very young a high degree of deafness makes the acquisition of speech impossible, and dumbness is the result. Hence the terms "the deaf and dumb" and "deaf mutism." The dumbness is a result of the deafness, and is in no way due to any fault in the organs of speech. What degree of deafness necessarily results in this absence of speech is not definable in arithmetical terms, but it may be practically stated as deafness to the human voice used in the ordinary manner. For teaching purposes this amount of deafness requires no separate name, for apart from its most important result—the dumbness—it needs little consideration from the teacher. But clinically it is often important to think of the deafness as a separate condition and to refer to it apart from the dumbness. Here, therefore, the term "surdism" will be used when this is necessary. Surdism may be defined as that degree of deafness which makes the acquisition of speech in the very young impossible by ordinary means, or which involves the loss of recently acquired speech.

Before the beginning of the present century our knowledge of the physical conditions on which deaf-dumbness depends was limited to the fact that the dumbness depends on the deafness. When and by whom this discovery was made is a question which will be discussed in the educational section of this work. Attempts to educate the mute had been reduced to a science, but no precision existed in the diagnosis of the cause or in

the treatment of deafness. Aural surgery was in its infancy. Guyot had proposed, and Cleland had practised, the catheterization of the Eustachian tube, but apart from this operation the treatment of deafness consisted chiefly of the instillation of drops into the external ear. The speculum was known, and had been in use since the time of Fabricius von Hilden, in the middle of the seventeenth century, but no pathology of the ear existed, and without such there could be no accurate knowledge of the nature of deafness. When we come to discuss the treatment of deaf mutism, we shall see that in the earlier decades of the nineteenth century empiricism and quackery, with their consequent wonderful "cures," were common, and that the attempts made to deal with deaf mutism were often not creditable to those whose names are most distinctly associated with them.

On the continent better work was being done. Schmalz[1] of Dresden, in 1830, published his valuable work on the *Statistics of Deaf Mute Establishments*, and Kramer,[2] in 1836, wrote his book on *Diseases of the Ear*. Kramer's chapter on "Deaf-Dumbness" is chiefly devoted to the exploding of the so-called cures of his time. He has no pathology of deafness to offer, and no rational remedies to replace the empiricism he condemns. But it was something to have demolished so much that was false, and to be able to declare distinctly and fearlessly, "Hitherto no single deaf mute has been cured—that is to say, has been rendered capable of communicating, like a person who hears well, with his fellow-men in an unrestrained manner by means of hearing, under all circumstances."

If the clinical study of deaf mutism in Britain during the first half of this century was but little removed from quackery, amends were made before the second half had well begun. Wilde,[3] who, as one of the Irish Census

[1] Ed. Schmalz, *Ueber die Taubstummen und ihre Bildung*, etc., 1838.

[2] *The Nature and Treatment of Diseases of the Ear*, by Dr. William Kramer: translated by James Rudson Bennett, M.D. London, Longman, 1837.

[3] *Aural Surgery*, by William R. Wilde. London, John Churchhill, 1853.

Commissioners, was well qualified to speak on the statistics of deaf mutism, wrote his classical book on *Diseases of the Ear* in 1853, and appended a valuable chapter on "Deaf-Dumbness." This work, which will be frequently quoted in subsequent chapters, placed the clinical study of deaf mutism on a scientific basis. It supplied us with our first accurate figures regarding the extent of deaf mutism in these islands, and it contains the statistical notices of the causes of acquired deafness.

In 1860 Mr. Toynbee's[1] work on the *Diseases of the Ear* appeared. Unlike Wilde, Toynbee avoided all statistics and all discussion on deaf-mute education. He confined himself to remarks on the examination of 411 deaf mutes. But he was the first British aurist who examined on an extensive scale the ears of deaf mutes during life, or who tested their hearing. He also published a tabular view of the condition of the ear in thirty-six dissections of deaf mutes.

Since 1860 no English medical work of importance has been published on Deaf Mutism. No English medical author has ever treated the subject separately and exhaustively. It has almost always been relegated to the end of a book on Diseases of the Ear. Perhaps this is due partly to the fact that we were in possession of a good English translation of a first-rate German work by Dr. Arthur Hartmann,[2] and partly to the absence of the material for such a work at home. Very recently Mygind of Copenhagen has published an admirable work on *Deaf Mutism*.[3] In this volume the morbid anatomy of deafness is fully and carefully treated. In Britain itself facts about the deaf are accumulating, and interest is awakening. Although it is not yet the rule, some of the institutions have aurists attached to them. The education of the deaf is compulsory as in the case of the hearing. Perhaps this happy result is due in most part to the Report of the Royal

[1] *Diseases of the Ear*, by Joseph Toynbee, F.R.S. London, John Churchhill, 1860.

[2] Hartmann, *Deaf Mutism*: translated by J. P. Cassels, 1880.

[3] Mygind, *Deaf Mutism*, 1894.

Commission which was issued only a few years ago. But this valuable document is a permanent memorial of the ignorance which, towards the end of the nineteenth century, exists amongst Englishmen regarding the deaf and dumb in their midst. Most of the opinions brought out in the report and almost all the statistics are American. The report has done much, but perhaps it has done no better service than in opening our eyes to the need for exact information about the deaf and dumb in these islands.

If correct views on the nature and management of deaf mutism are to be got, they must be built on careful observation of the deaf mute and on equally careful post-mortem examination of the organs, the disease of which has caused the deafness. The remarkable advance which has been made in recent years in every branch of medicine and surgery has been made chiefly along these lines. In some branches the progress has resulted in greatly improved methods of treatment, and in great saving of human life and suffering. But deaf mutism is a finished condition, and in its treatment anything analogous to the application of antiseptics in surgery is not possible. Our more accurate knowledge need not be quite fruitless on that account. The diseases which produce deafness are amenable to treatment, and in many cases they are preventable. Then, where there is a fair remnant of hearing left, it can be utilized in teaching. Now and again careful management of the ear and its connections in the throat lessen the deafness, and our patient may turn out something better than a deaf mute. In every case it is possible to get at the truth and to combat the disagreeable aspects of it on honest and scientific principles. But the clinical observation of any diseased state, or the examination after death of the wreck it has left, must be preceded by a study of the healthy organ and of the work it does when at its best. The plan of this work, therefore, is on these lines. After considering the deaf mute himself, the normal anatomy of the ear will be described and its function and capacity studied at some length. These will be compared with the state of the hearing in deaf mutes. And not only will

the diseased appearances as found in the living be detailed, but the morbid anatomy of deaf mutism as ascertained by post-mortem examination will be reviewed. After which we shall be in a position to take up the treatment of the deaf mute. Finally, the extent and distribution of deaf mutism amongst us, as displayed by our census returns, will be discussed.

Apart from the careful study of individual cases, information about the deaf and dumb may be collected in two ways. (1) Queries may be inserted in the census papers with the object of eliciting facts; (2) special schedules may be drawn up in connection with the schools or institutions through which, in a country like Britain, almost all deaf mutes must pass.

The first method is of limited utility and supplies information chiefly about the total amount and the distribution of deaf mutism in a country; the second is better suited for the purposes of a work like this. Where education is compulsory, nearly all deaf mutes must, at the age of 7 or 8 years, pass into a school, the head of which understands the importance of procuring as many facts about the deafness and its cause as possible, and the results of the inquiry will depend on the thoroughness of the system adopted and the care with which that system is carried out. Recognizing this, nearly all institutions have formulated an admission schedule of some kind. Part of this must be filled up by the parent or guardian of the deaf mute, whilst part is more appropriately filled up by the medical practitioner who knows most about the cause of the deafness. In cases of acquired deafness the symptoms of the illness which produced the deafness are usually fresh in the memory of the child's parent. They date, as a rule, only four or five years back, and, if they are dubious, they may be brought before the medical officers whose business it is to examine the ears of every child on admission, and one of whom should be attached to every deaf and dumb institution.

The information got from schools or institutions, and the means of obtaining it through admission schedules,

will be considered first. The best admission schedule is difficult to detail. It will vary with the incidence of the diseases which cause acquired deafness, with the social habits of the people, and with the educational arrangements of each country. But for each country it should be uniform if the returns to be made are to be of real statistical value. That in use at the Glasgow Institution at the present time was drawn up two years ago, and is as follows:

ADMISSION SCHEDULE.

INSTITUTION FOR THE DEAF AND DUMB, GLASGOW.

RULES RESPECTING THE ADMISSION OF PUPILS.

I. That no child shall be admitted to the Institution before seven years of age or after sixteen; though, on the occurrence of any special case, the Directors shall have the power of dispensing with this Rule.

II. That all applications for admission of children be transmitted to the Secretary or Headmaster, with certificate of applicant's birth, an attestation that the applicant is deaf and dumb, and a medical certificate that applicant has been vaccinated and is free from infectious illness.

III. That before a child is admitted, security shall be given by a School Board or by some responsible person for (1) the regular payment in advance of the charge for board, clothing, and education; and (2) in case of sickness, improper conduct, deficiency in intellect, or completion of education, for removal of the pupil immediately on receiving notice to that effect.

IV. That this schedule be carefully and accurately filled up.

The following questions are to be answered by the Parents of the Child, or by the Party making Application for the Child's Admission into the Institution.

1. What is the Name, Residence, Parish, and County of the applicant?
2. When was applicant born? Where?
3. What is the name and residence of the applicant's father?
   If the mother or father be dead, what caused death?
4. How many children are in the family?
   Are all the children in good health?
   If any have died, what was the cause of death?
5. Was the applicant born deaf?

6. If the applicant is not totally deaf, can he distinguish any spoken words or hear the human voice at all?
   Can he hear any loud sounds?
   Can the applicant speak? If so, to what extent?
7. Are there any other deaf and dumb children in applicant's family, or any very deaf children?
8. What evidence have you of the intelligence of the child?

The following questions are, if possible, to be answered by the Medical Man under whose care the Child has been, or, in case of the Medical Man's Signature not being available, the Minister whose Church the parents attend should sign. The Medical Man should also revise the answers on the preceding page.

1. What do you know of applicant's family history?
   Is there consumption or idiocy in the family?
2. Are the special senses other than hearing good?
   In particular, is the eyesight quite normal?
   Are the vocal arrangements perfect?
3. Has the applicant been subject to fits, scrofula, rickets, or special disease?
   Does he appear idiotic or weak-minded? Is he now in good health?
4. Has the applicant had small-pox, measles, whooping-cough, or scarlet fever?
   Has he been vaccinated?
   Is he the subject of any infectious skin disease?
5. If the applicant was not born deaf, what caused deafness, and when was the sense of hearing lost?
   What do you know of the present state of the organ of hearing?
6. Has the deafness been treated, and, if so, what has been the result?
   Do you think it is increasing or diminishing?
7. Are there any other cases of deafness in the family, or amongst more distant relatives?
   If so, what is the exact relationship between those thus affected and the applicant?
8. Was there any relationship or consanguinity between the parents previous to marriage; *e.g.* were they cousins?

Information about the present state of the deaf mute, *e.g.* his general health, his intelligence, his means of communication with others, should be got by personal examination by an expert. Questions bringing out this need not load

the inquiry sheet, which looks formidable enough to the parent already, and makes enough demand on the time of the busy practitioner. In the case of adults additional questions might be added, but as all deaf mutes must now pass through school, a separate adult schedule is not called for. Such questions would have reference chiefly to marriage and its issue. It should be made a condition of admission that the schedule be fully and accurately filled up.

But the information got through any single schedule about any one locality is not sufficient for a purpose like that of this work, which aims at gathering together the facts about a whole country. The following queries were therefore addressed to the Principals of British institutions by the authors. They embody those points which are of most general interest, and those on which local differences exist. The response was very general and full, and the valuable answers received have supplied material which has been woven into almost every chapter of the work.

A.—ON DEAF MUTISM IN GENERAL.

1. How many deaf mutes are on the school roll?

2. What percentage of those now at the Institution, or of past pupils, have been born deaf?

3. Of those who have become deaf after birth, what is the assigned cause of deafness?

4. What evidence have you of the heredity of congenital deafness? Any striking instances of the transmission of the defect should be carefully traced and noted.

5. Have you any opinion of the effect of consanguinity *per se* on the production of congenital deafness? Have you any evidence of its effect?

6. Has any aurist tested the hearing or examined the ears of the pupils in your Institution? If so, have the results been published? If not, could you supply the details of the examination?

7. Has any treatment been used for the recovery of hearing, or have any means for the development of hearing been used in your Institution.

8. Can you give any other information regarding the deaf which you think valuable, *e.g.* their liability to disease—their mental character.

9. Can you supply the details of any unpublished post-mortem examination of the ears of deaf mutes?

B.—ON THE EDUCATION OF DEAF MUTES.

10. Number taught—orally, silent, combined—in your school?

11. Do the orally-taught semi-deaf show any improvement in hearing under tuition.

12. What proportion and to what extent do oral pupils keep up their speech in adult life?

13. Do you consider it possible to educate the *average* deaf mute without using signs in the common acceptation of the term?

Information on some minor points was also supplied by the teachers of the Glasgow Institution, whose constant intercourse with their pupils made them the best authorities on them. Examples of these points are the general intelligence of individual pupils, the occurrence of left-handedness, the presence of subjective symptoms belonging to the organ of hearing.

CHAPTER I.

GENERAL CHARACTER OF DEAF MUTES.

WHILST the study of Deaf Mutism is essentially that of the deafness with its causes and its effects, the subject of the deafness—the deaf mute himself—must not be forgotten. Is he an ordinary child minus the sense of hearing? Are the physical and mental characteristics of deaf mutes different from those of their hearing brethren, and, if so, in what does the difference consist? The clearing up of these questions will simplify the study of deaf mutism, and will therefore be taken up in this chapter.

The most superficial observer may convince himself that a deaf-mute school is filled with very ordinary-looking children. Their faces are not more "like those of hares or monkeys" than are the faces of their neighbours, although this has been gravely asserted of them. Then the deaf mute plays at cricket, has his football fixtures, goes through his drill, enjoys his gymnastics, and takes the whole thing like his hearing brother. Assertions that the deaf mute has weak lungs, tends to scrofula, is left-handed, or feels less pain than those who hear need more careful examination.

With the object of studying the physical characteristics of deaf mutes the following plan was adopted. Fifty-four boys from the Glasgow Institution were weighed, their heights taken, and the circumference of the head and chest noted. Then the apparatus was removed to the Queen's Park Public School, in the vicinity of the institution, and the experiments repeated there. The headmaster, Mr.

Fyfe, was asked to take from certain classes all the boys of 15, 13, and 11 years respectively. On another day the weighing and measuring machine was taken to Washington Street School, where Mr. Macpherson submitted his boys to examination. This school is in the centre of the city of Glasgow, where the scholars are chiefly the children of tradesmen, artizans, etc. Almost no boys of 15 attend such a school. A set of boys at 9 were therefore examined, and the boys of this age at the Deaf and Dumb Institution were afterwards taken for purposes of comparison. No kind of selection was practised at any of the schools. Either all the boys of a given age were taken from a class, or, in one or two instances, where the number was too large, the boys were taken in the order in which they happened to sit. At Queen's Park School it was at once noticed that the boys aged 15 were an exceptionally fine set, and the examination confirmed this impression. The other sets presented nothing striking to a casual observer.

GROUP I.

QUEEN'S PARK PUBLIC SCHOOL.

BOYS AGED 15.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
R. S., - - -	5	$9\frac{3}{4}$	9	$9\frac{1}{2}$	$22\frac{1}{4}$	31
O. L., - - -	5	$6\frac{1}{2}$	8	8	22	$31\frac{1}{8}$
A. B., - - -	4	$11\frac{1}{2}$	6	9	21	$29\frac{1}{4}$
J. M'L. - - -	5	$4\frac{1}{8}$	8	$7\frac{1}{2}$	$21\frac{1}{4}$	$32\frac{1}{8}$
S. A., - - -	5	3	6	7	$21\frac{1}{8}$	$29\frac{1}{8}$
A. C., - - -	5	$6\frac{1}{2}$	9	13	$21\frac{7}{8}$	$30\frac{3}{4}$
J. F., - - -	5	$6\frac{3}{4}$	7	5	$21\frac{1}{2}$	$29\frac{1}{4}$
W. M., - - -	5	$6\frac{7}{8}$	7	10	$21\frac{3}{4}$	30
F. M'K., - -	5	$3\frac{7}{8}$	9	$1\frac{3}{4}$	22	$29\frac{3}{4}$
J. P., - - -	4	$9\frac{15}{16}$	5	6	$20\frac{3}{4}$	$24\frac{1}{2}$
N. M., - - -	5	2	6	1	$21\frac{1}{4}$	26
H. W., - - -	5	0	6	$3\frac{3}{4}$	$20\frac{15}{16}$	$26\frac{1}{4}$
J. W., - - -	4	$11\frac{1}{2}$	5	9	$21\frac{9}{16}$	26
	68	$10\frac{5}{16}$	97	$6\frac{1}{2}$	$279\frac{5}{16}$	$375\frac{1}{8}$

Average height, 5 ft. 3·56 in.
Average weight, 7 st. 6·9 lbs.
Average head meas., 21·48 in.
Average chest meas., 28·86 in.

DEAF AND DUMB INSTITUTION.

BOYS AGED 15.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
G. D., - - -	5	$4\frac{1}{2}$	7	12	21	$31\frac{7}{8}$
A. B., - - -	5	$4\frac{1}{8}$	8	1	$21\frac{1}{8}$	$29\frac{1}{8}$
D. P., - - -	5	$1\frac{1}{2}$	7	$1\frac{1}{2}$	$22\frac{1}{8}$	$29\frac{1}{2}$
W. L., - - -	4	$10\frac{1}{2}$	6	2	$21\frac{1}{8}$	28
J. S., - - -	5	$1\frac{1}{4}$	7	$2\frac{1}{2}$	$21\frac{1}{4}$	$29\frac{1}{2}$
J. H., - - -	4	$11\frac{3}{4}$	6	$2\frac{1}{2}$	$20\frac{1}{4}$	$25\frac{1}{4}$
H. M'K., - -	4	$6\frac{7}{8}$	5	6	$20\frac{1}{2}$	$26\frac{1}{2}$
A. S., - - -	4	$11\frac{1}{8}$	6	$4\frac{1}{2}$	$20\frac{1}{2}$	$26\frac{7}{8}$
A. K., - - -	4	$10\frac{3}{4}$	6	3	$21\frac{3}{4}$	$26\frac{7}{8}$
	45	$2\frac{1}{8}$	60	7	$189\frac{5}{8}$	$253\frac{1}{2}$

Average height, 5 ft. 0·23 in. Average head meas., 21·06 in.
Average weight, 6 st. 10·11 lbs. Average chest meas., 28·16 in.

GROUP II.

QUEEN'S PARK PUBLIC SCHOOL.

BOYS AGED 13.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
S. K., - - -	5	$0\frac{1}{4}$	6	$2\frac{1}{4}$	$20\frac{1}{2}$	$26\frac{1}{4}$
R. C., - - -	4	6	4	$5\frac{1}{2}$	$20\frac{3}{8}$	$23\frac{1}{4}$
R. L., - - -	4	$6\frac{1}{4}$	4	$7\frac{3}{4}$	$20\frac{5}{8}$	24
P. T., - - -	4	$6\frac{3}{4}$	4	$8\frac{1}{4}$	$20\frac{3}{8}$	$24\frac{5}{8}$
R. F., - - -	4	$10\frac{1}{8}$	5	5	21	$25\frac{1}{2}$
D. C., - - -	4	$10\frac{3}{4}$	5	$7\frac{1}{4}$	$20\frac{3}{4}$	$25\frac{1}{2}$
F. N., - - -	4	$0\frac{1}{4}$	3	$5\frac{1}{2}$	$20\frac{1}{4}$	22
R. A., - - -	4	$9\frac{3}{4}$	6	1	$20\frac{3}{4}$	$25\frac{3}{4}$
W. O., - - -	4	$10\frac{1}{4}$	5	$2\frac{1}{2}$	21	$23\frac{1}{8}$
W. R., - - -	4	8	4	13	$20\frac{1}{4}$	$25\frac{1}{8}$
A. C., - - -	5	$0\frac{3}{8}$	6	$12\frac{1}{2}$	$21\frac{1}{4}$	$27\frac{3}{4}$
D. M'K., - -	4	$9\frac{1}{2}$	5	$7\frac{1}{2}$	$21\frac{3}{4}$	$25\frac{1}{8}$
D. G., - - -	5	$1\frac{1}{2}$	5	7	$21\frac{3}{8}$	$24\frac{1}{4}$
	61	$7\frac{3}{4}$	68	1	$270\frac{1}{4}$	$322\frac{5}{8}$

Average height, 4 ft. 8·9 in. Average head meas., 20·78 in.
Average weight, 5 st. 3·3 lbs. Average chest meas., 24·81 in.

WASHINGTON STREET PUBLIC SCHOOL.

BOYS AGED 13.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
G. M., - - -	4	$6\frac{5}{8}$	4	$5\frac{1}{2}$	$20\frac{1}{8}$	$21\frac{7}{8}$
W. H., - - -	4	$6\frac{1}{2}$	5	4	$21\frac{1}{4}$	$24\frac{1}{2}$
J. C., - - -	4	10	5	6	21	$23\frac{3}{4}$
D. S., - - -	4	$9\frac{1}{2}$	5	$0\frac{1}{2}$	$20\frac{7}{8}$	24
J. A., - - -	4	$5\frac{5}{8}$	5	1	$20\frac{15}{16}$	$24\frac{1}{2}$
J. N., - - -	4	7	5	1	$21\frac{9}{16}$	25
J. K., - - -	4	$9\frac{1}{4}$	5	$4\frac{1}{2}$	$20\frac{1}{8}$	$25\frac{5}{8}$
J. C., - - -	4	$7\frac{5}{8}$	4	$11\frac{1}{4}$	21	$24\frac{1}{2}$
	37	$2\frac{1}{8}$	40	$5\frac{3}{4}$	$166\frac{7}{8}$	$193\frac{3}{4}$

Average height, 4 ft. 7·76 in. Average head meas., 20·86 in.
Average weight, 5 st. 0·72 lbs. Average chest meas., 24·22 in.

DEAF AND DUMB INSTITUTION.

BOYS AGED 13.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
A. G., - - -	4	$10\frac{1}{8}$	5	$6\frac{1}{2}$	$21\frac{1}{8}$	$26\frac{1}{4}$
H. L., - - -	4	$3\frac{5}{8}$	4	7	$20\frac{3}{8}$	26
W. R., - - -	4	$5\frac{3}{4}$	5	5	$20\frac{15}{16}$	$25\frac{5}{8}$
D. F., - - -	4	11	6	$8\frac{1}{2}$	$21\frac{3}{4}$	$28\frac{1}{4}$
S. M'D.,- - -	4	$8\frac{1}{4}$	5	8	$20\frac{1}{4}$	25
S. G., - - -	4	$8\frac{1}{4}$	5	$10\frac{1}{4}$	$20\frac{3}{8}$	$25\frac{5}{8}$
D. D., - - -	4	$11\frac{1}{2}$	6	$3\frac{1}{2}$	$20\frac{1}{8}$	$26\frac{1}{4}$
J. M'K.,- - -	4	$7\frac{7}{8}$	5	$10\frac{1}{2}$	$20\frac{1}{8}$	$26\frac{3}{4}$
	37	$6\frac{1}{8}$	45	$3\frac{1}{4}$	$165\frac{1}{16}$	$209\frac{3}{4}$

Average height, 4 ft. 8·26 in. Average head meas., 20·63 in.
Average weight, 5 st. 9·1 lbs. Average chest meas., 26·2 in.

GROUP III.

QUEEN'S PARK PUBLIC SCHOOL.

BOYS AGED 11.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
D. A., - - -	4	$6\frac{3}{8}$	4	$10\frac{3}{4}$	$20\frac{3}{4}$	$23\frac{7}{8}$
F. H., - - -	4	$6\frac{1}{8}$	4	13	$20\frac{7}{8}$	24
C. G., - - -	4	$5\frac{7}{8}$	4	$6\frac{1}{2}$	21	$23\frac{1}{2}$
W. P., - - -	4	$11\frac{1}{8}$	5	7	$21\frac{1}{8}$	24
L., - - -	4	$4\frac{1}{8}$	4	$7\frac{1}{8}$	$20\frac{15}{16}$	$23\frac{1}{4}$
N. M'L., - -	4	$2\frac{3}{8}$	3	$13\frac{1}{2}$	$20\frac{3}{8}$	$23\frac{1}{8}$
A. R., - - -	4	$2\frac{3}{4}$	3	12	$20\frac{3}{8}$	$21\frac{7}{4}$
T. R., - - -	4	$3\frac{3}{8}$	4	7	$20\frac{1}{16}$	$23\frac{1}{16}$
J. M'K.,- - -	4	$5\frac{1}{2}$	4	$9\frac{3}{4}$	$20\frac{1}{16}$	24
E. L., - - -	4	6	5	$6\frac{1}{4}$	$21\frac{1}{8}$	25
J. S., - - -	5	$1\frac{1}{4}$	5	$12\frac{1}{4}$	$21\frac{1}{4}$	$24\frac{3}{4}$
	49	$7\frac{5}{8}$	52	$7\frac{1}{2}$	$228\frac{3}{16}$	$260\frac{3}{16}$

Average height, 4 ft. 6·1 in.
Average weight, 4 st. 10·8 lbs.
Average head meas., 20·74 in.
Average chest meas., 23·65 in.

WASHINGTON STREET PUBLIC SCHOOL.

BOYS AGED 11.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
W. M'D., - -	4	$3\frac{1}{8}$	4	$1\frac{1}{4}$	$20\frac{1}{8}$	$23\frac{1}{8}$
T. C., - - -	4	$2\frac{1}{8}$	4	0	$20\frac{15}{16}$	23
J. S., - - -	4	$5\frac{7}{8}$	4	3	$20\frac{15}{16}$	$22\frac{1}{2}$
H. T., - - -	4	$3\frac{1}{8}$	4	0	$20\frac{1}{4}$	$22\frac{7}{16}$
G. C., - - -	4	$5\frac{1}{16}$	5	1	$20\frac{3}{4}$	$26\frac{1}{8}$
A. N., - - -	4	6	4	$8\frac{1}{2}$	$20\frac{3}{4}$	$22\frac{15}{16}$
G. H., - - -	4	$5\frac{1}{2}$	4	11	$20\frac{7}{8}$	$24\frac{1}{4}$
J. H., - - -	4	6	4	$4\frac{1}{2}$	$21\frac{3}{8}$	$24\frac{1}{8}$
J. N., - - -	4	$1\frac{1}{4}$	4	3	$21\frac{5}{8}$	$23\frac{7}{8}$
M. R., - - -	4	$2\frac{3}{8}$	4	$6\frac{1}{2}$	$20\frac{5}{8}$	$23\frac{7}{8}$
	43	$4\frac{9}{16}$	43	$10\frac{3}{4}$	208	$236\frac{1}{4}$

Average height, 4 ft. 4 in.
Average weight, 4 st. 5·27 lbs.
Average head meas., 20·8 in.
Average chest meas., 23·625 in.

DEAF AND DUMB INSTITUTION.

BOYS AGED 11.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
W. W., - - -	4	$3\frac{1}{4}$	4	$9\frac{1}{2}$	$20\frac{1}{2}$	$26\frac{5}{8}$
W. H., - - -	4	$1\frac{3}{4}$	4	0	$19\frac{3}{16}$	$23\frac{1}{2}$
W. M'G., - -	4	1	4	0	$20\frac{1}{8}$	$24\frac{3}{8}$
J. M'W., - -	4	$4\frac{1}{4}$	4	$9\frac{1}{2}$	$21\frac{1}{16}$	$24\frac{3}{4}$
C. H., - - -	4	$1\frac{1}{8}$	4	4	21	25
T. S., - - -	4	$1\frac{1}{8}$	4	10	$20\frac{3}{4}$	$25\frac{5}{8}$
T. O., - - -	4	$4\frac{1}{2}$	4	13	$20\frac{3}{8}$	$25\frac{1}{4}$
J. N. M'C., - -	4	$8\frac{5}{8}$	5	5	$21\frac{3}{8}$	$26\frac{1}{4}$
	34	2	36	9	$164\frac{3}{8}$	$201\frac{3}{8}$

Average height, 4 ft. 3·25 in.
Average weight, 4 st. 8·1 lbs.
Average head meas., 20·5 in.
Average chest meas., 25·17 in.

GROUP IV.

WASHINGTON STREET SCHOOL.

BOYS AGED 9 YEARS.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
M. D., - - -	4	$1\frac{3}{4}$	3	9	$20\frac{3}{4}$	22
P. M'K., - -	3	11	3	9	$20\frac{3}{8}$	$22\frac{3}{8}$
S. F., - - -	3	$11\frac{3}{4}$	3	9	$20\frac{1}{4}$	23
P. S., - - -	4	$1\frac{3}{4}$	4	0	$20\frac{1}{4}$	$23\frac{1}{8}$
J. M'Q., - - -	3	11	3	$6\frac{1}{2}$	$20\frac{1}{8}$	$21\frac{3}{4}$
S. B., - - -	4	$0\frac{5}{8}$	3	13	$20\frac{1}{8}$	$22\frac{3}{4}$
J. T., - - -	3	$9\frac{1}{4}$	4	0	$20\frac{3}{4}$	$22\frac{3}{4}$
W. T., - - -	4	$1\frac{1}{8}$	3	$10\frac{1}{8}$	$21\frac{1}{8}$	$21\frac{1}{8}$
A. C., - - -	4	$2\frac{1}{2}$	3	$8\frac{1}{4}$	$20\frac{1}{8}$	$22\frac{3}{8}$
	36	$2\frac{3}{4}$	33	$9\frac{1}{2}$	$184\frac{5}{8}$	$201\frac{5}{8}$

Average height, 4 ft. 0·3 in.
Average weight, 3 st. 10·36 lbs.
Average head meas., 20·51 in.
Average chest meas., 22·4 in.

DEAF AND DUMB INSTITUTION.

BOYS AGED 9 YEARS.

	Height.		Weight.		Head Measurement.	Chest Measurement.
	Ft.	In.	St.	Lbs.	Inches.	Inches.
J. S., - - -	4	$1\frac{5}{8}$	4	2	$20\frac{1}{8}$	23
J. A., - - -	4	$5\frac{1}{3}$	5	$3\frac{1}{3}$	21	$25\frac{1}{4}$
J. F. M., - -	3	$11\frac{1}{2}$	3	$8\frac{1}{3}$	$19\frac{1}{3}$	$23\frac{3}{4}$
A. M'L., - -	4	0	4	$4\frac{1}{2}$	$20\frac{1}{4}$	$23\frac{1}{4}$
J. H., - - -	4	$2\frac{3}{4}$	4	6	$21\frac{1}{8}$	$24\frac{1}{8}$
J. R., - - -	4	2	4	$0\frac{1}{2}$	$20\frac{5}{8}$	$22\frac{3}{4}$
S. E., - - -	4	$2\frac{1}{4}$	4	6	$20\frac{1}{3}$	$23\frac{3}{4}$
R. B., - - -	4	$1\frac{1}{4}$	4	0	$20\frac{3}{8}$	$24\frac{1}{2}$
A. K., - - -	3	$10\frac{1}{3}$	3	$6\frac{1}{2}$	$20\frac{1}{2}$	$21\frac{1}{8}$
J. B., - - -	4	$1\frac{5}{8}$	4	12	$20\frac{1}{3}$	26
P. S., - - -	4	$3\frac{1}{2}$	4	$2\frac{1}{2}$	$20\frac{5}{8}$	23
	45	$6\frac{1}{2}$	46	10	225	$260\frac{1}{4}$

Average height, 4 ft. 1·68 in. Average head meas., 20·45 in.
Average weight, 4 st. 3·45 lbs. Average chest meas., 23·65 in.

The chest measurement in every case was taken at a distance of 2 inches below the nipple. This avoids the scapula and the larger muscles.

AVERAGE HEIGHT.

	15 Years.		13 Years.		11 Years.		9 Years.	
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
Queen's Park School, - -	5	3·56	4	8·9	4	6·1	—	
Washington Street School, -	—		4	7·76	4	4	4	0·3
Deaf and Dumb Institution,	5	0·23	4	8·26	4	3·25	4	1·68

AVERAGE WEIGHT.

	15 Years.		13 Years.		11 Years.		9 Years.	
	St.	Lbs.	St.	Lbs.	St.	Lbs.	St.	Lbs.
Queen's Park School, - -	7	6·9	5	3·3	4	10·8	—	
Washington Street School, -	—		5	0·72	4	5·27	3	10·36
Deaf and Dumb Institution,	6	10·11	5	9·1	4	8·1	4	3·45

AVERAGE CHEST MEASUREMENT.

	15 Years.	13 Years.	11 Years.	9 Years.
	Inches.	Inches.	Inches.	Inches.
Queen's Park School, - -	28·86	24·81	23·65	—
Washington Street School, -	—	24·22	23·62	22·4
Deaf and Dumb Institution,	28·16	26·2	25·17	23·65

AVERAGE HEAD MEASUREMENT.

	15 Years.	13 Years.	11 Years.	9 Years.
	Inches.	Inches.	Inches.	Inches.
Queen's Park School, - -	21·48	20·78	20·74	—
Washington Street School, -	—	20·86	20·8	20·51
Deaf and Dumb Institution,	21·06	20·63	20·5	20·45

At 15 years old the deaf-mute boys are in most respects inferior to the hearing boys of Queen's Park School at the same age. The absolute measurements are less in every case, but the chest measurements are as good or better when the less height and weight are considered. Head measurement is nearly half-an-inch less than in the hearing boys.

At 13 years the deaf mutes are physically the finest of the three sets examined. In height they are only half-an-inch less than the Queen's Park boys, and half-an-inch better than the Washington Street boys. In weight they are easily ahead of their hearing competitors. In head measurement they almost equal the Queen's Park boys, whilst both of these sets are inferior to the Washington Street boys by about a quarter of an inch. In chest girth they are the best of the three by about 2 inches.

At 11 years the deaf mutes are least in height and least in head measurement, whilst with regard to weight they occupy a middle position. In chest measurement they again easily lead.

At 9 years the deaf mutes excel the hearing boys of Washington Street in every measurement except head girth.

It has been asserted that deaf mutes are physically

inferior to hearing children, and that this inferiority is chiefly shown in a non-development of the lungs and a consequent liability to tuberculosis (Meissner, Kussmaul, and others). In support of this theory it is assumed that the lungs are chiefly expanded by the exercise of speech, and that this is awanting in deaf mutes. Meissner examined, post-mortem, the larynx and lungs in deaf mutes and found both poorly developed. The figures which have just been submitted prove that no such physical inferiority exists as a consequence of deaf mutism. Where it exists amongst deaf mutes it is the result of poor feeding, the breathing of a vitiated atmosphere, insufficient clothing, and carelessness about physical exercise, and these causes produce just the same results in hearing children. A game at football or cricket will do more to develop a deaf mute's lungs than a week of speech-training. In the Glasgow Institution the children come at 7 years and stay till they are 14 or 16 years old; they are drawn mostly from the poor; their parents are socially lower than those of the children at Queen's Park School, and probably also lower than those of the Washington Street School; the oral system is followed only to a limited extent in the school, but the children are well and plainly fed, outdoor exercises are followed by scholars and teachers in common, gymnastics are an essential part of the training of the children, and the result is that the deaf-mute boys of the Glasgow Institution are physically equal to, if not better than, the average of hearing children.

That this last statement is correct may be proved by reference to such a paper as that of Mr. Roberts on the "Physical Development and Proportions of the Human Body." Before making the comparison it is necessary to make a deduction for the clothes worn by the deaf mutes of the Glasgow Institution at the time of measurement. These children were stripped of all but a pair of stockings, a pair of trousers, and a shirt. Mr. Addison weighed six of each of these garments, and the result was as follows:

	Lbs.	Ozs.
Six pairs of trousers, - - - -	8	12
Six shirts, - - - - - -	3	12
Six pairs of stockings, - - - -	2	8

giving a deduction of $2\frac{1}{2}$ pounds from the weight of each of the deaf mutes.

Aet.		Height.	Weight.	Chest.
15	Hearing, - -	5 ft. 0·77 in.	6 st. 7·43 lbs.	29·70 in.
	Deaf mute, - -	5 ft. 0·23 in.	6 st. 7·60 lbs.	28·16 in.
13	Hearing, - -	4 ft. 8·56 in.	5 st. 1 lbs.	26·30 in.
	Deaf mute, - -	4 ft. 8·26 in.	5 st. 6·6 lbs.	26·2 in.
11	Hearing, - -	4 ft. 4·87 in.	4 st. 4·15 lbs.	24·33 in.
	Deaf mute, - -	4 ft. 3·25 in.	4 st. 5·6 lbs.	25·17 in.
9	Hearing, - -	4 ft. 1·52 in.	3 st. 9·2 lbs.	23·27 in.
	Deaf mute, - -	4 ft. 1·68 in.	4 st. 0·95 lbs.	23·65 in.

The above averages regarding hearing children are taken from Roberts' tables in *Exercise and Training.*[1]

The figures which have just been discussed map out for us the chief physical characters of the deaf and dumb. They tell us that these deaf mutes are not physically inferior to hearing people. But it has been asserted that deaf mutes are the subjects of minor peculiarities. A large percentage are said to be left-handed (Kilian). Of 157 attending the Glasgow Institution in June, 1895, 11 were left-handed. At the Queen's Park School (a hearing school with a daily attendance of over 1000 pupils) 4·7 of the children were found to be left-handed. The Glasgow Institution cases were found as largely amongst those of acquired as amongst those of congenital deafness.

Then it has been stated (Itard) that deaf mutes are less sensitive to painful impressions than hearing children. All the writer's experience in working with the deaf contradicts this. Many are exquisitely sensitive to pain when

[1] *Exercise and Training.* Health Primer Series, edited by Langdon Down, Mortimer Granville, etc.

middle-ear operations are being done. Deaf mutes are patient and bear pain well. Their defect makes them rely more on those in charge of them, and there is less of that fear about them which so largely makes up children's pain.

The breathing of deaf mutes is peculiar. It is heavy, noisy, not stertorous or snoring, but full, loud, and resonant. This is probably due to no physical defect or peculiarity in the lungs, nose, or throat, but to the absence of hearing. In hearing people the ear governs the respiratory sounds. Regarding noisy breathing in others as disagreeable, and feeling it so in themselves, hearing people breathe quietly when well. The deaf mute has no more idea of the noise his breathing makes than he has of the dissonance of his shrieks when in pain, or when labouring under excitement.

Deaf mutes have been supposed to require larger doses of medicine than hearing children (Mansfield). No such peculiarity exists amongst those attending the Glasgow Institution. Deaf mutes are said to be more liable to certain diseases than hearing people. At the Glasgow Institution a search was made for past or present evidences of tubercle amongst the children (157, June, 1895). Two cases of strumous cicatrix were discovered, and eight cases of eye disease, possibly tubercular; ulcerated cornea, opacities of cornea, iritis, etc. Only one of these eye cases was in active progress. As there was no history available of these cases, it cannot be asserted that they were all tubercular; but as tubercle is the condition to which the deaf mute is said to be most liable, and as it is a possible explanation of all the cases, they have been put into one group. And when it is remembered that almost all these children come from poor homes and have lived their earliest years under-fed and amongst insanitary surroundings, another reason than the deaf mutism is easily found. In any case, the list is not a very heavy one and could easily be matched in any hearing school in the poorer localities of our crowded cities. Only one death has occurred from tubercle amongst the children during the past five years, and this happened at the child's own home and was due to pulmonary consumption. During these years the only other death

amongst the children connected with the Glasgow Institution occurred in the Victoria Infirmary, and was due to thrombosis and heart disease. It should be mentioned, however, that a year or two before death, the writer removed two large sequestra from the middle ear of this girl in the Glasgow Royal Infirmary, and that as suppuration had continued for many years prior to this operation from both ears, the case should really be classed as tubercular. The number of children connected with the Institution during that period was 244. Mygind[1] makes a suggestive statement regarding the Copenhagen Institution: "From 1824 to 1839 a third of the children died during their residence there from tuberculosis. When the new asylum, in 1839, replaced the older building, which had been devoid of the simplest sanitary arrangements, the mortality rapidly decreased, and in 1870 was even lower than among children in general of the same age."

The diseases of the eye, to which deaf mutes are subject, are not peculiar to them. Many teachers think that extra calls made on the organ of sight in those who do not hear give rise to errors of refraction to a greater extent amongst deaf than hearing children. Retinitis pigmentosa is supposed to have a connection with deaf mutism. The symptoms of this disease are inability to walk about in a dim light, such as that of twilight; by day direct vision is good, after dusk it is impaired, the field of vision gradually gets contracted, and objects placed obliquely are not seen. Examined by the ophthalmoscope the retina shows large deposits of pigment, beginning at the periphery and gradually extending towards the centre.

Amongst the Glasgow children no case with these symptoms was found. This condition is considered by ophthalmic surgeons to be in most cases congenital and to be often hereditary. Like cleft palate, albinism, idiocy, etc., it may co-exist with deaf mutism, and, if the deafness be congenital, is likely to have a common origin with it. Schmalz found seven cases of it amongst the relatives of 1591 deaf mutes.

[1] Mygind, *Deaf Mutism*, 1894.

In 1861, Liebreich found 341 deaf and dumb persons in Berlin.[1] Of these he examined 241 with the ophthalmoscope, and found 14 with retinitis pigmentosa. He believed that besides these 14 cases there were not more than 20 others in Berlin. This gives of course a much higher rate for this disease amongst deaf mutes than amongst hearing people. Amongst the 341 deaf mutes there were 42 Jews. This extraordinary proportion shows that one deaf and dumb person is to be found in 1477 Christians and one in 368 Jews. Whether this preponderance of the disease amongst the Jews is connected with consanguinity or not will be considered in another chapter. In the meantime the distribution of Liebreich's cases is worthy of notice. Amongst the deaf and dumb affected with retinitis pigmentosa, five were brothers and sisters, four sisters and brothers, two were sister and brother, and three were children of different parents.

The teeth in deaf mutes are not characteristic. Mr. M'Cash, the Honorary Dentist to the Glasgow Institution, reported on 127 children present in the institution (August 28th, 1895) as follows:

"There are only two typical cases of syphilitic teeth —two girls—and in another case—a boy—the two upper central incisors present the characteristic markings of syphilitic teeth, making in all three cases. He also observed a boy with teeth deeply pitted and quite devoid of enamel owing to the action of mercurials. Such are called 'mercurial teeth.' These, together with three cases of malposition from thumb sucking and one of prognathism, make up the entire list of departures from the normal dentition, evidence of other diseases which affect the teeth being entirely absent. The general character of the permanent dentition is rather above than under the average, that is, comparing them with those of hearing children to be met with in private practice. The jaws were found strong and well developed. The dental arch was well developed as a rule (there were three V-shaped palates)."

One cannot damage so important an organ as that of

[1] *Medical Times and Gazette*, 1861, p. 372.

hearing without throwing some of its work on the other senses. Sight takes the place of hearing, and the eye of the deaf mute becomes quick and sharp. The exercise of a function begets power and activity on the part of the organ exercising it; use begets greater ability. By whatever system the deaf mute is educated, his eye has extra calls made on it. He is constantly deciphering movements of lip or finger which puzzle hearing people. It is in this sense, and in this way only, that deaf mutes have acute sight. But they are not better gifted than the hearing in the matter of sight. Teachers of the deaf meet with the same defects of vision as those who educate hearing children. The view above stated is almost unanimously supported by the teachers of the Glasgow Institution, to whom the question was, along with some others, submitted. It is this development of the sense of sight which makes lip reading so remarkable in some deaf mutes. At the oral class in Donaldson's Hospital the writer said the following with a good light falling on his face and in full view of all the members —ten or a dozen in number (July, 1894): "Last night I saw a man who tried to cut his wife's throat. What would you call him? Afterwards he tried to cut his own throat. What would you call him now?" This was correctly written by every member of the class, and the answers, "A murderer" and "A suicide" were also given. This incident is not to be understood as committing the writer to any opinion as to methods of education, but as an instance of the acuteness of vision possessed by trained deaf mutes. There was no mouthing or gesticulation practised by the speaker during the experiment.

The sense of touch occasionally undergoes special development in the deaf. This, however, is rare. Hartmann collects instances from various sources. A deaf and dumb girl had such a fine sense of touch that, in a perfectly dark room, she could communicate with her bedfellow by placing her flat hand upon the bare breast of the latter (Pfüngsten). A deaf and dumb girl, who was at the same time blind, is said to have understood everything

her sister said by placing her hand upon the mouth of the latter (Meissner). A deaf and dumb boy at Erfurt, with his face turned away, understood and repeated words which were spoken against the back of his hand (Hill). More probable than these are the instances—also quoted by Hartmann—of a special skill on the part of deaf mutes in understanding words written by the finger on the surface of the skin (Albert von Haller, Eschke, etc.). Amongst living deaf mutes Helen Keller, who is also blind, is said to possess the power above attributed by Meissner to a deaf, dumb, and blind girl, that of understanding speech by placing her hand on the mouth of the speaker. It appears to be this combination of blindness with deaf mutism which specially develops the sense of touch. In the Eighteenth Annual Report (1839) of the Glasgow Institution for the Deaf and Dumb, three biographies are given of blind deaf mutes. The first is that of James Mitchell, son of a minister whose parish was on the banks of the Findhorn. He was born in 1795, and at the date of writing was 39 years old. He was born a blind deaf mute. As he grew up he discovered an extraordinary acuteness of the senses of touch and smell. Within a moderate range of the manse he walked fearlessly and without a guide, and he constantly explored fresh ground. When any new object was put into his hand he examined it by running it over with the points of his fingers, then he applied it to his mouth and felt it with his tongue and, if it were a body that admitted of it, he rattled it between his teeth. He was fond of horses, and when a mounted stranger arrived at the manse Mitchell's sense of smell informed him of the circumstance. He had considerable power of reflection, displayed great affection for his sister, was susceptible of pleasure from joking, and took the greatest delight in new clothes.

The second case is that of David Gilbert Tate, born in the Island of Fetlar, to the north of the Shetland group, where in 1818 he was discovered by Dr. Herbert, having dragged on an unnoticed existence for twenty-five years. Tate had a blind elder sister who was also idiotic and he

himself was weak-minded. He was devoid of smell, and his sources of pleasure were the senses of touch and taste. But he lived in abject poverty, almost unclothed, and even these senses had no opportunity of being highly developed. He was fond, however, of working with anything he could alter the shape of, such as woollen or linen clothes, materials of cotton or straw, etc.

The third case is that of Julia Brace, described as "by far the most interesting object to be met with in the Hartford Institution for the Deaf and Dumb." Although blind she could thread a needle, a feat she never accomplished without the aid of her tongue. Like Mitchell, she was fond of dress, preferring articles of the finest texture. Amongst a number of watches owned by various gentlemen present, she always returned the right watch to its owner even when the different owners changed places. Her capabilities of touch and smell became exceedingly heightened. She observed the greatest neatness in her wardrobe, and always noticed and rectified the slightest disorder in it which had been caused by a stranger. She always selected her own garments without hesitation from amongst the mass gathered in the large baskets returned from the Institution laundry. At the tea table with the whole family, having sent a cup to be replenished, one was accidently returned which had been used by another person. Although the cups were exactly alike, she at once noticed this and pushed it from her with some slight appearance of disgust, as if her sense of propriety had not been regarded. Reference is made to one or two other cases in the report from which these are cited. The cases of Laura Bridgman and Edward Meystre are illustrations of successful education of blind deaf mutes, and whilst their discussion might give fresh examples of compensatory acuteness of touch, it belongs rather to the second part of this work.

During the investigations in connection with the 1851 census, Wilde discovered six deaf, dumb, and blind persons in Ireland. The two cases of most interest were those of Daniel Cole in the city of Dublin, and Hugh Gorman in

the county of Tyrone, both congenitally blind and deaf. Cole was at that time ten years old, and the seventh of eight children. He was delicately formed, small for his age, and had hydrocephalus in infancy. He had the appearance of an idiot. He had a delicate childhood. He was of gentle disposition, by no means devoid of intellect, and was in all other respects healthy. "His mother has taught him several letters of the manual alphabet by making him feel her fingers. He can thus figure the letters upon his fingers forming 'bread' and several other words. His sense of touch seems particularly acute, and he feels with great care every substance with which he comes in contact, and especially the dresses of the persons around him."

Gorman's case, says Wilde,[1] is thus reported by Dr. Twigg:—"He is well formed, healthy, handsome, and, considering his peculiar circumstances, intelligent. The only thing against his appearance is a strabismus of both eyes. He is quite blind, but has no cataract, and the pupils are perfectly sensible to light. He smells his food before he eats it, and also everything he touches that he is not previously acquainted with. His sense of touch appears particularly acute; he rubs everything he touches between the palms of his hands. There were some clothes drying in the house when I visited him; when he came in contact with them he smelt them, and then rubbed them gently between his hands. His mother placed him near the fire, and he cautiously passed from one side to the other, keeping at an equal distance all the way. His mother says that when irritated he beats his head with a stick, or any instrument he can find. He makes his wants known by crying."

The mental qualities in the deaf and dumb are not necessarily damaged. Of 157 children attending the Glasgow Institution in June, 1895, the teachers returned 114 as of "good," "very good," or "excellent" mental capacity, 15 as "fair," 22 as slow or poor, and 6 as aphasic, idiotic, or weak-minded. Mental capacity cannot

[1] Wilde, *Aural Surgery*, 1853, pp. 482-3.

be regarded as a single entity either in the deaf or the hearing. Mr. Haycock—one of the Glasgow teachers—found two of his boys bright in the cricket field and smart at manual occupations, but woefully deficient in the language faculty. Others he describes as strong in language and poor at manual work. These are just the characters found in hearing children. The peculiarities of the deaf-mute's mind are not to be sought for in his deafness, but in its cause. If the disease which has caused his deafness has also damaged his brain he will be a dull stupid child. If his brain has been unaffected he will be intellectually like a hearing child minus the power of sustained reasoning which the possession of a language confers.

The above figures show 4 per cent. of aphasic or idiotic amongst the Glasgow children. This is a larger percentage than amongst hearing children. But the aphasia or idiocy is not due to the deafness—indeed, some of these children are mute, although hearing quite well. Cases like this then are either not cases of deaf mutism, or, if there be deafness, it is only part of a larger fault in the central nervous system.

It is a remarkable fact, that although the Glasgow deaf mutes examined by the author were found quite up to the average in physique, their head measurement was always below that of their hearing competitors. Occupying a middle position with regard to height, a superior place with regard to weight, the topmost situation as to chest measurement they were always at the bottom of the list when cranial circumference was concerned. This cannot be an accident. It is more difficult to teach a deaf than a hearing child; progress is slower; mental culture in the average deaf mute cannot reach such a high point as in the hearing. This is not the same as saying that the mental capacity of the average deaf mute is inferior to that of the hearing. To begin with they are the same. But it is a confession that in the absence of hearing our means of developing that capacity are deficient. If the development of the functions of the brain, as the organ of thought,

has anything to do with the size of the organ itself, then we must be prepared to find deaf mutes with smaller brains than hearing people. The measurements above quoted give colour to this theory. The deaf mute, when he enters school at 7, is like the hearing child at 2 years; and that brain growth, which is due to the rapid development of intelligence in a hearing child between these ages, has progressed more slowly in the deaf child. Hence the smaller measurement. The anthropology of deaf mutism has been too little studied to warrant anything more positive than the above being stated on this subject. Future observation will supply larger data. In the meantime it is interesting to gather together the impressions of British headmasters as expressed in their replies to question 8 of circular (p. 8). These gentlemen, as a rule, think the deaf equal to the hearing in physical and mental qualities. When physical inferiority is mentioned by them, it is usually accounted for, not by the deafness, but by the disease which produces it. Children who have become deaf from meningitis are spoken of by one or two teachers as mentally dull (Mr. Simeon Kutner, Mr. Kirk).

When studying the physical character of the deaf and dumb, it should be remembered that these latter are drawn very largely from the poorer classes, and that during the whole of life they are by their defect handicapped in the struggle for existence. Deaf mutes, therefore, die in a larger proportion than hearing people of those diseases the predisposing causes of which are bad feeding, poor housing, and insanitary conditions generally. Deaf mutes also for the same reason cannot be expected to compare favourably with hearing people in the matter of longevity. But when placed under the conditions which are now to be found in our institutions, deaf mutes show no physical inferiority when compared with hearing children.

CHAPTER II.

THE EAR AND HEARING.

DEEP down in the side of the skull lies the organ of hearing. Protected from jar or accident by its hard, bony surroundings, it is yet open to the slightest impulse which reaches it from the atmosphere in the shape of sound waves. Essentially it is a complicated nervous expansion shot out from the brain through a narrow bony opening and spread over a series of membranous canals and partitions, these latter being supported by a system of bony canals of similar shape, whilst the whole apparatus is bathed in fluid. Waves of sound reaching the ear are modified by this fluid and fitted for transmission to the brain by the auditory nerve. The temporal bone in which this delicate organ is lodged lies on the side of the head. It consists of three parts: a flat portion spreading up thinly and forming part of the wall of the skull for a distance of $2\frac{1}{2}$ inches, both vertically and horizontally, and called the squamous portion; a thick knob felt behind the ear and called the mastoid portion; and a third not palpable from the outside of the skull, but projecting inwards and forwards from the junction of the two first named, and from its hardness called the petrous portion. Here it is that the organ of hearing is encased.

In studying the anatomy of the ear in connection with the production of deafness it will be found convenient to divide the hearing apparatus into essential and auxiliary. Everything deeper than the internal wall of the tympanum

may be called essential, everything external—the middle and external ears—may be regarded as auxiliary. There is thus an external, a middle, and an inner ear. The external ear or auricle is composed of a thin plate of cartilage covered by skin. Its interior surface is irregularly concave, and looks outwards and slightly forwards with regard to the side of the head. From its posterior surface a funnel-shaped process runs into the side of the skull and forms the outer part of the external auditory canal. There is a little fatty tissue under the skin of the auricle. There are also a few muscular bands extending from the auricle to the side of the skull, and from one part of the auricle to another; but these in man are rudimentary and only occasionally are fully enough developed to be capable of moving the auricle. Along with certain ligaments they attach the auricle to the side of the head. The external ear collects the sound waves for transmission by the external auditory canal to the tympanic membrane, but in people who hear well it can be removed without sensible diminution of hearing. In slightly deaf or in old people the auricle is relatively more important, and these often try to increase its area by putting the hand behind the ear.

The external auditory canal is formed of the funnel-shaped process of cartilage above referred to, and of a similar osseous tube in the temporal bone to the outer extremity of which it is attached. Its total length is fully an inch, and the bony is a little longer than the cartilaginous part. It runs inwards and slightly forwards, and in this course curves like a slightly bent forefinger. When one wants to see along its whole length, it is therefore necessary to straighten it by pulling the auricle upwards and a little backwards. The canal is narrowest in the middle, at no part is it quite circular, but is oval in various directions. At its outer end the skin is provided with a set of small hairs, towards its inner end it is studded with a set of cerumenous glands which secrete the wax of the ear. Its inner end is blocked by the tympanic or drum membrane, which, in a healthy ear,

is quite intact and offers no passage for air or fluid between the canal and the drum cavity.

The tympanic or drum membrane separates the canal from the middle ear. Its area is about two-thirds that of the smallest British silver coin—the threepenny piece. It is almost but not quite circular, being a little longer in an oblique diameter beginning at its upper and hinder part. It is fixed in a groove at the inner end of the auditory canal, and its plane deviates considerably from the vertical, the membrane sloping inwards as it passes downwards. The floor of the auditory canal is thus longer than the roof. Further, the centre of the membrane is pulled inwards by the malleus, one of the small bones of the middle ear, the handle of which is attached to the membrane, like a single

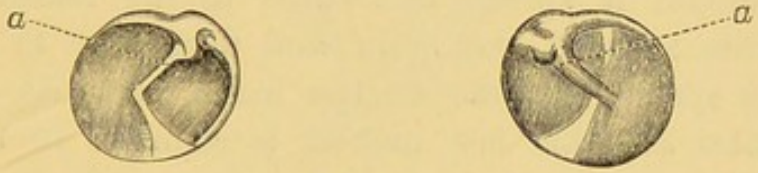


FIG. 1A. FIG. 1B.
Right and Left Tympanic Membranes—*a*. Handle of malleus.

spoke in a wheel, extending from its upper border to its centre (see Figs. 1 and 3).

The membrane is composed of three layers, one derived from the canal—epidermic—one from the mucous lining of the middle ear—epithelial—and a fibrous layer proper to the membrane itself, and lying between these two. The fibres run in two directions, radiating and circular.

The tympanum or drum of the ear is a wedge-shaped cavity, with its apex downwards, placed between the membrane above described and the inner ear or labyrinth. Its roof is formed by a thin plate of bone which separates the middle ear from the brain. Because of the approximation of its sides, its floor—the apex of the wedge—is very narrow. Behind, the drum opens in a series of small air spaces in the mastoid process, called the mastoid cells. In front it is prolonged into a tube—the Eustachian tube—which reaches to the throat. The outer wall is formed

almost entirely by the tympanic membrane. Its inner wall is very uneven. In it there are two important openings or windows—one oval, the other round. The fenestra ovalis is occupied by the foot-plate of the stapes or stirrup bone, to be described shortly. It is placed in the upper part of the inner wall of the tympanum. Behind and below, and separated from the oval window by a protuberance called the promontory, is the round window or fenestra rotunda. On the other side of the round window is the cochlea, which is separated from the middle ear by a small membrane which occupies the window. Similarly the oval window communicates with the vestibule, another part of the inner ear, its opening being occupied, as above described, by the foot-plate of the stapes. When disease attacks the middle ear it may become dangerous to life should it spread backwards to the mastoid cells, or upwards towards the brain, and dangerous to hearing should it spread inwards to the inner ear. As will be shown later on, this last process is common in the production of cases of acquired deafness.



FIG. 2A.

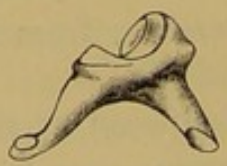


FIG. 2B.



FIG. 2C.

Auditory Ossicles—A. Hammer or Malleus; B. Incus or Anvil; C. Stapes or Stirrup bone.

Across the tympanic cavity, from the drum membrane to the oval window, stretches a chain of small bones or ossicles (Fig. 2). These are three in number, and are named from without inwards: the malleus or hammer bone, the incus or anvil bone, and the stapes or stirrup bone. With the exception of the stirrup bone the English names of these bones do not accurately describe them. The hammer is attached to the drum membrane by its handle in the manner indicated when the membrane was described; its head is connected with the anvil by a joint or articulation. The anvil, which is more like a tooth with two diverging

roots, is again connected with the head of the stirrup bone by a joint, and the foot-plate of the latter is fixed loosely into the oval window. The whole chain forms an irregular jointed rod, connecting the drum membrane with the internal ear. In addition to their attachments to each other and to the structures at the ends of the chain, the hammer and the anvil are supported by ligamentous structures which stretch to the walls of the drum cavity. Further, two little muscles—called the tensor tympani and the stapedius—spring from the Eustachian tube and the tympanic wall, and by their attachment to the chain of bones control its movements (see Fig. 3).

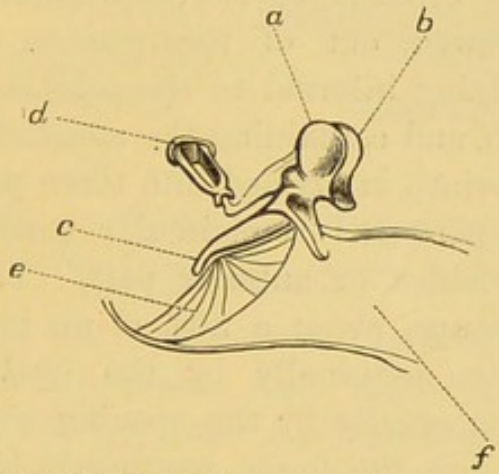


FIG. 3.—TYMPANIC MEMBRANE WITH OSSICLES ATTACHED.

a, Malleus; *c*, Handle of malleus; *b*, Incus; *d*, Stapes or stirrup bone; *e*, Tympanic membrane; *f*, External auditory canal.

The drum cavity contains air which it obtains from the throat by the Eustachian tube. It is lined with mucous membrane, which not only covers its walls but spreads round and covers the ossicles, and passes backwards and lines the mastoid cells. Disease, therefore, may spread from the throat to the middle ear, for the latter may be looked on as a branch of the former, and indeed most cases of ear disease are preceded by some disturbance in the throat. The Eustachian tube, which forms the communication, is cartilaginous at its lower or throat end, but osseous at its upper or ear end. It is about an inch and a half long. Its throat end is funnel-shaped. It is lined with ciliated epithelium, which sweeps the mucus of the tympanum towards the throat. Usually

the tube is closed, but the act of swallowing and other movements in the pharynx open its mouth and it admits air to the drum cavity. Simply increasing the air pressure in the throat is enough to open the tube, as may be proved by closing the lips firmly and the nose with the fingers, and forcibly expiring air from the lungs. The fulness felt in the ear during this experiment can be seen to be accompanied by a corresponding bulging of the membrane by an observer who has the latter under view.

The structures which have been described are the auxiliary or sound-conducting apparatus. We shall now proceed to examine the essential or sound-perceiving apparatus. This consists of a complicated cavity or set of cavities hollowed out of the petrous portion of the temporal bone, lying internal to the middle ear, called the osseous labyrinth, and containing the membranous labyrinth. The osseous labyrinth is divided into three parts: the vestibule or middle part, the semicircular canals or posterior part, and the cochlea or anterior part. The vestibule is of almost oval shape, about a fifth of an inch in diameter, and communicates externally by the oval window with the middle ear, internally by the opening which admits the auditory nerve, with the brain, posteriorly by five openings with the semicircular canals, and in front with the scala vestibuli of the cochlea.

The semicircular canals are three bony tubes placed above and behind the vestibule, and called respectively the superior, the posterior, and the external. At one end of each, near its opening into the vestibule, the canal bulges out into an ampulla or dilated part. Two of the canals make about two-thirds of a circle before they join the vestibule, in the third the contiguous ends join before the vestibule is reached, so that there are only five openings of the canals into the vestibule.

The cochlea is the front part of the labyrinth. It is really a long tube coiled spirally round an axis or centre pin, and so much thicker at the base that it assumes the appearance of a short thick cone a quarter of an inch high and the same in diameter at the base (see Fig. 4).

This spiral tube makes two and a half turns round the axis and is about one and a half inches long. It is almost equally divided throughout its entire length by a partition which is bony on the side next the axis and membranous in its outer half. There are thus two

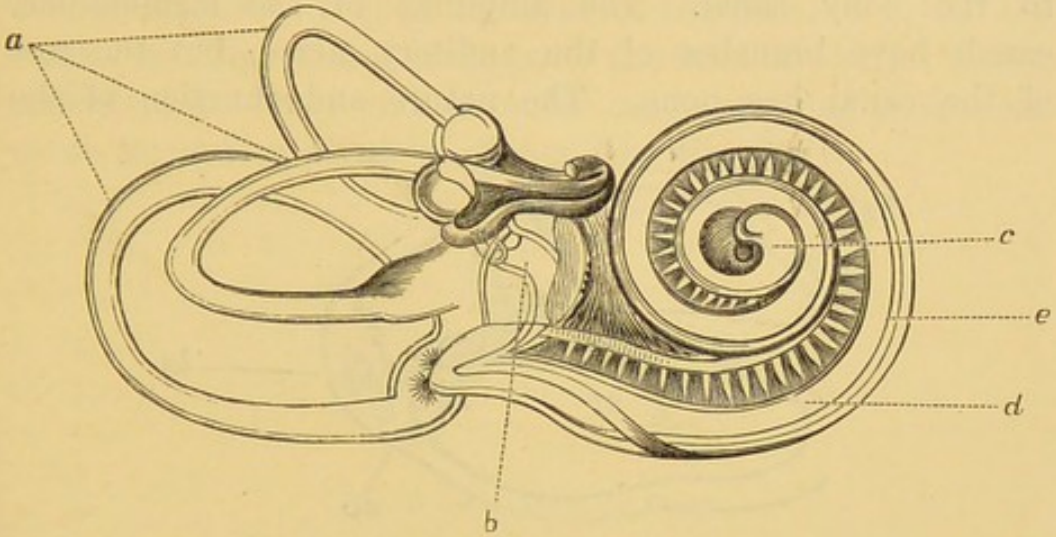


FIG. 4.—THE MEMBRANOUS LABYRINTH.

a, Semicircular canals; *b*, Vestibule; *c*, Cochlea; *d*, Basilar membrane *e*, Spiral ligament.

tubes or scalae in the cochlea, and these are named from the parts into which they open at the base, the scala vestibuli opening into the vestibule, and the scala tympani communicating by the round window with the tympanum. The tubes communicate with one another by a small opening at the apex of the cochlea—the helicotrema. Such is the bony labyrinth. It is filled with a clear fluid called the perilymph, and contains the membranous labyrinth, a series of membranous tubes of similar shape floated in the perilymph and filled with a similar fluid, called the endolymph, and on the walls of which are spread out the arrangements for the perception of sound.

Looking at these membranous tubes (Fig. 4) more closely we find that they are not everywhere exact models of their bony counterparts. The membranous vestibule consists of two sacs, the utricle, and the saccule. The utricle is placed behind, and receives the five openings of the membranous semicircular canals. The saccule is in front and communicates by a small canal with the

cochlea. Both are supplied with fibres of the auditory nerve and contain small crystals of carbonate of lime.

The membranous semicircular canals are similar to but smaller than the bony canals of the same name. Their concave border is free, but their convex border is attached to the bony canal. The ampullae of the membranous canals have branches of the auditory nerve, but the rest of the canal has none. The nature and function of the

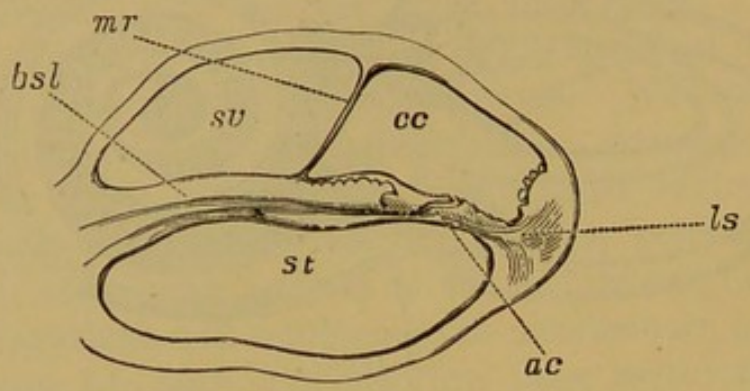


FIG. 5.—SECTION OF A TURN OF THE COCHLEA.

sv, Scala vestibuli; *st*, Scala tympani; *cc*, Canal of the cochlea; *ac*, Arches of Corti, or basilar membrane; *bsl*, Bony spiral lamina; *ls*, Spiral ligament; *mr*, Reissner's membrane.

terminations of the auditory nerve in the ampullae and in the utricle and saccule are not well understood. Stiff hair-like processes are attached to the epithelium in these localities, and filaments of the auditory nerve are distributed to the cells.

The membranous cochlea is the last part of the labyrinth to be described. It is almost certainly the seat of hearing proper, and its structure is somewhat intricate. We have seen that the spiral tube of the cochlea as it winds round the modiolus or axis is divided by a partition into two tubes or scalae of almost equal size (Fig. 5). But the scala vestibuli is further divided by a second partition. This, the membrane of Reissner, stretches from about the middle of the spiral partition above described to the outer wall of the cochlear tube, thus shutting off a third canal triangular in section, and smaller than either of the scalae (see Fig. 5). It is shut at both ends and communicates with neither scala, but it contains the organ of Corti, the essential part of the hearing apparatus. This triangular

canal is called the canal of the cochlea. Its base is formed by the outer part of the bony lamina spiralis and the membranous prolongation of it, which, along with it, separates the scalae. Its roof is formed by the membrane of Reissner, and its outer wall by the cochlear tube itself. The membranous part of the base of the canal is called the basilar membrane, and it supports the rods of Corti. These consist of an inner and an outer set supporting each other so as to form a series of arches (see Fig 6).

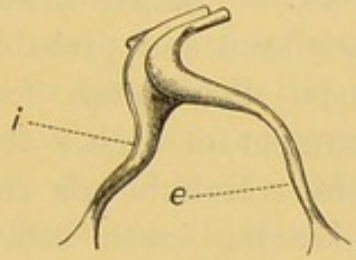


FIG. 6.—AN ARCH OF CORTI.

i, Internal; *e*, External rod.

The basilar membrane is a firm, tightly-stretched membrane composed of radiating fibres attached at the inner extremity to the bony spiral lamina, and at the outer extremity to a triangular cushion called the spiral ligament. The arches of Corti are composed, as mentioned above, of two sets of rods, an inner and an outer. These rods are stiff, cylindrical, slightly S-shaped threads with thickened tops. They stand on the basilar membrane, and are united at their tops. The arches are so placed on the basilar membrane that the feet of the outer rods stand about its middle, whilst over the arches, and springing from the bony partition at the inner end of the membrane, is thrown a coverlet of connective tissue, which has a reticulated appearance, and is called the membrana tectoria. Greater detail in describing the minute structure of the organ of Corti is here unnecessary. It is enough to state that it is amongst specialized epithelial structures that the ultimate filaments of the auditory nerves are lost. These epithelial structures consist of cylindrical cells topped by many stiff-like hairs, and they are ranged in two sets, one inside, the other outside, of Corti's arches.

It is interesting to note that the number of Corti's arches bear some similarity to the number of recognizable musical intervals. Helmholtz[1] tells us that Waldeyer has estimated that there are about 4500 outer arch fibres in the human cochlea. He thinks also that in each octave 600 separate intervals can be recognized, or, as there are 12 semitones to the octave, that a trained ear can appreciate a difference of $\frac{1}{50}$ of a semitone. Prof. Preyer[2] of Jena and the author[3] have shown that the human ear is quite up to this work. Trained musicians can certainly recognize $\frac{1}{64}$ of a semitone and probably $\frac{1}{80}$. This would involve—on the basis of an arch for each recognizable interval—a larger number of arches than Waldeyer found to be actually present. Helmholtz's calculation takes the musical scale as embracing seven octaves, and with 600 intervals to the octave 4200 arches are needed in a good ear. But if $\frac{1}{80}$ semitone can be distinguished, 6720 rods would be required to account for this degree of acuteness throughout the musical scale. But this acuteness does not exist throughout the scale. At very low and at very high pitches much larger intervals are undetected. So that the theory of a rod for each tone is not contradicted by experiment. Helmholtz, however, makes his hypothesis provide for the contingency of greater acuteness of hearing. "If," he says, "a simple tone be struck, having a pitch between two adjacent Corti's arches, it would set both in sympathetic vibration, and that arch would vibrate the more strongly which was nearest in pitch to the proper tone. The smallness of the interval between the pitches of two fibres still distinguishable will therefore finally depend upon the delicacy with which the different forces of the vibration excited can be compared, and we have

[1] Helmholtz, *Sensations of Tone as a Physiological Basis for the Theory of Music*, 1885: translated by Alex. J. Ellis, p. 147.

[2] Preyer, *Ueber die Grenzen der Tonwahrnehmung*, 1876, and *Akustische Untersuchungen*, Jena, 1879.

[3] J. Kerr Love, "The Limits of Human Hearing," *Glasgow Medical Journal*, 1888, and "Acoustics of Musical Sounds," *Proceedings of the Glasgow Philosophical Society*, 1889.

thus also an explanation of the fact that as the pitch of an external tone rises continuously, our sensations also alter continuously, and not by jumps, as must be the case if only one of Corti's arches were set into sympathetic motion at once."

The auditory nerve, by which the ear is connected with the brain, takes its origin in the lower half of the floor of the fourth ventricle, where its nucleus forms an eminence. From this point of origin in the medulla oblongata it branches outwards, and in its course towards the internal auditory meatus it is accompanied by the facial nerve. The meatus is placed on the inner and posterior aspect of the petrous bone, and receives the auditory nerve, which divides into the cochlear and vestibular branches, supplying these two divisions of the internal ear.

Before discussing the function of hearing, it will be well to look for a moment at the stimulus—sound—which gives rise to the sense itself. Sound is caused by the vibrations of sounding bodies. When these are irregular, the result is noise; when periodic and regular, musical sounds are the result. In either case the movement in the sounding body is communicated to the air, and takes the form of waves, which, proceeding in all directions, reach the ear. The character of sound waves is most easily studied by examining these regular movements or musical sounds, and the instrument which is of most use for this purpose is the siren (see Fig. 7). It consists of a small wind chest, with a series of holes—usually ten—in its lid. Covering this lid, and moving on an upright spindle, is a circular disc pierced by holes similar in number and position to those in the lid of the chest. The two sets of holes are so shaped that, when air is blown through the pipe which communicates with the supplying bellows, the disc rotates on the chest lid, and its movements are chronicled on the clockwork above the apparatus. Each time two holes coincide, a puff of air corresponding to a vibration escapes, and when sufficiently rapid the vibrations or puffs become welded into an audible musical sound. Here then is a means of finding the vibration number of any musical

sound. We find that C is caused by 264 vibrations per second, and that its octave is caused by twice that number. The Fifth, G, is caused by 396 vibrations, $\frac{3}{2}$ of C; the Fourth, F, by 352, or $\frac{4}{3}$ of C, and so on with the other intervals; and we come to the simple and beautiful law which may thus be stated, that what we

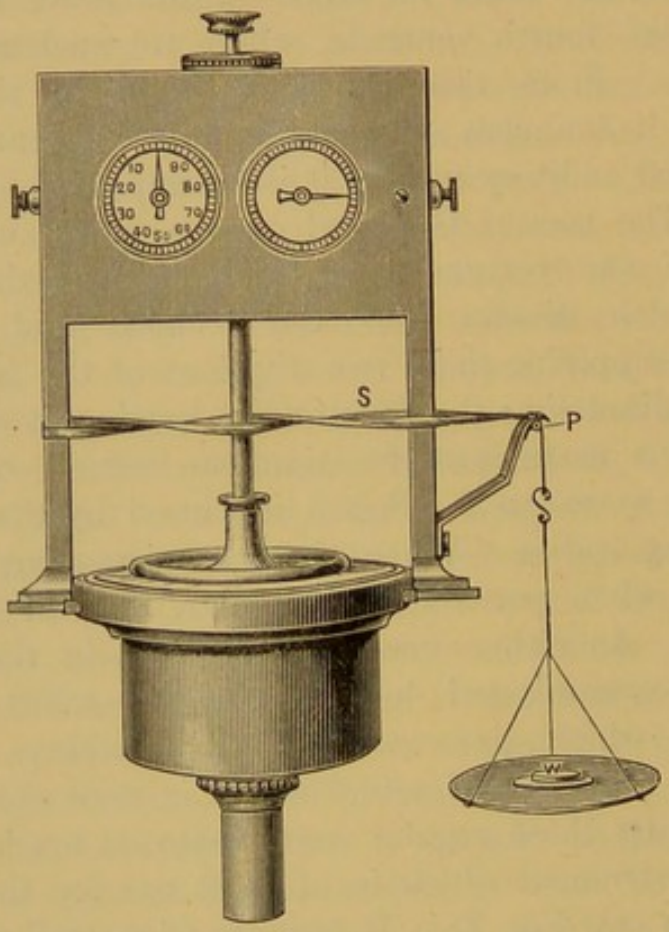


FIG. 7.—SIREN, WITH AUTHOR'S ADDITION FOR ENSURING STEADINESS OF PITCH.[1]

S, Strand of silk; P, Pulley; W, weight, varied for each note.

call consonance or smoothness when two tones are sounded together is greatest when the fraction representing their vibration ratios is simplest. And further, as almost no musical sound is simple, but made up of harmonics, the smoothness of any individual tone depends on the predominance in it of upper partials or harmonics, whose relationship to the prime tone can be stated in these simple fractions. It is the partials which give

[1] See *Proceedings of the Glasgow Philosophical Society*, 1889.

quality to a sound. When none are present we have a bald, characterless sound and a simple wave, and the quality of a musical sound, that which makes us know one from another, is due to the presence in that sound of elements which make its wave-form complex and different from that of any other. That difference, which may be put down on paper as wave-form, is made known to the ear by the relative predominance of certain partials over others. So much for quality. But sounds may differ in two other respects—pitch and intensity. Pitch, as the siren teaches us, depends on the rapidity of the vibrations; the faster the spindle travels, the higher the note. Intensity, or loudness, depends on the amplitude of the vibration in the sounding body.

When a sound wave reaches the auricle its direction is probably altered, and it is concentrated and gathered together by that organ. In man, however, this function is not very important, and indeed it may be removed altogether without much damage to hearing. But it is easy to see that the horse and the dog use the auricle as a sound collector and turn it in the direction of the sounding body. Indeed in these animals its trumpet shape gives us a hint for the construction of our simplest aids to hearing.

The curve of the drum membrane and its oblique position are well suited to make the most of the wave, which has now entered the external auditory canal. Here it is reflected from side to side, and arrives at the membrane, striking it almost perpendicularly. Any movement of the membrane sets in motion the chain of small bones. The handle of the malleus, fixed as it is into the substance of the membrane, follows the movement of the latter, and can be seen, when suction is applied to the external canal by Siegle's speculum, to perform a sort of rotation round an axis. The incus accompanies the malleus; but as part of it impinges on the bony tympanic wall, the rotatory movement becomes an inward one when it reaches the stapes, the foot-plate of which fits loosely into the oval window. The middle ear is constantly supplied with air

from the throat. The Eustachian tube opens when one swallows, and thus pressure in the middle ear and in the external air are constantly being equalized. Temporary disturbance of such equilibrium is experienced in climbing any high mountain; permanent closure of the Eustachian tube is followed by absorption of air in the middle ear, indrawing of the tympanic membrane, great deafness, and ultimate structural change in the tympanic cavity. Beyond the middle ear the course and conduct of a sound wave must be a matter of speculation. The foot-plate of the stapes makes an inroad on a system of fluid-filled and fluid-surrounded canals, along which waves travel with ease. Assuming that the organ of hearing proper is the structure about Corti's arches, the wave must travel through the saccule (part of the vestibule), along the scala vestibuli, through the little communication at the top—the helicotrema—and back by the scala tympani to the round window, the membrane of which will bulge a little into the tympanic cavity. In this course it will pass over both Reissner's membrane and the basilar membrane. The fluid in the cochlear canal may pick up the wave and transmit it to the hair cells, or it may reach the same destination through the basilar membrane and Corti's arches. In either case it is now at the terminal bodies of the auditory nerve, along which it travels to the brain and gives rise to its proper sensation. The semicircular canals are probably no essential part of the hearing organ, but associated with the maintenance of the erect posture. Injury to them, or disease in them, causes giddiness and loss of equilibrium, and is a common feature of ear disease.

When studying deafness deficient function is manifested in various respects—loss of hearing for high or low notes, want of power to distinguish notes of nearly the same pitch, loss of hearing for sounds of an ordinary character. Before looking at the diseased condition, let us see what the ear can do at its best. An inquiry into the power and capacity of the ear as the organ of hearing raises the following questions:

1. What are the lowest audible notes?
2. What are the highest audible notes?
3. What is the smallest difference in the pitch of two tones which can be procured?
4. At what distance can a note of given loudness be heard?

I. THE LOWEST AUDIBLE NOTES.

In producing very low notes various mechanisms have been used: very large organ pipes, very large tuning forks, metallic tongues, etc. According to the means employed and the capacity of the observer the result will vary, but sounds produced by vibrations of from 16 to 24 per second can be heard by the human ear.

II. THE HIGHEST AUDIBLE NOTES.

The next point to look at is the other end of the range of hearing. What is the highest audible note? From the very low tones we have just been considering, those represented by higher vibration numbers become more definite and more used in music for about seven octaves, when their musical value begins rapidly to diminish and soon disappears. The notes having vibration numbers from 256 to 1024 per second are those we most commonly hear. Human voices range from about 64 to 1400. Anything above 1400 is unusual, even in treble voices. The 16 foot C of the organ, which gives a note having 32 vibrations per second, as we have seen, is questionably musical, and is seldom used alone in organ music. Above 4000 vibrations per second the notes begin to be too indefinite in pitch to have a musical value. The highest note of most pianos has about 3500 for its vibration number; the highest of the piccolo flute, 4700. Such notes are useful chiefly to give brightness to the combinations in which they occur. But the ear can appreciate and often hears notes having a very much higher vibration

number. The sounds made by bats, crickets, and some insects are caused by vibrations occurring at the rate of from 5000 to 15,000 per second. The squeak of a mouse too is among the very high ranges. While most ears can hear these and even higher notes, curious instances of inability occur. Professor Tyndall[1] gives a good one. When he was crossing the Wengern Alp, in company with a friend, "the grass on each side of the path swarmed with insects which to me rent the air with their shrill chirruping. My friend heard nothing of this insect music, which lay beyond his limits of audition."

During the series of investigations undertaken by the present writer, for the purpose of fixing the appreciation for differences of pitch of the human ear, and which will shortly be referred to, an interesting case was met. A gentleman with a very correct ear was deaf to all sounds higher than E, 5280. Although this note and those above it were sounded on the organ, he heard nothing. He distinguished differences of sounds separated by $\frac{1}{60}$ semitone quite readily.

The most convenient method of producing very high notes for testing purposes is by Mr. Francis Galton's whistle, a small brass tube of very fine bore, provided with a movable piston by which to vary the pitch, and for the production of sound with a small compressible rubber bag.

Mr. Galton,[2] in his very interesting work, says: "On testing different persons, I found there was a remarkable falling off in the power of hearing high notes as age advanced. The persons themselves were quite unconscious of their deficiency so long as their sense of hearing low notes remained unimpaired. It is an only too amusing experiment to test a party of persons of various ages, including some rather elderly and self-satisfied personages. They are indignant at being thought deficient in the power of hearing, yet the experiment quickly shows that they are absolutely deaf to shrill notes

[1] Tyndall, *On Sound*, p. 71.
[2] Galton, *Enquiry into Human Faculty*.

which younger persons hear acutely, and they commonly betray much dislike to the discovery. Every one has his limit, and the limit at which sounds become too shrill to be audible to any particular person can be quickly determined by this little instrument. Lord Rayleigh and others have found that sensitive flames are powerfully affected by the vibrations of whistles that are too rapid to be audible to ordinary ears. I have tried the experiment with all kinds of animals on their power of hearing shrill notes. I have gone through the whole Zoological Gardens using an apparatus for the purpose. It consists of a walking stick that is in reality a long tube. It has a bit of india-rubber pipe under the handle, a sudden squeeze on which forces a little sound. I hold the stick as near as is safe to the ears of the animals, and when they are quite accustomed to its presence and heedless of it, I make it sound. Then if they prick their ears it shows they hear the whistle. If they do not, it is probably inaudible to them. Still, it is very possible that in some cases they hear but do not heed the sound. Of all creatures, I have found none superior to cats in their power of hearing shrill notes. It is perfectly remarkable what a faculty they have in this way. Cats, of course, have to deal in the dark with mice and to find them out by their squeak. Many people cannot hear the shrill squeak of a mouse. Some time ago singing mice were exhibited in London, and of the people who went to hear them, some could hear nothing, while others could hear a little, and others, again, could hear much. Cats are differentiated by natural selection until they have the power of hearing all the high notes made by mice and other little creatures they have to catch. A cat that is at a very considerable distance can be made to turn its ear round by sounding a note that is too shrill to be audible by almost any human ear." Mr. Galton also found that small dogs heard much higher notes than large ones.

In experimenting with very high notes the writer found Mr. Galton's whistle failed in the intensity of the sound produced. Its range, too, is limited. At 5 mm., where the

vibration number is nominally 17,000, and actually about 13,000, the note to him loses its clearness, and is much blinded by the rush of wind. At 4 mm. the writer can sometimes hear the note and sometimes not, but it is more of a metallic wheeze than a true note. He has met few adult observers who can hear the note at 3 mm., where Messrs. Shaw and Turner found the vibration frequency to be 21,517. Following Dr. Wollaston, he has used small open organ pipes for the production of high notes. The smallest pipes used in organs are called Fifteenths. These measure from 4½ to 5 mm. diameter. The writer has had pipes made by Mr. White, of Cambridge Street, Glasgow, of a diameter of 2 and 3 mm. By cutting these down he has succeeded in getting notes from a pipe of 6 mm. length, and in one case of 5 mm., measured from the upper lip of the mouth.[1] The total length of the whistle or pipe is 1 mm. more than these figures. Calculating by length only, these pipes must give notes of from 28,000 to 34,000 (nominal vibration number), or, if Messrs. Shaw and Turner's correction can be taken for open pipes, of 21,000 to 25,000 vibrations per second. The notes of these small pipes seem to the ear equal in pitch to the notes of Mr. Galton's whistle. With them the writer has been able to make very high notes audible to elderly persons who were quite deaf to the whistle.

Dr. Thomas Barr[2] found the perception of high notes destroyed or diminished in the case of boilermakers and others who work amidst noisy surroundings. The writer has met with one case in which shrill notes are very disagreeable to the left ear, but are heard by the right ear without unpleasantness. A weakly-ticking watch was heard by both ears equally well, and hearing was in other respects normal. Examination by speculum showed both ears

[1] This is the plan of measurement adopted in the article "Organ," *Encyclopaedia Britannica*, and is apparently adopted for the Cambridge whistles.

[2] Thomas Barr, "Boilermakers' Deafness," *Glasgow Philosophical Society*, 1886.

healthy and apparently alike. He does not know if this peculiarity has been noted before, but it is worth recording, in connection with Fechner's statement, that in individuals of normal hearing the left is more acute than the right ear. In connection with this case, Mr. W. H. Cole, with whom he discussed it, informed the writer that when listening attentively for anything out of tune in any of the instruments of his band, he "invariably uses the left ear and would never think of using the right." He thinks the use of the baton with the right hand may have something to do with this choice of the left ear.

III. THE SMALLEST APPRECIABLE DIFFERENCE IN PITCH.

This point has been tested by means of a tonometer composed of harmonium reeds by Dr. Preyer of Jena.

Dr. Preyer finds that nobody can recognize $\frac{1}{10}$ vibration at any part of the scale, that $\frac{1}{5}$ vibration cannot be certainly recognized either at 500 or 1000. The most skilful always recognize $\frac{3}{10}$ and $\frac{4}{10}$ vibration at 500 after sleep and amid other circumstances favourable for perception. Such keenness Dr. Preyer found only amongst violin-players, tuners, and musical instrument makers, also in a clinical student accustomed to the use of the stethoscope, and in a linguist, but not usually in pianists. A few weeks' training with the instrument makes observers proficient in discriminating pitch, and training has reduced Dr. Preyer's minimum from a whole to a half vibration when the tones are near 500. He is not so sensitive at 1000 as at 500. Herr Appunn always recognizes 1000 from 1000·5, but not 1000 from 1000·25, and not 500 from 500·2. The extreme limits appear to be 500 to 500·3, and 1000 to 1000·4.

In testing people for appreciation of small differences of pitch, the author has made use of two well-known facts in acoustics.

1. When two notes are sounded together which are

nearly but not quite in unison, an unsteady sound, characterized by alternate increase and diminution in volume, is produced. This is called the beating of the tones, and the number of beats per second is equal to the difference of the vibration number of the two tones.

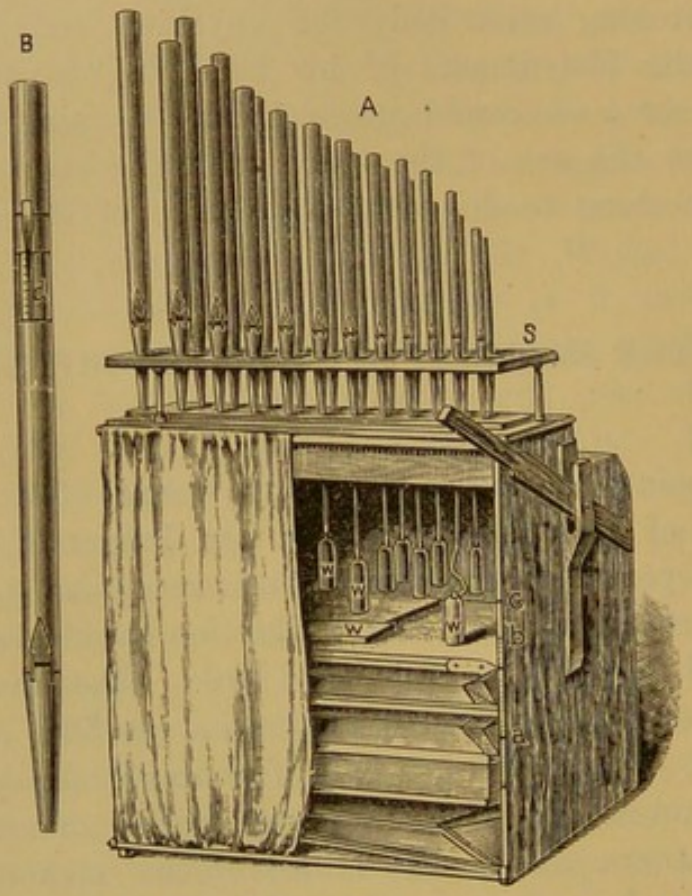


FIG. 8.—ORGAN TONOMETER FOR TESTING FOR APPRECIATION FOR DIFFERENCES OF PITCH.

A, Range of pipes; B, Single pipe, with movable top; w, Constant weight; w', Secondary weights; s, Place for siren.

2. Two organ pipes of exactly the same pitch can be made to differ in pitch and beat correspondingly if a movable top be fixed to one of them. When the pipe is shortened, the note is sharpened; when it is lengthened, flattening results.

If, therefore, two such notes be sounded, one after the other, of nearly the same pitch, the opinion of a listener can always be corrected by sounding the notes together and noting the beating of the tones. The instrument made for the author for this purpose he calls the organ tonometer

(see Fig. 8). With it a difference of half a vibration, or one beat, in two seconds can be accurately measured. With this instrument he has tested about 200 persons of all ages and of all degrees of musical attainment. Non-musical or miscellaneous companies generally had their capacity severely taxed by intervals of $\frac{1}{30}$ or $\frac{1}{40}$ of a semitone. Many made mistakes at $\frac{1}{6}$ semitone. Mistakes were oftener made with flattened than with sharpened intervals. Such companies were found at science classes, boys' brigades, university classes, etc. On the other hand, pianists, tuners, violinists, and other experts often recognized intervals of $\frac{1}{64}$ and $\frac{1}{80}$ of a semitone, but generally failed at smaller intervals. These last intervals in the middle part of the scale represent a half to one vibration. Of course, only musicians were tested with the intervals. Many of these showed a sensitiveness for the octave almost equal to that for unisons. At a considerable distance comes sensitiveness for the fifth, and at a much greater distance that for the fourth, major third, and major sixth. The further consideration of this subject would lead us into musical science, but the extent to which it has been discussed will illustrate the extreme sensitiveness of the human ear to differences in the pitch of sounds.

APPRECIATION OF A SOUND OR NOTE OF GIVEN INTENSITY.

In the consulting room the usual tests applied to hearing are the watch, the tuning fork, and whispered speech. For clinical purposes, perhaps the watch is the most convenient test for aërial hearing, but it is of little value where accuracy is necessary, or where, for purposes of comparison, a sound of constant intensity is needed; for hardly any two watches have the same strength of tick. Two watches the writer has can be heard respectively at distances of 7 and 14 feet. The tick of a watch, therefore, is not accurate enough as a test. The tuning fork, too, used in the ordinary way, is only a

rough test for hearing. In pathological states it is of much value. As a test for aërial hearing it has the same defect as the watch, with the additional one that the same fork gives sounds of different intensity according to the vigour of the exciting blow. Speech is an important test for hearing, because it is for the appreciation of spoken language that the faculty is chiefly used. But it is difficult to reduce to an absolute test, and it approximates an absolute test only when whispered speech is used.

According to Hartmann,[1] whispered speech is heard at a distance of 20 to 25 metres in a room as noiseless as possible.

Various forms of acoumeters have been constructed with the view of producing a constant test for hearing.

Politzer's acoumeter[2] is accurate and convenient. It consists of a small steel cylinder, on which a hammer of the same metal is made to fall through a definite distance. Both the cylinder and the hammer are supported on a vulcanite upright, the ends of which are made concave for the reception of the thumb and forefinger which hold the instrument. The distance through which the hammer falls is limited by its end nearest the hand coming in contact with a check which projects from the upright. The sound produced is like the tick of a very loud watch, and is said to be accurately tuned to C, which, however, can hardly be appreciated by any but a well-trained ear. The fall of the hammer gives a non-resonant metallic click. The instrument is made by Gottlieb, of Vienna. Hartmann found that many instruments made in Vienna were not uniform. With this instrument Politzer and Hartmann found that the average hearing distance was about 15 metres. Fechner found that in individuals with normal hearing the left ear was more acute than the right. The experiments of the writer with this instrument make him wish that it were improved in the direction of giving a sustained note, capable of being altered in pitch, and of a more definite pitch. Its click

[1] Hartmann, *Diseases of the Ear*: translated by James Erskine.

[2] Politzer, *Lehrbuch der Ohrenheilkunde*, Stuttgart, 1878 (p. 190).

is too loud for testing normal hearing in a room of moderate size, and for the individual practitioner it has no great advantage over a watch he knows well. Hartmann, after the invention of the telephone, endeavoured to obtain an exact gradation of sound by means of electric currents. In the current he placed—1, a tuning fork, by which the current is interrupted at regular intervals; 2, a rheochord or a sliding induction apparatus, by means of which the intensity of the current could be varied and exactly regulated at will; and 3, a telephone at which is heard a tone corresponding to that of the vibrating tuning fork of more or less intensity according to the strength of the current. Although the hearing test can be made easily and rapidly by means of such an apparatus, it is, unfortunately, too complicated, and, as only a small number of tones can be produced, the apparatus has not yet been introduced into practice.

Schafhäutl adopted as a test the minimum noise which could be heard in absolute stillness at midnight. He fixed the limit at the noise made by a cork ball weighing 1 milligramme falling from a height of 1 millimetre. Boltzmann and Töpler have reached results which Hensen considers to be as accurate as possible. By measuring the compression of the air at the end of an organ pipe of 181 vibrations per second they calculated that the ear responds with sensation to an amplitude in the vibrations of the molecules of the air not more than 0·00004 mm. at the ear. These calculations indicate that the motions in the cochlea must be astonishingly minute—far too minute to be observed even by the microscope.

NOTE OR TONE DEAFNESS.

When discussing the appreciation of small differences of pitch the influence of vocal and instrumental training in producing keenness of perception was apparent. But very good results were in some cases obtained where this kind of experience had not been great, and these afforded

examples of naturally fine ears. But the opposite condition of obtuseness to differences in pitch is also a familiar one. Almost every musical person, especially when in such a musically mixed society as a church congregation, is painfully aware now and then of the presence of some one who sings out of tune. Such people sing literally in such a monotonous way that one is forced to believe there must be something like tone or note-deafness analogous to colour-blindness.

The writer's observations with the instrument described on page 48 show that a large number of these tested were unable to distinguish the difference of pitch between two notes, one of which was $\frac{1}{8}$ or $\frac{1}{6}$, or even a $\frac{1}{3}$, of a semitone higher than the other. One observer said he required an interval of a whole semitone before any difference was apparent to him, and his replies to the tests given supported his statement. Mr. W. H. Cole states that he had at one time a pupil who, after three months' teaching, was unable to distinguish the difference between C and D on the violin. Mr. Schofield, the organist of Camphill Church, has had a similar experience with a piano pupil. A very remarkable case of note-deafness is recorded by Mr. Grant Allen.[1] The case is one of a gentleman of 30 years of age, well educated and capable of understanding and discussing psycho-physiological questions. This subject could not make out the difference between any two adjacent notes on the piano. He could make no distinction between C and F or A. From C to C^1 or A^1 he began to hear some difference in pitch; he therefore noticed the difference in pitch when the interval was extremely great, but not when it consisted of only a few notes. His power of appreciation was not the same for all octaves. In the middle octave he was able dimly to discriminate between notes having the interval of a third from each other, in the octave above the middle his best perception was a third, and a fifth, or a fourth, while at the highest and lowest octaves it needed a full seventh. His attempts at singing were

[1] Grant Allen, *Mind*, 1878 (p. 157).

failures: he sang "God Save the Queen" with hardly a single note correct. Discords had no unpleasantness for him, natural intervals like the octave no special features for him. His hearing was in other respects acute; he heard shrill and low notes well when tested. He recognized some tunes, but apparently by volume of sound and time alone. His father was quite unmusical, but not note-deaf; his mother was fond of music; his sisters were more or less musical, but in one the meatus was congenitally closed by a membrane. The musical bias of the family was on the whole unpronounced.

But this remarkable person was not altogether devoid of appreciation of the character of musical sounds. He distinctly appreciated the beauty of a single note, and liked the sound of a full rich tone such as that produced by the striking of a finger glass, and he was fond of church bells and chimes. He had a delicate ear for the metre of poetry. But he suffered great ennui when compelled to sit through a musical performance of two or three hours. On the other hand, when engaged in mental work he was not distracted by the performance of a brass band or a barrel-organ. Unless his attention was specially called to these, he was quite unconscious of their presence. He recognized what was lively, gay, tender, or majestic by the time and volume of sound, but could not recognize those minor changes of feeling which are exhibited within the limits of a uniform composition.

Mr. Allen thinks these cases are not uncommon, and Mr. Geo. T. Ladd[1] thinks persons insensible to differences of a tone and a tone and a half are not unfrequently met with. The writer has looked about a good deal for such cases, and has found none so extreme as that recorded by Mr. Allen, or even as those referred to by Mr. Ladd. Many of those who are said not to know one note from another rapidly improve under training. But such cases as that of the very unusual one recorded by Mr. Allen, and that reported by Mr. Cole, prove that a condition of tone- or note-deafness may exist.

[1] *Physiological Psychology.*

In connection with this subject Dr. M'Kendrick[1] tested ten such so-called non-musical persons—persons whom he describes as not knowing one melody from another, or who, on hearing the melody repeated, at last come to know it, yet lose it when the parts are added. He used the overtone apparatus of Appunn. He found that in all cases overtones were more or less perceived. He concludes as follows:—"The only difference I have noticed between musical persons and non-musical is that the musical hear tones of low intensity, such as the higher overtones, quickly and apparently without difficulty, whereas a person who is non-musical hears the lower overtones, but he cannot hear the upper at all, even with the aid of a resonator."

SUMMARY.

I. Notes produced by 15 or 16 vibrations per second are the lowest which can be heard by the human ear. The difficulty of producing vibrations of sufficient amplitude to make such notes heard is great, but it is probable that sounds caused by a smaller number of vibrations are perceived as separate impulses and not as true musical sounds. Many ears cannot hear notes caused by less than 24 vibrations.

II. The most powerful very high notes are produced by very small tuning forks, and by them a vibration number of over 40,000 has been heard by Dr. Preyer and a few other observers. Other and more convenient means for producing very high notes are Mr. Galton's whistle and the small open pipes described in this chapter. These tests show that most ears can hear nothing when the vibration frequency is over 30,000 per second. Many are deaf to notes produced by more than 20,000, and some to notes of 15,000 vibrations; in a few cases deafness to notes of 5,200 or 5,500 vibrations has been recorded. As age advances appreciation for high notes diminishes.

[1] "Note on the Perception of Musical Sounds," by J. G. M'Kendrick (*Proceed. Royal Soc., Edin.*, 1873-74).

III. The least observable difference in pitch is for untrained or slightly trained ears difficult to state, but (exclusive of cases of tone-deafness) it may be put down as from $\frac{1}{6}$ to $\frac{1}{40}$ semitone. The ears of such trained musicians as violinists, tuners, and some pianists, can perceive with certainty a difference of $\frac{1}{64}$ to $\frac{1}{80}$ semitone. All observers, but especially the untrained, detect sharpened better than flattened intervals.

IV. No quite satisfactory and at the same time convenient test has yet been found for the distance at which a sound of constant intensity can be heard. Politzer's acoumeter is the best and most convenient test, and is heard by normal ears in almost perfect stillness at a distance of 15 or 16 metres.

V. Cases of tone- or note-deafness (deafness to intervals of a whole tone or more) are very rare, but some well authenticated instances have been recorded.

CHAPTER III.

THE HEARING POWER IN DEAF MUTES.

Deafness is almost always relative. A man may be deaf to the tick of his watch but hear conversation; or he may hear nothing of conversation and hear a church bell, or a clap of thunder. Most of us have a little hearing power in reserve, a little to spare. We may become "dull" to a slight extent, and if the dulness be not accompanied by any painful symptom we may be ignorant of its existence till some accident occurs to reveal it to us. Then we find that the watch is not heard at the full distance; but as long as we can get along without difficulty in business, or in the parlour, or at church, we do not call ourselves deaf.

Moderate degrees of deafness are always measurable. The watch and the various acoumeters enable us to state, with regard to at least one sound of given quality and pitch, the hearing power in any case. A watch heard at 36 inches by a person with a sound ear may be heard at 6 inches by a person hard of hearing, and we are able to state that for that watch the person has lost 50 per cent. of his hearing, or that his hearing is ·5, or we may represent his hearing by the fraction $\frac{6}{36}$, always remembering that when thus represented by a vulgar fraction the case looks worse than it really is, for sound diminishes in intensity inversely as the square of the distance. The watch and the acoumeters are accurate as far as they go, but they do not go very far. A deaf person may not hear the watch at all, even in contact with his ear, and yet hear ordinary conversation

quite well, or he may hear the watch at several inches and have much difficulty with conversation. Then watches and acoumeters tell us nothing in the case of very deaf people; they are all unheard. So that, for the very deaf, we have no hearing tests, and, what is worse, we have no accurate nomenclature. When deafness is extreme in early life, or if great deafness be congenital, muteness accompanies it, and we begin to talk of the deaf and dumb. It is true that dumbness is a result of a certain degree of hardness of hearing, that amount of hardness of hearing which makes conversation difficult or impossible, but it is not a necessary result of such hardness. If such deafness occur in the adult he will never forget the art of speech, and will never be a deaf mute. If it occur in the child he may be taught by the oral system, and although stone-deaf he may speak well. So that the term deaf mute does not express any degree of deafness; it never had a very definite meaning, and the oral system has robbed it of some of the meaning it once had. And yet there is a degree of hardness of hearing which makes the acquisition of speech difficult or impossible by the ordinary methods, and which usually results in the loss of recently acquired speech. Such is deaf mutism, the definition of which has been given in the Introduction to this work.

No acoumeter for this degree of deafness has been devised, and perhaps such an instrument, if invented, would not be of much value. The important query about the very deaf is: Can he distinguish the various sounds of the human voice? If he cannot, he will never speak unless he can make his eyes do duty for his dull ears. If he can do this, even with difficulty, you may confer on him, or preserve for him, the gift of articulate speech.

In testing the hearing of the very deaf, the victims of surdism, many instruments have been used, and the human voice has almost always been employed. Among instruments—watches, clocks, tuning forks, and bells may be mentioned.

Toynbee[1] classed deaf mutes under seven different heads.

[1] Toynbee, *Diseases of the Ear*, 1860 (p. 409).

He examined 411 cases, of which 245 were totally deaf. The remainder were thus classed:

Clapping of hands heard by	14
Loud shouting close to the ear by	51
Loud voice close to ear heard by	50
Could distinguish and repeat vowels,	44
Could repeat short words,	6
Could repeat short sentences,	1
	166

Amongst these 411 were 313 born deaf, of whom 141 heard certain sounds. Of the remaining 98 with acquired deafness, 73 were deaf, and 25 heard certain tones.

Kramer examined 45 deaf mutes and classed them thus:

	Congenital.	Acquired.
Completely deaf,	10	13
Uncertain hearing for sound,	5	3
Uncertain hearing for vowels,	7	1
Distinct hearing for vowels,	2	—
Distinct hearing for all words they have been taught,	2	1
Distinct hearing for many words not known to them,	1	—
	27	18

Hartmann[1] examined 204 deaf mutes at the Berlin Institution, and classed them thus:

	Congenital.	Acquired.	Uncertain.
Words heard,	4	12	—
Vowels heard,	6	12	—
Sounds heard,	17	39	1
Totally deaf,	24	86	3
	51	149	4

Hartmann classes Toynbee's and Kramer's examinations and those at the two Baden Institutions of Meersburg and Gerlachsheim along with his own, and concludes as follows:

"More than one half (60·2 per cent.) of all deaf mutes

[1] Hartmann, *Deaf Mutism*, 1880.

are totally deaf. A fourth have hearing for sounds, a seventh hear vowels and words. The difference in the hearing power of congenital deaf mutes, and of those who have acquired deafness, shows itself principally in the fact that, amongst the latter class the cases of total deafness are far more numerous (68·4 per cent.) than amongst the former (44·2 per cent.)."

De Rossi of Rome examined the hearing of deaf mutes by speech (through the speaking-tube), and with the tuning fork (vibrating in the air and on the cranial bones), and with Helmholtz's resonators. He thus tested 70 cases, and states the result as follows:

Speech heard by - - - - - - -	27
Watch heard by - - - - - - -	4
Tuning fork vibrating in air heard by - - -	39
	70

In contact with the cranial bones, the tuning fork was perceived by almost all the deaf mutes, and there were only 11 who had no perception. He found only 3 cases of total deafness. More recently (in 1884) St. John Roosa of New York examined 147 deaf mutes. In 1867[1] he and Dr. George Beard examined 296 cases. The latter set of cases gave but meagre results according to Roosa, the former were examined chiefly for the purpose of ascertaining the locality of the lesion causing the deafness. Roosa used the tuning fork alone in his tests.

Dr. Barr of Glasgow tested the hearing of the adult deaf in the following way. At a lecture which he delivered some years ago to 150 deaf mutes, a light was applied to a mixture of oxygen and hydrogen, producing a very loud, sharp report. Before this was done all who should hear it were requested to stand up. Fully two-thirds of the deaf mutes stood with great manifestations of joy, those who sat looking very crestfallen. Those who had not heard were then asked to come to the platform close to the seat of the experiment, which was then repeated. About a half of this number were then seized

[1] *American Journal of Medical Sciences*, 1867.

with paroxysms of joyful excitement whilst the remainder heard nothing. This would give about 25 totally deaf in 150, or about 17 per cent.[1]

Dr. Robertson[2] of Newcastle examined the children at the Northern Counties Institution for the Deaf and Dumb. He found 50 per cent. of the congenital and 60 per cent. of the acquired cases totally deaf. The total number examined was 114, and only 2 could hear words. In adults, of which he examined 56, he found the proportion almost reversed, 62 per cent. of the congenital cases being totally deaf and 55 per cent. of the acquired cases. The tests used were a whistle, the voice, and tuning forks.

Mr. W. H. Harsant of Bristol has recently examined the children in the Bristol Institution. A paper on the result was down on the list to be read at the meeting of the British Medical Association held at Bristol in 1894, but was crushed out, and Mr. Harsant has handed his figures for insertion in this work. In all, 45 children were tested and 27, or 60 per cent., could hear nothing.

In testing the children at the Glasgow Institution the writer used a large bell, a large tuning fork, Politzer's acoumeter, and the human voice. Of these, the last is the most valuable test, and where the classification of deaf mutes for teaching purposes is the object in view, is almost the only test worth using. When testing with the voice, precautions must be taken against lip-reading. All very deaf people lip-read to some extent, and some, even when untaught, lip-read to a very great extent. The test words or vowels were pronounced either behind the child's back, or his eyes were covered with the hand. Next in importance come the bell and fork. For determining the presence or absence of aërial hearing the bell is the best test. Where any doubt on the point existed the child was made to count the strokes which were delivered singly and at short

[1] Dr. Barr related the experiment at a meeting of the Glasgow Medico-Chirurgical Society, when the author read a paper on "The Hearing Power of Deaf Mutes."

[2] Robertson, *Lancet*, September 8th, 1894.

intervals. Here too the eyes were covered during the test. The bell used was a large dinner-bell with a spring tongue attached at the junction of the handle and the bell, and so arranged that a violent shake produced a sound of great intensity. A little practice enables the operator to produce sounds of very uniform loudness. In the open air, at the Queen's Park, near Glasgow, the bell could be heard at a distance of nearly 1000 yards (see Fig. 9).

The tuning fork is a large one about ten inches long, including the handle, and giving a note due to a vibration number of 330 per second. Although a powerful fork, it takes a good ear to hear it across an ordinary room by aërial conduction; and yet instances were found of deaf mutes who heard this fork at several inches from the ear, and who could not be made to hear the loudest strokes of the bell. But the fork is most useful for testing bone-conduction, and thus indicating the situation of the lesion causing the deafness. Although this is the special value of the tuning fork, its usefulness is very limited. In very deaf people, when the handle is placed on the forehead, or over the mastoid, the mechanical vibration communicated to the skull is often mistaken for sound, and unless the deaf mute be very intelligent and well-educated, one cannot be sure that he has heard the sound. He may only have felt the tremor. It requires a deaf mute of more than the average intelligence to appreciate the tapering off and cessation of a sound produced during a bone-conduction experiment, or to compare the results of experiments on his two ears.

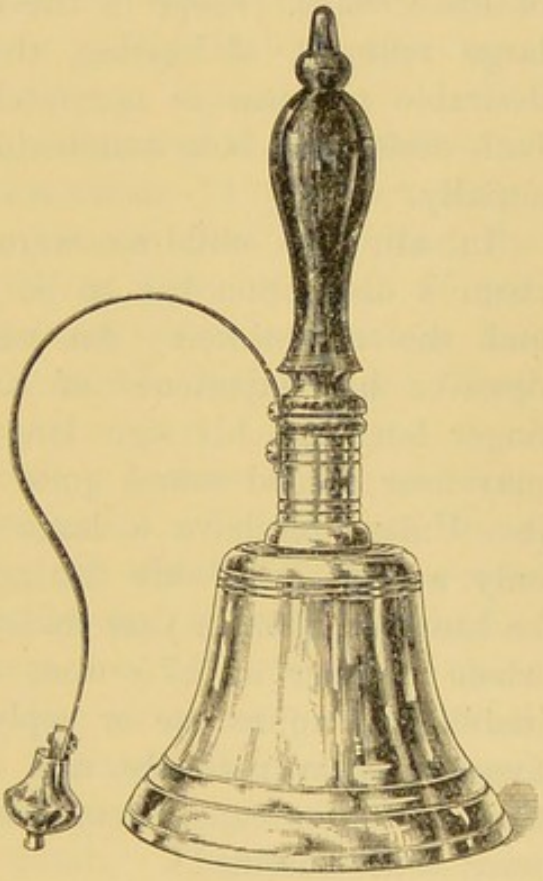


FIG. 9.—BELL FOR TESTING HEARING OF DEAF MUTES.

These difficulties, and the fact that the lesion is probably in many cases one which affects both internal and middle ears, render an exact diagnosis of its seat very difficult, and possible only in a minority of cases. The presence or absence of bone-conducting hearing can generally be ascertained, but the amount of it is not usually measurable.

The acoumeter is the least important of the test instruments. The author used it in his first hundred cases, mostly educated deaf mutes, and then gave it up as being of little value, except in the case of the semi-deaf with a large remnant of hearing, the amount of which it was desirable to measure accurately. He used it in testing both aërial and bone-conduction hearing. Twelve heard it aërially.

In all, 175 children were examined. In classifying them a distinction has to be made between the educated and the uneducated. An uneducated deaf mute cannot describe his experience of a test like this; he has no finger language, his sign language is of the vaguest; he may hear a loud sound quite well, but he cannot imitate it. Unless he have a large residue of hearing and be only a semi-mute,[1] his testing cannot be relied on until he has been about a year under tuition. Forty-nine of the whole number of 175 were thus disqualified because of inability to appreciate or reply to the tests. Three were found to hear perfectly, and to have their muteness due to some other cause than deafness. The remaining 123 were thus classified:

I. Stone deaf—hearing neither the bell nor the loudest shouting, nor the tuning fork sounding in the air,	9
II. Could hear and more or less distinguish the loudest sounds, *e.g.* the voice from the bell,	81
III. Could hear and distinguish the sounds of the human voice,	33
	123

[1] In the above, the term semi-mute is to be taken as meaning those whose remaining speech depends on their remaining hearing.

These latter 33 were found to consist of 20 who could hear and distinguish vowels only, and 13 who could hear and distinguish vowels, consonants, and some words.

Fourteen were quite deaf to the bell. Of these 5 heard the fork by aërial conduction, leaving 9 totally deaf.

Further, of the whole number (123), 80 heard the fork by aërial conduction, and 43 did not. The fork was appreciated by bone-conduction in almost every case, even where no aërial sound was heard. If this sensation were always hearing, and not mere tremor, the number of deaf mutes who have no hearing would be very small indeed, but I have included as totally deaf all that have no aërial hearing.

From the above it will be inferred that the number of totally deaf is very small (sometimes 7½ per cent. only) amongst deaf mutes. In the second class are found the bulk of deaf-mute children (81 in 123, or about 65 per cent.). These hear and distinguish very loud noises, but cannot differentiate the various sounds of the voice. They are practically quite deaf.

The third class contains over a quarter of the children (33 in 123, or about 27 per cent.). Thirteen of these children would hear something of what their fellow-men say to them, if the latter would say it loudly and distinctly enough; that is perhaps too much to expect from the world. But they are seldom or never properly dealt with. Remember that these thirteen children can hear, distinguish, and repeat without lip-reading, consonants and some words. They are not dumb. They are sent to our deaf-mute institutions, and the author has the strongest proof that most of these children become much deafer, and very soon quite dumb. Nothing is done to stimulate their auditory apparatus, and it gradually falls asleep, never again to wake. The proof he refers to is this: The 13 children are drawn from all ages in the institu-

They are better called semi-deaf. The term semi-mute is sometimes applied to a different set of cases: those whose remaining speech is entirely a recollection of what they once heard, although they may now be stone deaf. Teachers use the term semi-mute in this sense.

tion, but not equally so. Ten were found among the 75 children admitted during the last two years. Only 3 existed amongst the 100 children admitted before that period. Nearly two years[1] previously he had evidence of quite a different sort, pointing in the same direction. When first going over the children, he found several quite deaf to consonants and words, and even to vowels, who were described in the schedule report as having, at the date of admission, a good deal of hearing and a little speech. The schedule is usually filled up under the supervision of a medical man, and is usually correct. The conclusion is inevitable. Semi-mutes become deafer and totally mute, because no effort is made to preserve and develop their remaining hearing. When we come to speak of treatment of deaf mutism we shall see that this is not as it should be. Either these children should never enter an institution for the deaf and dumb, or special classes should be made for them, and teaching by the aural or acoustic method adopted. To teach them the finger method is to consign them to a world of silence. The oral method does not meet the case either. It may accustom the child to hear his own voice by bone-conduction, but it does very little to preserve his hearing for the sounds of the world around him. If the remaining hearing is to be preserved and developed, the stimulus must reach the auditory nerve by the ordinary channel, and the stimulus must consist of the distinctly articulated words of a teacher, and not merely of the imperfect imitations of the pupil himself.

Anticipating the subject of the causes of deaf mutism, it may here be noticed, that of the 9 totally deaf, 7 were born deaf, and 2 were born hearing (as reported in the schedules). Of the 33 who distinguished voice sounds, 8 are said to have been born deaf, 20 born hearing, and regarding the remaining 5 doubt is expressed or information is not given.

The author has tested the hearing of over 50 deaf-mute children since he compiled the figures which have been

[1] J. Kerr Love, *Archives of Otology*, Vol. XXII., No. 2, 1893.

quoted in connection with the Glasgow Institution, but hesitates to add them to those already given, as these children were all present for the first or second year at school, and were for the most part without the means of expressing their appreciation or non-appreciation of the meaning of the tests applied. He has, however, lately (June, 1895) revised his results got from the older children. When the children were being weighed, measured, etc., in connection with the inquiry into the physical characters of deaf mutes, the oldest 43 of the boys—aged from 9 to 16 years—had their hearing re-tested. The bell was used. Thirty-three heard and *counted correctly* the strokes delivered behind the back at such a distance that no draught could be felt. Eight heard nothing. Regarding two the result was doubtful, mistakes in counting occurring, although the boys asserted that the sound was heard. At the former testing, 14 in 123 were found quite deaf to the bell. The results, therefore, on the two occasions correspond so closely that they may be taken as correct. The difference between the results obtained by the present writer and many others is very marked, and may be due to two causes:

1. He has rejected all cases where extreme youth, want of education, or other cause appears to hinder the subject from appreciating what perhaps he hears quite well. Some of these cases may be stone-deaf, but they are not all, or even most of them, necessarily so.

2. Observers use different tests. A bell appears, on the whole, the best test for the presence of hearing in the very deaf. A whistle is usually too shrill, and deafness for high notes is common along with hearing for sounds of moderate pitch. The voice is the only test worth using when the question of hearing available for teaching purposes is concerned. It matters nothing what shrill or loud sounds a deaf mute hears if he is quite deaf to the human voice. But as a test for the presence of hearing, such a bell as is here figured, with an arrangement for getting a single stroke of pretty uniform intensity, is convenient. The length of the bell to the handle top is 11½ inches. Its weight is 38 ounces. (See Fig. 9.)

Comparing these results with those of other observers, the author finds himself in accord with De Rossi in regard to the main points raised.

1. Total deafness is not common amongst deaf mutes. To aërial sounds not more than 15 or 20 per cent. are quite deaf, sometimes only 7 or 8 per cent.; to bone-conduction sounds even a smaller number.

2. Hearing for speech is pretty common. It exists to a useful extent in 25 or 27 per cent. of deaf mutes, and from 10 to 15 per cent. are only semi-deaf. Under the finger system of teaching these become rapidly deafer, and soon totally dumb. The oral system may do something to prevent this, but it can only be properly dealt with by the acoustic method (see Chap. VII., "Treatment").

3. Cranial conduction exists in almost all cases, and a large vibrating tuning fork is almost always heard in this way. It is also heard in the majority of cases by aërial conduction. In a small number of cases such sounds as those of a watch or Politzer's acoumeter can be heard. On the other hand, the author is much at variance with Toynbee and Hartmann, who found most deaf mutes totally deaf. Hartmann's further statement, that total deafness is commoner in acquired than congenital deafness, does not coincide with his experience. Most of those examined by him and found to have hearing for vowels, consonants, and words, were cases of acquired deafness. Only two of his nine cases of total deafness were said to have been born hearing.

CHAPTER IV.

CONGENITAL DEAFNESS.

Much difference of opinion exists about the relative extents of congenital and acquired deafness. This is well illustrated by Scott,[1] who writes as follows: "In a circular issued from the Dublin Institution, it is stated that in 489 deaf children, 423 were born so, the remaining 66 losing their hearing from various accidents and diseases. In the Thirteenth Report of the Hartford (America) Asylum, it is said that out of 279 pupils, 117 were born deaf, 135 lost their hearing in infancy, and 28 were doubtful." Statements differing so widely suggest a mistake somewhere.

Hartmann's[2] illustrations on this point are quite as striking. "According to the Irish statistics there are 4010 cases of deaf-dumbness (congenital) amongst 4930 deaf mutes. In Schmalz's compilation there are 3665 cases of congenital deafness and 1760 of acquired deafness in a total of 5425." Hartmann states, however, that more recent statistics have shown a preponderance of acquired deaf mutism. These figures, like the last given, are taken from German institutions, and show a total of 2658 deaf mutes, with 1285 congenital, and 1359 acquired cases. Hartmann thinks that, on the whole, a little more than one half of the deaf mutes have been born deaf, while the other half have acquired the defect by disease.

[1] W. R. Scott, *The Deaf and Dumb*, 1870, p. 28.

[2] Hartmann, *Deaf Mutism*: translated by Cassels, 1881.

Writing, in 1835, Kramer[1] says: "Amongst the causes which act so perniciously on the organ of hearing during early life, that the development of the faculty of speech does not take place in the usual way, original defects of conformation stand pre-eminent."

In contrast with this statement of Kramer's may be quoted a letter sent the author lately by Dr. C. M. Hobby, the President of the Otological section of the Pan-American Medical Congress of 1893: "I have been working in the same field for eight or nine years and have made personal examination of more than 500 mutes in institutions and outside. I go much further than Roosa in claiming that the actually congenital cases are not more than 15 per cent., and I believe that 10 per cent. better represents the rate (of course, this is for the United States). I know that of those I examined not more than 14 per cent. could have been congenital, and the possibility exists that a large portion of these cases acquired deafness during the first six months of life."

Roosa, above referred to, thinks that wherever personal examination by an expert is responsible for the figures, the acquired cases will be found more numerous than the congenital.

Taking two American institutions as typical of that country, the figures point strongly in the direction indicated above by Hobby and Roosa. The institutions are the American Asylum and the Illinois Institution. Referring to the former, Mr. Job Williams, the Principal,[2] says: "Since the last decennial Report 289 pupils have been admitted. In regard to these great pains have been taken to get reliable facts. Of these, 118, or nearly 41 per cent., were born deaf."

Mr. Philip Gillet,[2] the Superintendent of the Illinois Institution, shows that, out of 1886 pupils admitted during thirty-two years, only 490 were born deaf. This gives about 26 per cent.

[1] Kramer, *The Nature and Treatment of Diseases of the Ear*: translated by James Ridson Bennett, 1835.

[2] Alexander Graham Bell, *Facts and Opinions relating to the Deaf* (From America), p. 44. Spottiswood & Co. 1888.

The most extensive observations in connection with any one institution with which the writer is acquainted have lately been published, and are as follows:

In 2400 cases, assigned causes in the form of disease after birth are given in 1791 cases, leaving 609 congenital cases. This gives nearly 75 per cent. of cases of acquired deafness, and about 25 per cent. of congenital deafness.[1]

The details of Hartmann's recent statistics above referred to are as follows:

	Congenital.	Acquired.
Nassau,	228	153
Cologne,	143	151
Magdeburg,	284	230
15 Institutions of German-Austria,	471	483
Two Baden Institutions,	61	144
Rotterdam Institution,	53	58
Two Berlin Institutions,	45	140
	1285	1359

This gives, in Germany, a slight preponderance of acquired cases.

For reasons already stated, statistics regarding deaf mutism have often to be accepted with great caution. This is particularly true of census returns which are hardly of any value, except with regard to the total number of deaf mutes, and their distribution in the country they represent. The above figures, and those which follow, are chosen because they have been made up by experts in the examination, or the education, of the deaf. Turning from America to Britain, we shall begin with the Glasgow Institution, and it may here be well to examine the value of our sources of the information. In every case the parent or guardian of the child is brought in contact with an intelligent teacher who, by inquiry, can with tolerable certainty get at the truth as to the state of the child's hearing during its first year of life. Then the schedules, so far at least as they relate to the state

[1] *Thirty-Seventh Biennial Report of the Illinois Institution*, 1894.

of the ears and the general health of the child, are filled up and signed by a qualified medical practitioner. Errors sometimes occur, but there is no reason to believe that they always tend in one direction, or that they are ever great in any direction. A mother's word may generally be taken as to whether her child heard during its first year. Long before speech is expected, proof is given of the presence of hearing. A moderate noise will break a young child's sleep or make it start or look round, and if a mother is quite clear about these proofs of hearing, then mutism is due to disease happening after the age of six months, and the deafness is not congenital. The difficulty of ascertaining the presence of hearing in early life has been exaggerated. A disease may occur during the early months of life with striking symptoms, and may be supposed to account for an already existing deafness. On the other hand, acquired deafness may come on insidiously during early infancy and give the impression of its being congenital. The writer agrees with Hartmann in thinking that these two sides of the calculation pretty nearly balance one another, and he believes that with care the schedules of our institutions may be made to tell the truth. With this view, he has gone carefully into the schedules of the children admitted in the Glasgow Institution during the past ten years—about 250 in all—and has compared each report with the actual examination of the child's ears. The results show that congenital and acquired cases do not always bear the same ratio one to the other. Over the whole period acquired cases account for 54 or 55 per cent. of the admissions; during 1891-92 they accounted for over 65 per cent. During the earlier period—1885-90—the congenital and acquired cases nearly equal each other. A statement of the condition of this question in Glasgow is given in the Sixty-second Report (1883). As it is carefully detailed and comes up almost to the beginning of the period dealt with by the present writer, it may be quoted here. At that time 142 children were at the school, or, at least, are embraced in the statistics, which evidently dealt with recent admissions only. Of these

79 were born deaf and 63 had acquired deafness. This gives a percentage of 55 for congenital cases.

The above figures lead us to conclude that during the latter half of this century in the West of Scotland congenital and post-natal causes are about equally important in the production of deaf mutism. Within the last ten years acquired deafness has preponderated, and at the present time tends to do so. Earlier in the century however the opposite held good. In the 1865 Report it is stated that of 581 pupils who at that time had attended the institution 447 were congenital cases. It should however be stated that these are evidently less accurate than the more modern figures. Not only are the causes of acquired deafness less carefully stated, but in nearly half the cases the cause is not stated at all. This statement with regard to Scotland is well borne out by the return from the Edinburgh schools. At Donaldson's Hospital 56 per cent. are said to be deaf born, and at the Edinburgh Institution 65 per cent. The average of the three institutions is about 60 per cent. born deaf.

In England great variety exists in the returns, which are tabulated below.

Percentage of deaf-born children in English schools:

Leeds,	39	Swansea,	58
Preston (Cross),	47	Birmingham,	59
Sheffield,	52	Hull,	63
Exeter,	53	Bristol,	66
Liverpool,	56	Brighton,	70
Newcastle,	57	Doncaster,	71
Manchester,	58	Margate,	74
Ealing,	58	Fitzroy Square,	86

This gives an average of 60 per cent. born deaf. There is therefore no reason to suppose that in England the proportions of congenital and acquired cases are radically different from those in Scotland. The above figures are taken from a return sent in by the head masters of English and Scottish schools in reply to a circular signed by the authors of this work (see page 8).

THE TRANSMISSION OF CONGENITAL DEAFNESS.

In 1835 Kramer[1] stated that no instance of deaf-mute parents producing deaf-mute offspring had been recorded. Sedgwick considered this so rare that deaf mutism could not be regarded as hereditary in the ordinary sense of the word.

Even amongst later authors Lent (quoted by Mygind) is of opinion that deaf mutism cannot be considered to be hereditary. Mygind[2] gives but a weak adhesion to the theory that deaf mutism is hereditary. He considers hereditary influences to be of great importance in deaf mutism caused by congenital deafness, although congenital deafness is seldom transmitted directly.

Hartmann[3] thinks congenital deafness hereditary, but only quotes one case in which he found it so. "In the course of my investigations in the institutions of Berlin I have come across two families in which both fathers and mothers are deaf mute. In one of the families both parents were deaf from birth; besides that, the mother of the wife was born deaf. They had five children—four deaf-mute girls, and one boy with perfect senses." In the other case, the deafness in both parents was acquired.

The records of any large institution, if carefully sifted, will illustrate the heredity of deafness. Every degree and phase of the tendency will be met with.

In the two lists which follow, and which are taken chiefly from the records of the Glasgow Institution, a contrast is noticed. In the earlier list only one case of deaf-mute offspring from deaf-mute parents occurs. In the later list, dealing with a smaller number of cases (233, to 440 in the earlier), three cases, in which both parents are congenitally deaf, produce deaf offspring. These three marriages produce five congenital deaf mutes in a total of eleven children; and, in addition, one child so deaf that he is almost mute. The second list also contains three similar instances in Glasgow outside the institution.

[1] Kramer, *Diseases of the Ear*, 1835. [2] H. Mygind, *Deaf Mutism*, 1894.
[3] Hartmann, *Deaf Mutism*, 1880.

Taking heredity as the transmission of the characters—expressed or latent—of the parent to the offspring, we shall see what evidence exists of the transmission of this peculiarity.

List I. embraces the period 1819 to 1853, when 440 pupils had been admitted to the institution. It was drawn up by Mr. Duncan Anderson, the Principal, at the latter date. List II. may be taken to represent the period from 1885 to 1895, and was drawn up by the author. The lists are given not because they are unique, but because they are complete.

List I. (1819-1853.)

1. A boy has a maternal cousin.
2. Two sisters have had a maternal cousin.
3. Two sisters have had five maternal cousins.
4. Two brothers and a sister have had two maternal cousins.
5. A brother and a sister have had a maternal cousin.
6. Two brothers and a sister—one of the brothers marrying a deaf mute, has left three children, two of whom are deaf mutes.
7. A girl has had a paternal aunt.
8. A boy had a paternal cousin.
9. A boy had a paternal uncle and aunt.
10. A girl had two paternal uncles.
11. Three brothers had a paternal grandfather.
12. A brother and a sister, whose father was deaf and dumb, and for many years blind, have had two cousins.
13. Two sisters have had a nephew, a maternal uncle, grandfather, and half-cousin. The nephew is the son of a hearing sister, who married a hearing man. One of the sisters married a deaf mute, and had a child who hears.

(In 12 and 13 all the mutes are of weak or poor intellect; in 9 the boy is of poor intellect. Some of the adults are described as uneducated, but all the others in the list are described as of average or good intellect.)

14. In the 1839 Report of the institution there is a case of eight deaf mutes in a family of nine.

15. In the 1865 Report a case is given with seven deaf mutes in one family.

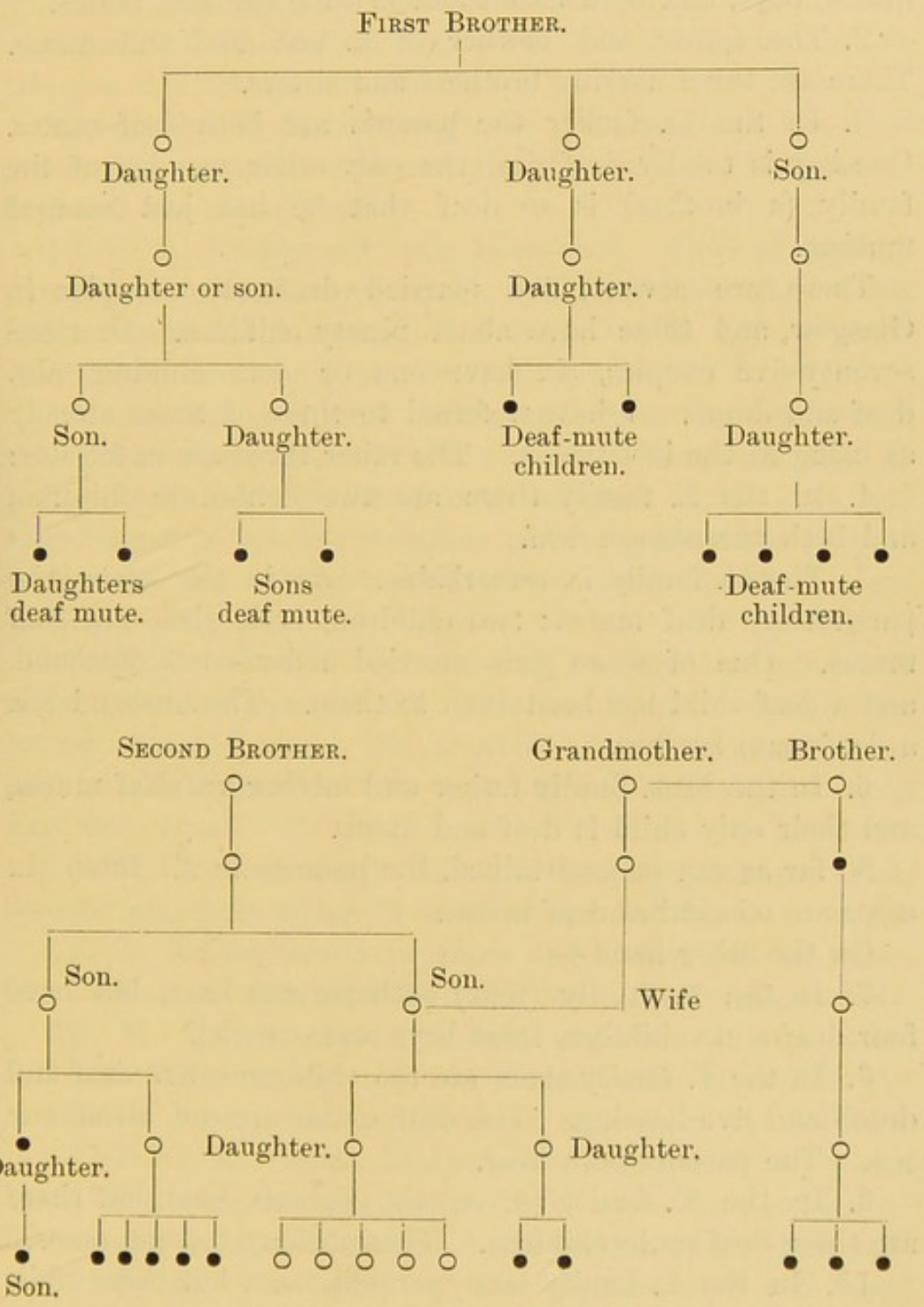
The Glasgow Family.

16. A progenitor had two hearing daughters, by one of whom he had two great-great-granddaughters deaf and dumb, the daughters of a hearing great-grandson; and two deaf and dumb great-great-grandsons, the children of a hearing great-granddaughter. By the other daughter he had two great-grandchildren deaf and dumb, the children of a hearing granddaughter. He had also by a hearing son four deaf and dumb great-great-grandchildren, the children of a hearing great-granddaughter. A brother of the progenitor has had by two hearing grandsons, eight deaf and dumb great-great-grandchildren and one great-granddaughter, who is the mother of one of the great-great-grandchildren. One of the grandsons had two hearing daughters who married. One of them had five children, and the other two deaf and dumb children. The grandmother of this grandson's wife had a brother who had a deaf and dumb son and three deaf and dumb great-great-grandchildren descended from the deaf son, so that in this branch of the family deafness is hereditary on both father's and mother's side. The other grandson had a daughter deaf and dumb, who is the mother of a deaf son mentioned above. Nine of these mutes have been pupils at the Glasgow Institution, and have all been of very superior intellect.

In 1862 Dr. M'Call Anderson examined two deaf mutes who were admitted to the institution, and who were connected with the above family, though he could not find out the exact relationship—thus showing that this taint is still being transmitted from generation to generation. "And," continues Dr. Anderson, "I am informed that there are a number of other persons who are deaf and dumb and are likewise connected with this family, though their

cases have not been jotted down owing to the difficulty of getting correct information as to the precise relationship.[1]

THE GLASGOW FAMILY.



[1] T. M'Call Anderson, *Medical Times and Gazette*, 1863, p. 247.

List II. (1885-1895.)

(For the most part derived from children at present or in recent years pupils at the Glasgow Institution.)

1. In the T. family—five in all—there are three deaf mutes, boys, and both father and mother are deaf mutes.

2. The father and mother of S. are deaf and dumb. There are three hearing brothers and sisters.

3. In the D. family the parents are both deaf mutes. One boy is totally deaf, and the only other member of the family (a brother) is so deaf that he has just escaped mutism.

There are seventy-five married deaf-mute couples in Glasgow, and these have about ninety children. Of these seventy-five couples, six have one or more children also deaf and dumb. I have referred to three of these already as being in the institution. The other three are as follows:

4. In the E. family there are two deaf-mute children, and both parents are deaf.

5. The M. family is remarkable. As in the others, the parents are deaf mutes; two children, both girls, are deaf mutes. One of these girls married a deaf-mute husband, and a deaf child has been born to them. The husband has a deaf-mute brother.

6. In the M'A. family father and mother are deaf mutes, and their only child is deaf and dumb.

So far as can be ascertained, the parents in all these six cases are congenital deaf mutes.

On the other hand—

7. In the R. family (four) both parents hear, but have four deaf-mute children, three boys and one girl.

8. In the F. family there are ten children—five deaf and dumb and five hearing. The deaf mutes are not all of one sex. The parents both hear.

9. In the K. family (seven) the parents hear, but there are three deaf-mute children. These belong to both sexes.

10. In the L. family both parents hear, but three children are deaf and dumb. The family consists of seven children.

11. In the B. family the parents hear, the father is slightly deaf, and an ancestor was deaf. There are three deaf-mute children.

These are instances of families where several members are congenitally deaf, but where the parents both hear, and where all consanguinity between the parents is denied.

Outside the institution the two following instances in the Glasgow district may be added:

12. In the D. family—eight in all—there are six deaf mutes, one imbecile, and one healthy child. The parents hear and are not related.

13. J. S., Kilmarnock, was born deaf. He had healthy parents who heard and spoke. His mother died. His father married again, and the second wife had a deaf-mute child (not in Glasgow Institution).

14. Another case, this time drawn from the institution, shows how Case 13 may have come about. In the D. family there are two deaf-mute brothers, both born so; there are five hearing brothers and sisters; both parents hear, but the mother's father and three brothers were deaf and dumb.

15. M. D. is said to have lost hearing by tubercular disease of the ear at six months. I have classed her as an acquired case, but a slight doubt is thrown on this by the note that two grand-uncles had each a child deaf and dumb.

16. W. T. born deaf, but with hearing parents. Half brother and half sister of mother are deaf mutes.

17. A. K. has seven brothers and sisters, all of whom hear. Her parents hear, but she has a deaf-mute cousin.

18. M. R. has three brothers and sisters who hear; her parents hear, but she has a deaf-mute cousin in the institution; her state at birth is described as doubtful.

19. D. C. has seven brothers and sisters, all of whom hear; the parents hear; one child now dead was deaf mute, and a cousin of the boy's mother was born deaf.

20. J. M'L. was born deaf, and has one deaf and dumb brother in a family of six in all. Father and mother full cousins.

21. W. M'M. probably born deaf, with three others in the family who all hear. Father and mother cousins.

22. G. H. born deaf, with one brother with very defective hearing. Father's great grandmother was great-great-grandmother to boy's mother.

23. W. P. born hearing, having lost hearing at eight years from measles. Father and mother cousins.

24. In the G. family, two children, a brother and sister, in a family of six are deaf mutes. Both are called acquired cases, one due to constitutional disease, the other to meningitis. I refer to this as a case of multiple deafness, due probably to syphilis, and likely to give rise in the lay mind to an impression that the cases are congenital.

25. S. M'I. was born deaf, and another child was deaf mute and died at six years old.

26. In the M'E. family there are two deaf mutes, both at school at present. The other nine children all hear.

27. E. B. was born partially or totally deaf, has one deaf-mute brother.

28. M. P. has two grand-aunts, two aunts and two female cousins all named J. deaf and dumb.

29. E. C. was born deaf, and there is another deaf mute in the family. Of the total of seven children in this family four have died young.

At the Glasgow Institution, of 152 whose state at birth could be ascertained with almost absolute certainty there were 78 acquired cases and 74 congenital cases. The 78 acquired cases were drawn from seventy-seven families; in other words, two cases occurred in only one family; the other deaf-mute brothers and sisters not at the institution raised this total to 82 deaf mutes in seventy-seven families, the total number of children in which was 469.

The 74 congenital cases were drawn from seventy families, in which, including children not at the institution, there were 109 deaf mutes in a total number of 385 children. Two cases occurred in seventeen families, 3 in three families, 4 in one, and 5 in one family.

The following points may be noted in connection with the above figures:

(*a*) The total number of children in the families represented by congenital deaf mutes is smaller than in those represented by acquired deafness, *i.e.* the former are less productive. In the "acquired" families the average membership is $6\frac{3}{5}$ children, in the congenital only $5\frac{1}{2}$.

(*b*) The percentage of deaf mutes is much higher amongst the "congenital" than amongst the "acquired" families, 82 in 469 in the latter to 109 in 385 in the former.

The above figures may leave the impression that deaf-mute unions are fertile because the average children per family, even where one or more members are congenitally defective, is by no means small. This impression would be incorrect, as the statement includes only the fertile families, and as most of the parents are hearing people, to estimate the fertility of deaf-mute unions we must look at all the marriages which take place between deaf mutes in any district. There are in and around Glasgow about 600 deaf and dumb adults. This is the estimate made by Mr. Henderson, of the Glasgow Mission to the Deaf and Dumb, who also informs the writer that there are seventy-five married deaf-mute couples in Glasgow, and these have about ninety children. Of these seventy-five married couples six have also one or more children also deaf and dumb. These figures point to a large number of sterile marriages.

The figures above quoted from the Glasgow Institution show that families into which congenital deafness comes are fairly fertile. The Ayrshire family to be noticed shortly is very fertile, but the deaf-mute branches are often sterile. The relative infertility of deaf mutes is perhaps due to various causes. More of them die at an early age! In the middle decades more of them become affected with insanity and other diseases inimical to life than is the case with hearing people. At least among the females their defect diminishes their chances of early marriage. We are therefore warranted in adding a third inference.

(*c*) Deaf-mute unions are not prolific and are often sterile altogether.

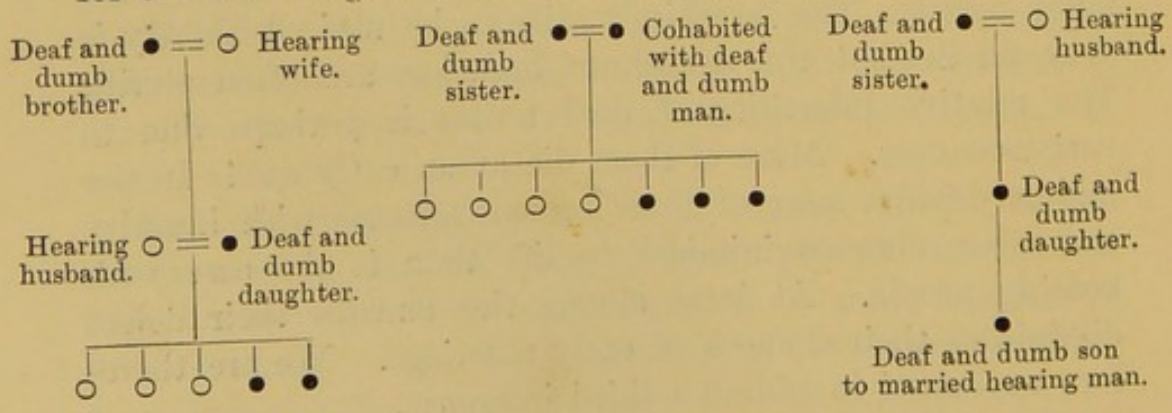
This fact, which the above figures show in connection with Glasgow, is well brought out for the rest of the United Kingdom by Mr. Howard's tables (see pp. 83-85).

Every institution in the land could supply evidence of this kind. In the *Forty-seventh Report* (1893-94) *of the Cambrian Institution*, under the heading "Statistical Notes," important information on various subjects is put down. In connection with the present subject the following table is given. The figures embrace the period 1847 to 1894.

1	family	had	5	deaf out of	6
1			5		11
1			4		8
1			4		10
1			4		9
3			3		5
1			3		6
2			3		7
1			3		8
2			3		9
1			3		15
1			2		2
3			2		3
4			2		4
2			2		5
4			2		6
2			2		7
3			2		9
34	families	had	54	deaf out of	130 children.

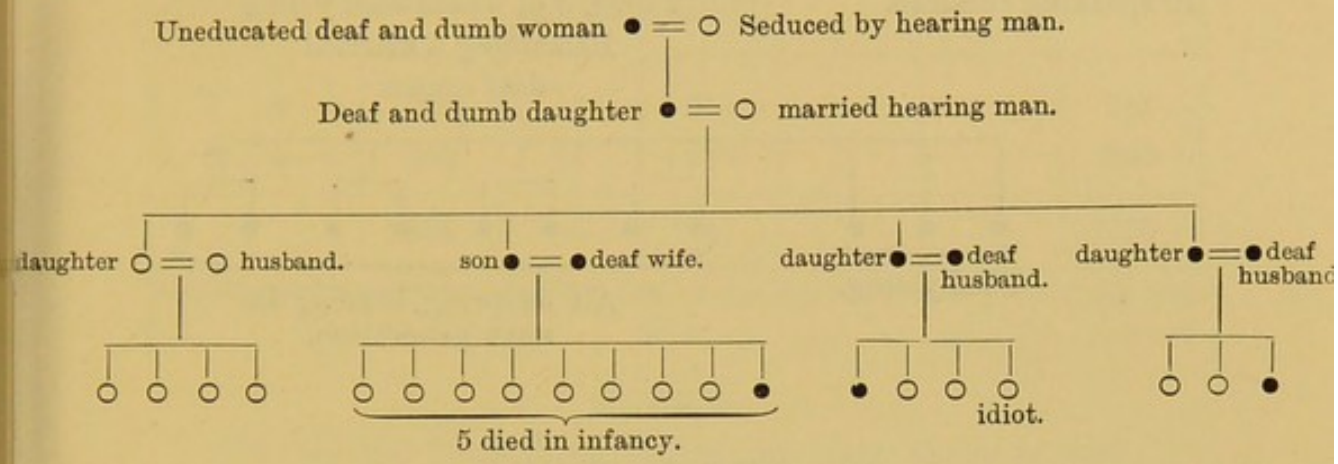
In almost all of them heredity may be assumed.

The writer is indebted to Mr. Townsend, the Principal of the Royal Institution for the Deaf and Dumb, Birmingham, for the following case which is worthy of publication.



Omitting the progenitors we have here in a total of fifteen children, eight deaf mutes.

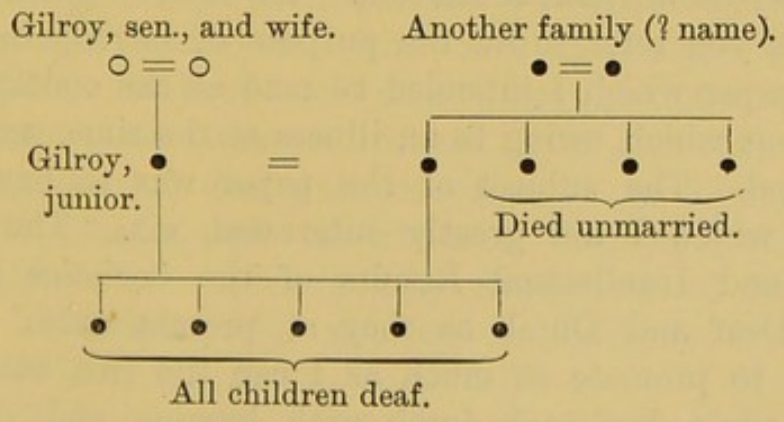
Mr. Stephenson, the Principal of the Sheffield Institution, sends us the following case:



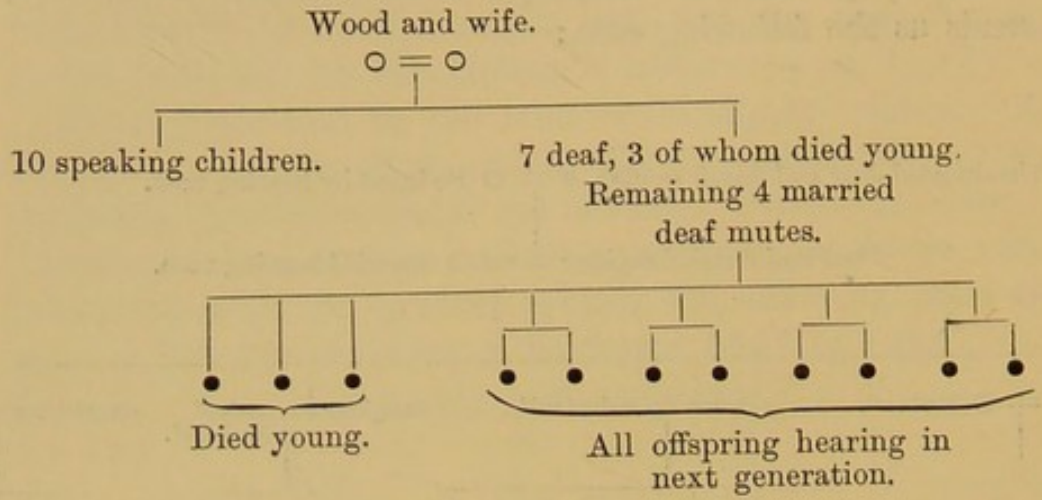
Mr. Simeon Kutner, of the Jews' Deaf and Dumb Home, sends the case of two children in his school, part of a family of six, all totally deaf. Both parents are also deaf mutes of such a low grade of education as to be unable to give any particulars of interest.

Mr. Howard, of Doncaster, sends the following cases:

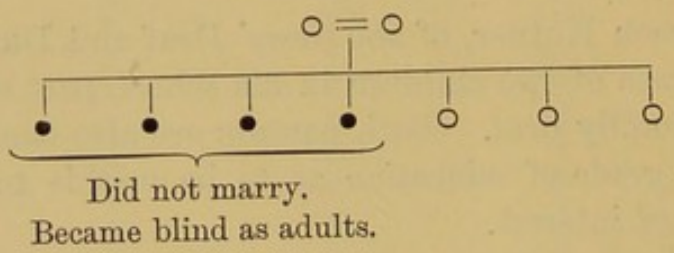
I. (HALIFAX DISTRICT) GILROY FAMILY.



II. (HALIFAX DISTRICT) WOOD FAMILY.



III. WILCOCK FAMILY.



Mr. Howard has investigated the question of the intermarriage of the deaf and dumb in the United Kingdom with great care. The statement drawn up by him is introduced on pp. 84-85 without alteration. He says, "I gathered the statistics you refer to for the purpose of introducing them into a paper which I intended to read at the conference of 1891, but which, owing to an illness at the time, was never completed. The subject of the paper was to have been one in which I am greatly interested, viz., 'The Social, Moral, and Intellectual Results of the Societies for the Adult Deaf and Dumb as they at present exist.' I am anxious to promote as much as I can the free association of the adult deaf and dumb with hearing and speaking people, rather than the isolation, as a class, which they seem themselves to prefer."

SUMMARY OF STATISTICS OF BRITISH INTERMARRIAGES OF DEAF MUTES (see pp. 84 and 85).

TABLE A.

● = deaf; ○ = hearing.

Class.	Parents.	No. of Families.	No. of Deaf Children.	No. of Hearing Children.			Total.
1	●—●	286	52	915			967
2	●—○	100	12	226			238
		386	64	1141			1205

Here the percentage of deaf children of ●—● parents would seem to be 5·3 per cent.
and „ „ ●—○ „ „ 5 per cent.

TABLE B.

The following Table shows how the percentages should be taken.

Class.	Parents.	No. of Families.	No. of Families with Deaf Children.	No. of Families without Deaf Children.	No. of Deaf Children.	No. of Hearing Children.	Total.
1	●—●	286	23	263	52	915	967
2	●—○	100	8	92	12	226	238
		386	31	355	64	1141	1205

The following are Mr. Howard's remarks on the summary:

"In Table B the twenty-three parents, both of whom are deaf and dumb and who have deaf-mute offspring, have almost without exception near relatives deaf and dumb, and these twenty-three are 8·04 per cent. of the whole number of deaf-mute couples (23 in 286); whilst the eight couples, one of whom is deaf and who have deaf children, are represented by 8 per cent. of the whole number of couples, one member of which is deaf mute (8 in 100)."

As further proving that the liability to have deaf progeny is sometimes greater when one parent only is deaf than when both are so, Mr. Howard points to the

STATISTICS ANENT INTERMARRIAGE OF THE DEAF AND DUMB OF THE UNITED KINGDOM.

DRAWN UP BY MR. HOWARD, OF THE DONCASTER INSTITUTION.

DISTRICT.	Adults.		Deaf and Dumb Couples.	No. of Children.	No. Deaf.	One of the Couples only deaf.	No. of Children.	No. Deaf.	REMARKS.
	M.	F.							
Information obtained 1887.									
ABERDEEN, - - - - -	23	19	8	31	3	1	10	...	
DERBY, - - - - -	69	47	11	23	1	7	7	1, 1 blind	
DUNDEE, - - - - -	46	31	11	28	9*	3	...	...	* Offspring of three families.
LOCHEE & BROUGHTY FERRY,	...	...	...	...	...	...	...	...	Lochee, etc.—Two deaf and dumb couples had each one child who died in infancy, eight deaf and dumb couples have all their children hearing, three deaf mutes with hearing wives have all children hearing, and three deaf and dumb couples have all their children deaf and dumb. Total hearing children, 19; deaf and dumb, 9.
EDINBURGH, - - - - -	112	88	30	110	11	11	37	6	This is a curious table. The deaf children are the offspring of parents who have other relations deaf; deaf children of deaf parents, 10 per cent.; whilst deaf children of parents, one of whom only is deaf, 16 per cent. *Eighteen couples have no children* (or 46 per cent. of whole married).
KILMARNOCK, - - -	29	21	10	22	...	4	...	...	
LEEDS, - - - - -	136	101	36	127	4	12	41	...	
STOCKTON, - - - - -	34	26	3	2†	...	6	21	...	† In one family.

Information obtained, 1889.									
BELFAST,	53	36	18	41	3‡	4	14	...	‡ All in one family.
BIRMINGHAM,	130	118	26	93	3	21	72	2	And two illegitimate.
BRADFORD,	38	35	13	49	2§	3	6	...	§ In one family.
GLAMORGAN,	32	32	7	15	...	3	13	...	
HALIFAX,	33	37	16	47	5*	...	...	...	* All in one family.
HANLEY,	78	65	14	39	5†	...	...	...	† All in one family.
LIVERPOOL,	225	175	59	242	...	19	8	1	Seven deaf and dumb couples have no children; eight ditto have 47 grandchildren, all hearing; twenty-three couples, one of whom has one or more relatives deaf and dumb; and seven couples have deaf relations on both sides.
MANCHESTER,	?	?	24	78	6‡	6	9	1	‡ Two families (4 and 2). The first, father has brothers deaf and dumb; the second, mother had four sisters and three brothers deaf and dumb.
LONDON (approximately),	About 1300.		?	13 Couples have Deaf and Dumb Children	About 40§	...	...	...	§ One case where there are eight deaf and dumb children in one family, mother is now a lunatic. In two other cases the affliction is found in three generations. In one case named, the mother of two deaf and dumb children lost both arms through a supposed syphilitic taint.

At the Margate Institution for the Deaf there are several pupils whose parents are deaf and dumb. As this is the London Asylum, it is probable that the numbers quoted may include many of these.

The following facts are known to the Head Master of the Deaf and Dumb Institution:—

NEWCASTLE.—(1) Two cousins had uncle deaf and dumb; they married and had three deaf and dumb sons and one deaf and dumb daughter. Their hearing daughter has two deaf and dumb children. (2) Deaf and dumb couple married, wife had deaf and dumb brother; offspring, five deaf and dumb and one hearing. (3) Deaf and dumb couple, all five children deaf. (4) Deaf and dumb man married deaf and dumb wife who had brother deaf and dumb; their only child is deaf. (5) Two deaf and dumb brothers, each married deaf and dumb wife. The family of one consists of two deaf and dumb children, and the other of four deaf and dumb children. (6) Man married wife dull of hearing; she had an aunt deaf and dumb. Result, five deaf and dumb children and three hearing. (7) Speaking brother of two deaf mutes only child deaf and dumb. (8) Hearing couple had two deaf and dumb daughters and one deaf and dumb son and one hearing; the last named has two deaf and dumb daughters. (9) Two cousins married, had three deaf and dumb children. One of these married a hearing man and their only child is deaf and dumb.

Edinburgh statistics, which show that where both parents are deaf 10 per cent. of the children were so, *i.e.* 11 in 110; when only one parent was deaf 16 per cent. were deaf amongst the children, *i.e.* 6 in 37. This, however, is exceptional. The 23 couples have 52 deaf children, or 2·26 where both are deaf; the 8 couples have 12 deaf-mute children, or 1·5 per family where only one parent is deaf mute.

In 1883 Mr. Graham Bell presented a memoir to the American National Academy of Sciences "upon the formation of a Deaf Variety of the Human Race." The theory itself will be discussed later on. In the meantime the figures on which it is built in as far as they are parallel with the above British statistics may be considered.

Dr. Turner in 1868 showed with regard to the American Asylum that in eighty-six families, where one parent was congenitally deaf mute one-tenth of the children were deaf, and in twenty-four families, where both parents were congenitally deaf, about a third were born deaf.

In 1854 Dr. Peet, of the New York Institution, made an inquiry into this subject. His conclusion was that about one in twenty have deaf-mute children where both parents are born deaf, and about one in 135 where only one is a deaf mute, and that the brothers and sisters of a deaf mute are about as liable to have deaf-mute children as the deaf mute himself, supposing each to marry into families that have, or each into families that have not shown a predisposition towards deaf-dumbness. This conclusion was based on figures drawn from both American and European institutions. British figures are hardly represented.

Mr. Bell's own figures are taken from the records of the Illinois Institution and the American Asylum.

At the former, when both parties were deaf mute, the percentage of deaf children per hundred families was 11·2, when one party was deaf mute it was 4·5.

At the American Asylum the percentages were actually reversed 9·8 with two deaf-mute parents, 10·1 when one

parent was a hearing person. Mr. Bell states that in most cases in his experience "where a deaf mute has married a hearing person, the hearing person belonged to a family containing deaf mutes."

That more deaf-mute children should be born into families where only one parent is congenitally deaf mute than into families where both are so is not what we would expect. When it does happen it is probably because the parents do not represent correctly the *tendency* to deafness in their respective families. For example, two hearing members representing families in which the tendency to hereditary deafness is strong will, if they marry, have a larger percentage of deaf progeny that two deaf persons representing families in which the tendency is less strongly marked. It is the family history extending through many generations, not the personal history of the parents, which must guide us when we estimate the chances of the occurrence of deafness in the offspring. This will receive further illustration shortly when we study the heredity of abnormality in general. It is brought up here to account for the apparent exceptions to what we have a right to expect. It receives immediate illustration in the following remarkable family tree.

The Ayrshire Family.

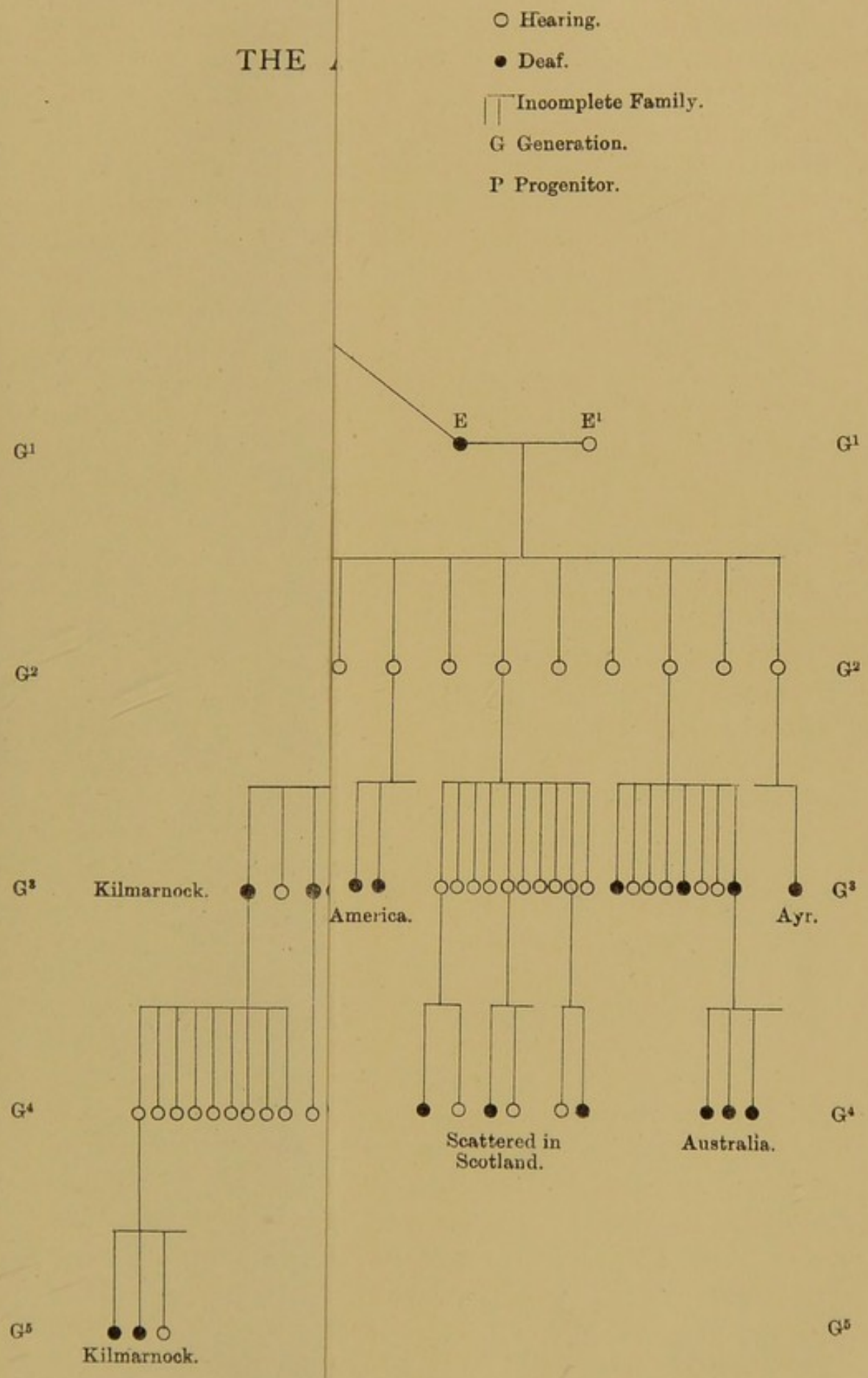
In the accompanying tree is a graphic delineation of the heredity of deaf mutism.

A. married A^1. of the same name, about the year 1800. The identity of name suggests consanguinity, but no evidence of a more positive kind has been got. Seven deaf mutes are known to have been born into this branch of the family, and in the present generation the tendency continues to express itself. Several cases of intermarriage between cousins have taken place amongst the members of this branch of the family, but without any increase in the tendency to deafness. The details of this part of the family were collected by the writer from old friends and acquaintances of the family in Ayrshire,

and have been corroborated from various sources. A. is second cousin to B., C., and D.

B., C., and D. all occupied farms within a radius of fifteen miles of the town of Galston, near which A. lived. The facts about the descendants of these three farmers have been collected from the oldest representative of the family still living in Ayrshire. There are fifteen deaf mutes in this branch. E. was born in New York, but his father left Galston before E.'s birth, and the latter returned to Scotland in early life. He resided at Strathaven. Absolute proof that E. was related to A., B., C., and D. has been got, but the exact relationship has not been made out. And the reader may ask himself whether in a parish like Galston with, at the beginning of the century, probably about 2000 inhabitants, two unrelated progenitors with such an unusual, indeed, almost unique tendency to deafness were likely to exist. There are nineteen deaf mutes in this branch, the details of which have been collected by Mr. Henderson of the Glasgow Deaf and Dumb Mission, from the family Bibles—the old Scotch register—of surviving members, and by Miss Cunningham and Mr. Large of Donaldson's Hospital. The facts about this branch have been corroborated by E.'s daughter, who is now living at the age of 84 in Lanarkshire. When the writer asked her if she could account for her father being deaf and dumb, she replied, "What a quashton to ask. Are ye *that* ignorant, man? It's God's wark. The Bible says't. Maybe your ain weans'll be deef and dumb; ye shouldna come atween God and the Deef and Dumb." There was no getting beyond that. The tree is of course incomplete. During the century which is about to close emigration from the West of Scotland has proceeded in a continuous stream, and from no class have these emigrants been drawn more largely than from the agricultural class. Its proximity to the great seaport of Glasgow made Ayrshire a county from which emigration was easy, and every family sent colonists to Australia and Canada. The tree shows that this family sent several members abroad in

THE


○ Hearing.
● Deaf.
Incomplete Family.
G Generation.
P Progenitor.
E
E¹
G¹
G¹
G²
G²
G³
Kilmarnock.
America.
Ayr.
G³
G⁴
Scattered in Scotland.
Australia.
G⁴
G⁵
Kilmarnock.
G⁵

this way, and two at least of the five progenitors have deaf-mute descendants in our colonies. The descendants of D. alone are represented by three deaf-mute families in Australia. Into one of those three families two deaf mutes have been born. Into the other two deaf mutes have also been born, but the number is not known in Scotland, and they are represented by a single black mark for each family. E.'s family is similarly scattered. The tree shows a total of forty-one deaf mutes. In this family the men generally were tall and of fine physique, and the women handsome. Insanity appeared occasionally, but not commonly, amongst its members.

THE HEREDITY OF MALFORMATION.

The occurrence of many cases of deaf mutism in one family suggests its heredity. The cases in the Glasgow family and in the Ayrshire family are almost startling in the persistence of the defect. Two considerations will throw light on the nature of the defect and its transmission.

1. The recurrence or heredity of special features in connection with other organs of the body.

2. The nature of the defect or disease which is the immediate cause of congenital deafness.

Many congenital peculiarities lend themselves to easy study, occurring in organs more open to examination than the ear.

I. Polydactylism, or increase in the number of digits, is often hereditary and is easy to study.

The writer has a patient who has six toes on each foot, and amongst whose children two examples of the same condition have occurred.

Clement Lucas[1] gives a remarkable case. He says: "Altogether the great-grandmother of my patients appears to be responsible for abnormalities occurring in no less than twenty-four persons out of a total of eighty descendants, or 30 per cent. of those carrying her blood. It was transmitted through the maternal great-grandmother, the

[1] Clement Lucas, *Guy's Hospital Report*, Vol. xxv.

grandmother, and mother of the man who furnished the history, and whose children were brought under my observation. Considering the number of times the blood has been diluted by marriage, the persistency with which this tendency asserts itself is very remarkable."

The details of this remarkable family tree, which represents five generations, are very interesting.

"The maternal grandmother had a family of eight, five of whom were affected. Her eldest son, though himself normal, had three children affected out of a total of nine; the second son had seven children, three of whom were affected; the third son escaped, and his family of seven also escaped; the fourth son was the subject of hare-lip. He had no family. The eldest daughter had six toes on each foot. She had four sons and a daughter: two sons (the first and the fourth) had extra toes, whilst the second and third sons and the daughter, who was last born, escaped; the second daughter had an extra finger on each hand. She had a family of ten, of whom two only were affected. The third daughter was the grandmother of my patients; she was born next to the last, and had an extra finger on each hand. The grandmother gave birth to seven children. The eldest (a daughter) had an extra finger; the second (a son) had six toes on one foot, seven on the other, and five fingers and a thumb on each hand. He had five children, three of whom had supernumerary digits. The fifth was the father of my patients. He had six toes on one foot, seven on the other, with the inner toes webbed: five fingers and a thumb on one hand. His eldest son had hare-lip and cleft palate, and a web between the big toes and the one adjacent in each foot. The second, third, and fourth children escaped; the youngest son (an infant) was born with five fingers and a thumb on each hand, six toes on each foot, and a web between all the toes. The sixth son (uncle of those last described) was normal, and he had three normal children. The third son (another uncle) was normal, and his twelve children were also normal."

All the points brought out by the Ayrshire deaf mutes are noticed here, and, in addition, the more persistent defect

is occasionally associated with others—hare-lip and cleft palate, defects which sometimes accompany deaf mutism.

J. S. Muir records a case in which this deformity appeared in not less than five generations.

Generation I.—Eight members; two with supernumerary digits.

Generation II.—Three members; two with the deformity.

Generation III.—Two members; both with the deformity.

Generation IV.—Grandfather; fingers deformed, but nature not stated.

Generation V.—Great-grandfather; same as above.[1]

An instance of this malformation is of special interest in connection with the statement of Mr. G. Bell, that the intermarriage of the congenitally deaf is producing a deaf variety of the human race. This statement will be discussed later, but is worth mentioning in connection with the following case. The case is as it stands in Professor Bertram Windle's paper.[2] A singular account is given by Devay on the authority of Dr. A. Potton, which seems to show that under favourable circumstances continued for a sufficient length of time, a separate breed of men possessed of some malformation might be produced, whilst it also shows that the instability of such a condition, which must persist for some time, leads to its being easily stamped out by the introduction of fresh and untainted blood. "In the department of Isère," he says, "not far from Cote-Saint-André and Rives, there is a small isolated village called Izeaux—lost, so to speak, formerly in the midst of a plain called the Plain of Bièvre—which, if not completely uncultivated, was at least very barren. The roads were difficult, if not impracticable. The inhabitants, thus cut off from the outside world, intermarried very freely. At the end of the last century sexdigitism both of the hands and feet suddenly appeared, and in thirty-five or forty years almost the entire population were thus affected. When in 1829 and in 1836," says Mr. Potton, "I observed

[1] J. S. Muir, *Glasgow Medical Journal*, Vol. XXI., p. 420.

[2] Windle, "Congenital Malformations and Heredity," *Proceedings of the Philosophical Society, Birmingham*, 1888.

this strange phenomenon, it was present in some subjects only in a very rudimentary manner; amongst many it was only a large tubercle containing a hard, osseous body, and fixed to the side of the thumb, a more or less well-formed nail terminating it. At this time the influence of crossing, due to opening up of communications, was making itself felt. In 1847 I had occasion to see a foreman originally from this locality, who was married and settled in Lyons. He was affected with the malformation, but was the father of four normal children. At the time of writing," he goes on to say, "the anomaly has almost completely disappeared from the district."

Similar examples could be given from the anatomy of other parts of the body. Hare-lip and cleft palate are markedly hereditary; absence and peculiarity of the teeth equally so. Two malformations may be combined, as is well shown by Windle,[1] who gives a case where the father had polydactylous and the mother had anomalous dentition. There the two streams of malformation united and produced the double peculiarity in the children. A very interesting case of this double defect is given by Sedgwick.[2] Here microphthalmia, with almost total absence of the iris, was the defect on the father's side, and deaf mutism that on the mother's side.

"A woman born of microphthalmic mother, but having the two eyes perfectly developed, was married to a man whose grandfather was deaf and dumb. Of this marriage there have been born five children—three boys and two girls; these last two are affected with microphthalmia. In one of these girls, who is at the same time deaf and dumb, there is a complete absence of the iris; the other is married, and has a male child three years old, who is deaf and dumb at the same time that he is affected with microphthalmia and coloboma iridis.

An interesting combination of defect of the eye and ear is given by Dr. Earle.[3] "The whole family is

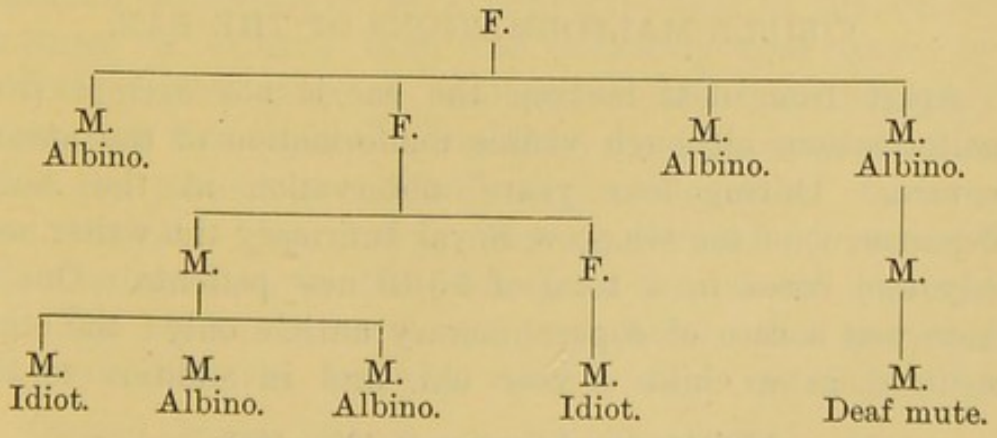
[1] Windle, "Congenital Malformations and Heredity," *Proceedings of the Philosophical Society, Birmingham*, 1888.

[2] Sedgwick, *Brit. and Foreign Med. Chir. Review*, Vol. XXVIII., p. 205.

[3] Earle, *American Journal of Medical Sciences*, Vol. XXXV., p. 347.

probably no less characterized by a defective musical ear than an imperfect appreciation of colours. Several of the individuals comprising it are utterly incapable of distinguishing one tune from another." Here we have colour-blindness and tone-deafness combined.

Cases like the above show that congenital defect of the organ of hearing is compatible with malformation or abnormality elsewhere, and thus leads to the notice of those cases where deaf mutism is the partial expression of a larger tendency or fact. Cases occur in which in one generation deaf mutism is found, in another idiocy, or these two may be present in the members of one family. The same is sometimes seen with insanity or epilepsy and deaf mutism. Statistics with regard to these points must always be accepted with care. In any family history traces of insanity, epilepsy, scrofula, and other heredity conditions will readily be found. But when in a given case both deaf mutism and one or more of these conditions is present, and when the deafness is congenital, we must not fall into the mistake of blaming everything on the deaf mutism, but rather look for an abnormality of the central nervous system which accounts for both. Dahl gives an instance in which insanity, idiocy, epilepsy, and deaf mutism exist together. Amongst thirty-four individuals there were four deaf mutes, four insane, five idiots, and one epileptic. An example similar to that quoted from Sedgwick's paper is one in which albinism, idiocy, and deaf mutism were combined, and is quoted by Mygind[1] on the authority of Dahl.



[1] Mygind, *Deaf Mutism*, p. 76. 1894.

Wilde[1] says: "I have not heard of any instance of a mute albino in the human race, but I have observed albinoes in families other members of which were mute, and in which the parents were related. An instance is related by the Rev. Mr. Bree of a white Persian cat with blue eyes, which was completely deaf. She produced at various times many litters of kittens, of which some were quite white, others more or less mottled, tabby, etc. But the extraordinary circumstance is that of the offspring produced at one and the same birth, such as were like the mother, entirely white, were like her invariably deaf, whilst those that had the least speck of colour in their fur as invariably possessed the usual faculty of hearing."

Amongst the 233 cases of deaf mutism examined in the Glasgow Institution four of malformation were found. One girl said to have lost hearing by a fall at two years of age had a supernumerary auricle and a hare-lip. Another born deaf had cleft palate and very deficient eyesight. A boy born deaf had malformation of the hands and the right foot. On the right foot the digits were deficient. On both hands they were deficient and webbed. A fourth case happening in a deaf-born girl consisted in a meningocele in the occipital region. The last three cases of malformation were certainly in deaf-born children. The first case may also have been so, for deafness from "falls" is often deafness only discovered after, and therefore attributed to accident. The case, too, was one of malformation of the external ear.

VISIBLE MALFORMATIONS OF THE EAR.

Apart from deaf mutism the ear is not exempt from malformation, although visible malformation of the auricle is rare. During four years' observation at the Aural Department of the Glasgow Royal Infirmary the writer met only two cases in a total of 2500 new patients. One of these was a case of supernumerary auricle only; the other occurred in a child a year old, and in addition to the

[1] Wilde, *Aural Surgery*, p. 492. 1853.

extra auricle there was absence of the external auditory canal, no trace of which could be found on dissection (see Fig. 10).

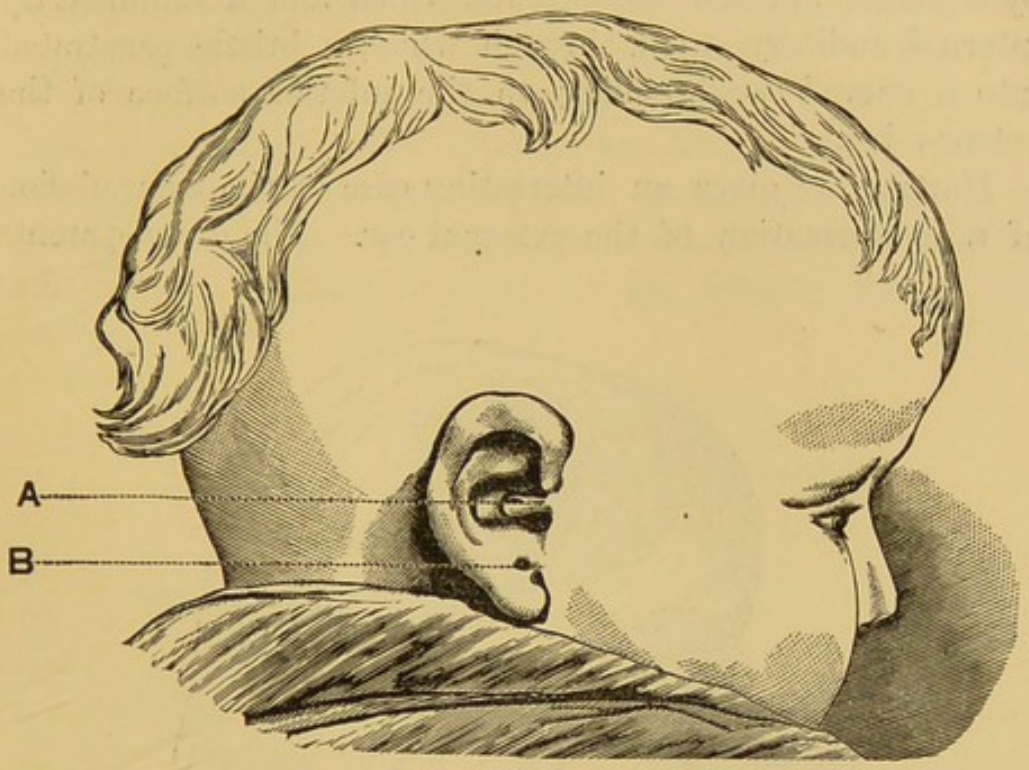


FIG. 10.—CASE OF SUPERNUMERARY AURICLE, WITH ABSENCE OF EXTERNAL AUDITORY CANAL.

From a photograph by the Author.

A—Supernumerary auricle, under which is small blind pit in situation of external auditory canal.
B—Remains of branchial fissures.

This child heard well, but the other ear was normal. Whether the deeper parts were malformed or not cannot be decided, but that malformation of the external ear is sometimes accompanied by a defective state of the deeper structures is evident from the following case given by Grüber:[1] "The external auditory canal was completely absent, and the auricle rudimentary on the same side on which the patient was totally deaf. The other ear was quite normal. The auricle was represented by a small fold of integument in the position of the lobe of a normal ear. The entire external auditory canal, the tympanic membrane, and the auditory ossicles were wanting. The

[1] Grüber, *Diseases of the Ear*, English edition, p. 211. 1890.

promontory was indicated by a very low longish prominence. The fenestra ovalis and the fenestra rotunda were both absent. The spaces of the labyrinth were represented by a single anterior semicircular canal and a rudimentary internal auditory canal, through which a bristle penetrated into a curved canal, ending on the inferior surface of the petrous bone."

Hartmann[1] gives an interesting case of the transmission of a malformation of the external ear. The grand-parents



FIG. 11.—BILATERAL DEFORMITY OF AURICLE, WITH ABSENCE OF DEEPER PARTS ON ONE SIDE.

of one of his patients were both affected with fistula auris congenita, with a fistulous canal anterior and close to the ear. The patient's father, his two brothers and five sisters, were all affected with a similar kind of fistula.

Such deformities are usually unilateral. A bilateral case was brought under the notice of the writer by Dr. Henry Clark of Glasgow. The child, a girl, was four years of age (Fig. 11). The lobule or lowest part of the auricle was represented by a loose, almost pendulous piece of skin; the rest of

[1] Hartmann, *Deaf Mutism*, English edition, p. 56. 1880.

the auricle was stump-like; near its middle was a small pit, representing the absent meatus; the upper part of the stump contained nodules of cartilage. There was no mastoid process; the lower jaw was deformed, and was much smaller than that of the opposite side. The face on this side looked smaller, and the mouth was drawn towards the latter. The opposite ear had a supernumerary auricle, but was otherwise normal. Testing the ears separately was not easy, but the child heard and spoke, hearing being almost certainly limited to the least deformed side (see Fig. 11).

THE HEREDITY OF DISEASE.

The heredity of diseased conditions need only be mentioned. The existence of such heredity is not seriously questioned by any observer of repute, and forms part of the working hypothesis of every physician and surgeon. It may be noticed here, however, that various times of life are apt to be marked by the appearance of special tendencies—syphilis, tuberculosis, and chorea in youth and early manhood; gout in middle life, and apoplexy in later life. The organ of hearing gives a parallel in this connection. The writer had a patient who died lately of phthisis, and who became very hard of hearing between thirty and forty, and was, at his death, almost stone deaf. His sister, only a little older, is now so deaf that she uses an ear-trumpet, and the same defect was shown by the father about the same period of life. Darwin quotes a case, related by Sedgwick, in which two brothers, their father, and paternal grandfather all became deaf at the age of forty.[1]

Mr. Sedgwick[2] says that Mr. Savory records the case of a man who became deaf at the age of forty years. "His paternal grandfather, his father, and two of his brothers have, at the same age, experienced the same defect."

[1] Darwin, *Animals and Plants under Domestication*, Vol. II., p. 78.
[2] Sedgwick, *British and Foreign Med. Chir. Rev.*, Vol. XXVIII., p. 202.

GENERAL CONSIDERATIONS ON HEREDITY.

The detail with which we have discussed malformation and its heredity must be our excuse for the acceptance of the general principle of inheritance and heredity. But there are one or two considerations which require separate statement. In the instances given of the heredity of deaf mutism, and, indeed, in those of all other malformations and diseased conditions, it will be noticed that the special character of the parent is not uniformly transmitted to the offspring. Indeed, the hereditary character may not have been exhibited in the parent at all; it may be regarded as such only because of its recurrence in the offspring; or if it be exhibited by the parent, it may be present in a few only of the offspring; or in a long family tree, an entire generation may be unaffected. This feature is explained by the theory of atavism, or reversion to the character of an ancestor older than the parent. The discussion in detail of this does not belong to a special work like the present, but it may be remarked that reversion is a familiar fact to all breeders of domesticated animals. "Two white or black pigeons of well-established breeds, when united, give almost always a sure white or black offspring; but when differently-coloured birds are crossed, the opposing forces of inheritance apparently counteract each other, and the tendency which is inherent in both parents to produce slaty-blue offspring becomes predominant."

Darwin, the author above quoted, states that, as a general rule, crossed offspring in the first generation are nearly intermediate between their parents, but the grandchildren and succeeding generations continually revert in a greater or less degree to one or both of their progenitors.

This involves the supposition of the existence of latent or unexpressed characters in every individual. Darwin illustrates this subject chiefly from the secondary sexual characters. "Mr. Hewitt," he says, "possessed an excellent Sebright gold laced hen bantam, which, as she became old, grew diseased in her ovaria and assumed male characters. In this breed the males resemble the females in all respects

except in their combs, wattles, spurs, and instincts, hence it might have been expected that the diseased hen would have assumed only those masculine characters which are proper to the breed; but she acquired, in addition, well-arched sickle feathers, quite a foot in length, saddle feathers on the loins, and hackles on the neck—ornaments which, as Mr. Hewitt remarks, would be held as abominable in this breed. The Sebright bantam is known to have originated about the year 1800 from a cross between a common bantam and Polish fowl, recrossed by a hen-tailed bantam, and carefully selected; hence there can hardly be a doubt that the sickle feathers and hackles which appeared in the old hen, were derived from the Polish fowl or common bantam, and we thus see that not only certain masculine characters proper to the Sebright bantam, but other masculine characters derived from the first progenitors of the breed, removed by a period of above sixty years, were lying latent in this hen bird, ready to be evolved as soon as her ovaria became diseased."[1]

This and many similar cases which might be quoted warrant the remarkable conclusion that, unless congenital deafness be excepted from the laws of heredity, every member, whether hearing or not, of a family in which congenital deafness has shown itself, is capable of transmitting the defect, and this conclusion, based on biological principles, is fully supported by the facts here adduced in connection with congenital deafness. Indeed, it is only by a far-reaching statement like this, that the facts about congenital deafness can be explained. Whether what is transmitted through the intervening apparently normal generations be a material substance or not, it is not necessary here to discuss, but that the character may disappear for one or many generations and then reassert itself is an established fact.

The power of transmitting their character is not equally possessed by all individuals in a species. Certain individuals appear to be prepotent, or to have special power in sending down their peculiarities of character. Certain

[1] Darwin, *Animals and Plants under Domestication*, Vol. II., p. 54.

well-known animals have left their special features on the best breeds of horses and cattle. It can hardly be supposed that the human race is an exception to this rule. Indeed, examples are easily found. Darwin[1] remarks "that otherwise we cannot understand how the same features should be so often transmitted after marriage with various females as has been the case with the Austrian emperors, and as, according to Niebuhr, formerly occurred with certain Roman families with their mental qualities." A similar prepotency in the case of individuals affected with congenital deafness would explain many curious cases (*e.g.* the Ayrshire deaf mutes).

Mr. Francis Galton[2] attempts to generalize on this subject. After discussing in detail the facts about the transmission of diseased tendencies, such as that to consumption, he says: "The complete heritage of the child, on the average of many cases, might be assigned as follows. One quarter to the personal characteristics of the father; one quarter to the average of the personal characteristics of the fraternity, taken as a whole, of whom the father was one of the members; and similarly as regards the mother's side."

We need not therefore expect every deaf-mute father to have a deaf-mute child, nor every deaf-mute child to have a similarly-affected brother or sister. Sometimes the peculiarity will affect a small, sometimes a large, number in the family and its connections; sometimes whole generations may be missed, but wherever it is congenital, if we take a wide enough view of the facts, we may expect to find it hereditary.

Many peculiarities are transmitted only through the male line, others only through the female, and some through both. Deaf mutism, when transmitted, usually affects both sexes. In the case of M. P. (List II., p. 78) all the seven affected were females; in Hartmann's case, already noted, although both parents were deaf, all the deaf children were females (four), and the maternal grandmother was deaf. But these are exceptions.

[1] Darwin, *Animals and Plants under Domestication*, Vol. II., p. 65.

[2] Galton, *Natural Inheritance*, p. 191.

These general considerations on heredity alter very much our view of what produces a congenital defect. Taking deaf mutism as an illustration, it is not enough to seek for its cause only in the parents of the affected child. These may hear or be deaf, but that single fact teaches little. Indeed, in the first generation the tendencies of two congenitally deaf parents may so counteract each other that the result is a hearing child; but reversion will ultimately assert itself. The second generation will probably follow the grandfather or grandmother with greater faithfulness, and a deaf grandson will result; or the characters of a prepotent progenitor separated by many generations may crop up, and an unlooked-for outbreak of deafness may take place. In calculating, therefore, the chances of deafness in a family in which it is feared, our view must not only include the immediate progenitors, but the whole family antecedents on both father's and mother's side. This statement is of practical importance; it takes all, or nearly all, the value out of the proposal to prohibit the intermarriage of the congenitally deaf, for, as has been shown, the hearing members of a deaf-mute connection send down the tendency to deafness with as great certainty as the deaf members.

THE IMMEDIATE CAUSE OF CONGENITAL DEAFNESS.

Deafness is a symptom clinically and nothing more. It no more implies one defect or disease than cough or jaundice does. The cough may be due to bronchitis or phthisis, the jaundice to cancer or gall-stones. So the deafness may be due to the non-development of parts, to their destruction by disease before birth, or to the onset of disease in the early years of life. The exact nature of the changes on which the deafness depends will be discussed in the chapter dealing with the morbid anatomy of deaf mutism. In the meantime it is necessary to indicate generally what the immediate causes of congenital deafness may be. Abnormality, or non-development of parts, accounts for a small number, the exact proportion of which,

with reference to the whole, cannot yet be stated. This abnormality may affect either the internal ear or the middle ear, or both, but often affects one and not the other. A study of the development of the ear shows that these two parts of the organ of hearing are developed independently, and that malformation may and does proceed in the one independently of the other.

Then the deafness may proceed from destruction of parts which have been already formed. Here the causes are almost certainly various—as various, perhaps, as the types of constitutional disease; but they result for the most part in inflammatory changes which obliterate the delicate membranes and nervous structures, and supplant them with new growths, usually of bony consistency.

CHECKS TO ACCENTUATION IN HEREDITARY DEAFNESS.

Reference has already been made to Mr. G. Bell's theory, that by the intermarriage of the congenitally deaf, a deaf variety of the human race is being formed in America. His contention that there is abundant material for the production of a deaf variety of man is abundantly supported by what has been said in this chapter. He further contends—(1) that there is a tendency on the part of deaf mutes to select deaf mutes as their partners in marriage; (2) that this tendency has been continuously exhibited during the last forty or fifty years; (3) that therefore there is every probability that the selection of the deaf by the deaf in marriage will continue in the future. Mr. Bell further elaborates what has been brought out in this chapter, that congenital deafness is hereditary, and concludes by demonstrating that the congenital deaf mutes of America are increasing at a greater rate than the population at large, and the deaf-mute children of deaf mutes at a greater rate than the congenital deaf-mute population.[1]

Now all this is quite what a study of heredity would

[1] A. Graham Bell, *On the Formation of a Deaf Variety of the Human Race*, 1883.

lead us to expect, and were deaf mutism due to one anatomical state like sexdigitism, the result Mr. Bell predicts might be brought about with certainty in a given time. Indeed, were this the case a deaf-mute community parallel to the six-fingered community of Izeaux could be produced with certainty and ease.

There are, however, certain checks at work which delay this result, and which make anything but a partial realization of Mr. Bell's prediction impossible. They consist in—

1. The presence amongst the deaf born of those whose deafness has been acquired. As the acquired cases are at least as numerous as the congenital, and in America more so, intermarriage can often only perpetuate without accentuating the tendency. This involves the supposition that acquired deaf mutism is not usually hereditary.

2. Congenital deafness, although usually hereditary, is due not to one but to many different and unconnected pathological conditions. Intermarriage of the congenitally deaf will therefore often only perpetuate without accentuating the defect.

3. The tendency to reversion to the normal type is at work amongst deaf mutes as it is amongst all living beings. But for this our race would soon become worse than deaf mute, and the statement, "And there is no health in us," would become a biological fact. Certain prepotent individuals appear to be able to hold this tendency in check or even to reverse it for a very long time; but ultimately it operates; and congenital deafness is no more likely to become the rule than sexdigitism. Indeed it is much less so, for it is, unlike the latter, not the expression of one anatomical state.

4. Deaf mutes are not prolific. Sterility is common amongst them. The average progeny is not over two per marriage. There is therefore a tendency for them to die out. This is particularly true of the unions between "congenital" cases, which are less prolific than those between "acquired" cases.

These conclusions were written and, indeed, this chapter was ready for the press before Mr. Howard, of Doncaster,

sent his valuable summary on the intermarriage of the deaf and dumb in the United Kingdom. The following remarks by him were appended to that summary, and, like the latter, are given without alteration :

"As a general conclusion from the facts at my disposal, I am strongly of the opinion that the scare originated by Professor Graham Bell is exaggerated. There seems to be a tendency to revert to the normal state of matters. In many cases there appears to be sterility, and the number of children does not appear to be in the same proportion as those of hearing and speaking parents.

"Deaf children are found mostly in families where collateral deafness exists; thus two deaf mutes marry who have deaf-mute brothers and sisters on either or both sides, or other deaf relatives, then the probability of offspring is very great. If such marriages could be prevented, then doubtless the offspring of the deaf and dumb generally would be normal or nearly so. Consanguineous marriages I believe to be far more fruitful of abnormal offspring than the fact of two deaf and dumb people marrying. I do not, however, favour deaf and dumb marriages, only I am of opinion that it is possibly the lesser of two evils."

CONSANGUINEOUS MARRIAGE AND DEAF MUTISM.

There remains for consideration the question of consanguinity as a cause of congenital deafness. Much difference of opinion still exists on this point, viz., the effect on the hearing of the offspring of the blood relationship of the parents. In France MM. Boudin, Chazarin, and others have found high percentages of deaf mutes amongst the children of blood relations. Ancelon, Voisin, and others have failed to find any similar connection. Dr. E. Dally[1] criticizes the facts as submitted by the various French observers, and concludes as follows: "The

[1] Dally, Paper read before the Anthropological Society of Paris, Nov. 15th, 1863. Translated in *Anthropological Review*, May, 1864.

statistics concerning deaf mutes (published by M. Boudin and others) are incorrect in their elements. We possess no exact information about the number of consanguineous marriages in France. For six deaf mutes of consanguineous marriage who have been inmates of the Paris Asylum, there are 315 who spring from unions between individuals who had no tie of relationship between them."

After dealing with the statistics which his opponents have brought forward, Dr. Dally says, "We must exclude from anthropological research all facts which relate to plants and animals; we must only study legitimate marriages and collaterals, and not those between direct progenitors and relations of the first degree; we must disengage from this study all considerations of domestic and moral order." These were unreasonable conditions even for 1863: they are impossible conditions for to-day. As we shall see, the lights this writer would take from us are our surest guides.

Dally claims that healthy consanguinity is favourable to the offspring, but admits that morbid consanguinity may be unfavourable to them. He attacks the theory that consanguinity *ipso facto* has in the absence of all disease in the parents the property of producing diseases in the children. Other authorities will be quoted, but in the face of such widely differing opinions it may be well to study shortly the effect of inbreeding in the lower animals. In man experiments on an extensive scale cannot be made in a matter of this kind. Many of the stock-raiser's plans for improving and specializing the breed would be called incest in human society. On the other hand inbreeding in animals has been persistently applied for many generations, and, as the results point tolerably well in one direction, we may accept the results as applicable to man.

The writer has noticed elsewhere the case of the Polwarth sheep.[1] Into this flock no new stock has been imported since its formation. Inbreeding has been persistently carried out. The result is that not only has

[1] J. Kerr Love, *Glasgow Medical Journal*, October, 1893.

the flock come to be marked by special characters, but that when crossed with other varieties these special characters are imprinted on the offspring in a far higher degree than where inbreeding has not been practised.

Other instances are given by Darwin.[1] We choose the two following: "Shorthorns offer the most striking case of close interbreeding; for instance, the famous bull, Favourite, who was himself the offspring of a half brother and sister, was matched with his own daughter, granddaughter, and great-granddaughter, so that the produce of this last union, or the great-great-granddaughter, had 93·75 per cent. of the blood of Favourite in her veins. This cow was matched with the bull Wellington, having 62·5 per cent. of Favourite blood in his veins, and produced Clarissa. Clarissa was matched with the bull Lancaster, having 68·75 of the same blood, and she yielded valuable offspring. Mr. Bates's (a celebrated breeder of shorthorns) view was that to breed in and in from a bad stock was ruin and devastation, yet that the practice may be safely followed within certain limits, when the parents so related are descended from first-rate animals. Mr. Wright, another high authority, asserts that many more calves are born cripples from shorthorns than from other and less closely interbred races of cattle. Mr. Wright tried the experiment of inbreeding with pigs. He crossed the same boar with the daughter, granddaughter, and great-granddaughter, and so on for seven generations. The result was that in many instances the offspring failed to breed; in others they produced few that lived, and of the latter many were idiotic, without sense even to suck, and when attempting to move could not walk straight. Now it deserves special notice that the two last sows produced by this long course of interbreeding were sent to other boars, and they bore several litters of healthy pigs."

These instances might be multiplied, but this would not conduce to further clearness. It may suffice to state that close inbreeding in healthy animals does not tend

[1] Darwin, *Animals and Plants under Domestication*, Vol. II., pp. 118-121.

to the production of any one kind of disease or malformation. The results are rather deterioration of the species as a whole, loss of size, general vigour, and a tendency to sterility. How far this is produced by an accentuation of the weaknesses common to both parents cannot be said, but that such accentuation occurs is quite certain, and is proved by the fact that it follows more rapidly and certainly when bad animals are inbred than when perfect specimens are mated. Even the malformations which arise may be due to the general weakening of the species. That crossing is beneficial and produces the opposite effect is proved by the fact that when large animals are wanted, or when the object is to send the produce into the market for consumption, breeders and butchers always avoid inbreeding. It is not contended here that the closest inbreeding never produces malformation, and that, in human beings deaf mutism in offspring may never be a result of consanguinity in the parents. But when it does occur it is to be looked on not as a special result of the consanguinity, but rather as an evidence of the deterioration consequent on the blood relationship. In healthy animals inbreeding in the degree which usually happens in the human race never does harm. In the case of brothers and sisters union in healthy animals certainly ends in deterioration and occasional malformation. The few examples which occur, and some of which will shortly be quoted, of similar unions in the human family will show that deterioration certainly follows, and that deaf mutism may form a part of that deterioration.

No exactly parallel experiments can be made with man, but cases approaching them have been chronicled. Hartmann[1] quotes a case from the *Journal de Médecine Mentale.* "In 1849 at Widah, in the kingdom of Dahomey, a Portuguese landed proprietor, Da Souza by name, well known to all captains visiting the West Coast of Africa, died. This man, being in his time an important personage in that country, had made a large fortune in the slave trade. At his death he left behind him a host of children, the fruits of his harem, containing 400

[1] *Deaf Mutism*, 1880.

wives. The Government of the kings of Dahomey suspicious of and hostile to the introduction of a mongrel population, confined this numerous offspring in an enclosed space under the superintendence of one of Da Souza's sons. Despised by the natives, and strictly guarded, these Mestizoes could only propagate by intermixing amongst themselves. In 1863 there were already amongst them children of the third generation. The colour of the skin was already deep black, although some of them still bore plainly the features of their European ancestor. In spite of this intermixing of the family, defying every moral and conventional law, there were amongst this offspring neither deaf mutes, blind creatures, nor ill-developed individuals; however, this human herd is decreasing very much, and may soon become extinct."

The island of St. Kilda supplies the proper conditions for the production of congenital deafness if the intermarrying of blood relations *per se* can produce it. Until recently, except for the purpose of rent collection, this lonely island, situated far out in the Atlantic, off the Outer Hebrides, was wholly unvisited by strangers. It had no communication with the outer world. The inhabitants are poor and badly housed. Dr. C. R. Macdonald, the Medical Officer of Health for Ayrshire, has described[1] the diseases which attack the inhabitants. On inquiry he assures the writer "that there is no history of any case of deaf mutism in this remote islet, nor, moreover, of other signs usually attributed to the results of intermarrying." In the article above referred to, he says: "There are no cases of deaf mutism; insanity and idiocy are unknown, and cases of imbecility are extremely rare." This is after centuries of intermarrying. The only disease this author feels inclined to connect with consanguinity is *trismus nascentium*, or infantile lock-jaw, which cuts off about half the children shortly after birth. This affection, which is probably due to a special bacillus, has lately been prevented by dressing the umbilical cord antiseptically after birth.

[1] C. R. M'Donald, "St. Kilda, the Inhabitants and the Diseases peculiar to them," *British Medical Journal*, July, 1886.

Sir Arthur Mitchell[1] has investigated the subject of consanguineous marriage fully with regard to Scotland, and various isolated communities like St. Kilda are discussed by him. His results will be noticed shortly. In the meantime a case given by Mr. Graham Bell[2] may be put alongside that of our lonely Scotch island. The case is that of Martha's Vineyard, an island fifty or sixty miles from Boston, in the southern part of Massachussets. The population of the little hamlet (Chilmark) is only 500, and there are 20 deaf mutes (June 1st, 1880). Mr. Bell has a list of 72 deaf mutes born in this place, or whose ancestors came from there. Consanguineous marriage has been common amongst the people, and he has been able to trace the ancestry through ten or twelve generations. Amongst the population there were also dwarfs, hermaphrodites, and six-fingered persons. Mr. Bell thus states his views: "We have no statistics that undeniably prove that a consanguineous marriage is a cause of deafness, but I see abundant proof that a consanguineous marriage occurring in a family in which there is already deafness increases the deafness in the offspring. It is simply a case of selection; the family peculiarities, whatever they are, are increased.[3]

It would be easy to multiply instances of communities like those of Dahomey, where consanguineous marriages appear to produce no bad results or instances like those of Martha's Vineyard, where such unions are followed by deaf mutism or other special defect. We have found this easy with individuals. Huth[4] does this with regard to communities, and because the results are not uniform, and do not lead all in one direction, he concludes that consanguinity has nothing to do with the bad results which follow. But there is a fallacy here: and it consists in this. One of the factors in the calculation is absent. Not

[1] Mitchell, *Edinburgh Medical Journal*, March, April, June, 1865.

[2] Graham Bell, *Evidence before Royal Commission on the Blind, Deaf, and Dumb.* Queries 21,450–21,453.

[3] *Ibid.*, Query 21,447.

[4] Huth, *The Marriage of Near Kin*, chapter iv., 2nd edition, 1887.

only must the consanguinity be reckoned with, but the presence of hereditary tendencies must be taken into account. With a human community parallel in point of health with shorthorns, or bred from a few first-rate pairs, inbreeding does no apparent harm. If practised closely enough general deterioration would follow in time, as in the case of cattle and sheep. There is no reason why that deterioration should take place in one direction more than in another. But such prolonged close inbreeding in man never happens, and therefore such indefinite and general deterioration is never seen. On the other hand, consanguineous marriage accentuates already existing diseased tendencies, and as these are usually present in every individual and community the effects we see almost always follow some special groove or grooves.

Mygge[1] investigated this subject in Denmark in 1879. His results are thus summarized by Mygind. While in Denmark consanguineous marriage may be supposed to represent about 3 to 4 per cent. of all marriages; 6·75 per cent. of the deaf mutes admitted into the Copenhagen Institution between 1858 and 1877 were the result of such marriages. If the congenital deaf mutes were considered alone, the result was that 7·55 were born of consanguineous marriages. Mygge's conclusion was—There are a comparatively greater number of deaf mutes amongst the children of consanguineous than those of crossed marriages; whilst, on the other hand, it is certain that the former do not play such an important part in the etiology of deaf mutism as was supposed by Boudin, since the chance of having deaf-mute children cannot be supposed to be more than about three or four times as great for persons who are blood relations as for persons who are not related, at least not nearer than the seventh degree.

The statistics of the Illinois Institution[2] (2400 cases) show that 133 of the pupils are the offspring of parents who are related thus:

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[1] See Mygind, *Deaf Mutism*, 1894.

[2] *Thirty-seventh Biennial Report*, 1894.

82 children of first cousins.
26 children of second cousins.
14 children of third cousins.
9 children of fourth cousins.
1 grandchild of first cousin.
1 child of uncle and niece.

133 or about 5½ per cent. of the whole.

Sir Arthur Mitchell,[1] before referred to, made his investigation in 1865. When speaking of deaf mutism, he says, "Out of 408 deaf mutes, we have 25·1 where parents were blood relations, or 1 in 16·2. If cousin marriages have no influence in the production of this result, then such unions in the general community ought to be to others in the proportion of 1 to 17. I have no figures to show that this is not the case, nor can I obtain them; but I believe all will at once agree with me in considering such a proportion as far too great. The average for Great Britain is probably not more than 1 to 60 or 70." Dr. Mitchell's investigations were made chiefly on the isolated communities of the Western Hebrides. Of course they include other supposed effects of consanguinity. His general conclusions are as follows:

1. That consanguinity in parentage tends to injure the offspring; that this injury assumes various forms; that it may show itself in diminished viability at birth; in feeble constitutions exposing them to increased risk from the invasion of strumous disease in after life; in bodily defects and malformations; in deprivation or impairment of the senses (especially of sight and hearing), and, more frequently than in any other way, in errors and disturbances of the nervous system, as in epilepsy, chorea, paralysis, imbecility, and moral and intellectual insanity. That sterility or impaired reproductiveness in marriage is another result of consanguinity, but not one of such frequent occurrence as has been thought.

2. That when children seem to escape, the injury may show itself in the grandchildren, so that there may be given to the offspring, by the kinship of their parents, a

[1] Dr., afterwards Sir, Arthur Mitchell, *Edinburgh Medical Journal*, March, April, June, 1865.

potential defect which may become active in their children, and thenceforward appear as an hereditary disease.

3. That many isolated cases and even groups of cases present themselves in which no injurious result can be detected. That this may occur even where all the circumstances are of an unfavourable character.

4. That as regards mental disease, unions between blood relations influence idiocy and imbecility more than they do the acquired forms of insanity, or those which show themselves after childhood.

5. That the amount of idiocy in Scotland is to some extent increased by the prevalence of consanguineous marriages, but that the frequency of these marriages does not appear to be nearly so great as has been generally supposed.

	No. of Pupils in Institutions.	No. of Families represented.	No. of Pupils, the offspring of Consaguineous Marriages.	No. of Families represented.
1. Scotch Institutions—				
Glasgow, Dundee, Aberdeen, Donaldson's Hospital, - - - -	201	181	12	9
2. English Institutions—				
Bath, Newcastle, Swansea, Exeter, Doncaster, Brighton, - - -	343	323	16	15
Total, - - -	544	504	28	24

Or, 5·1 per cent. the result of consanguineous union when all the pupils are considered; 6·86 when the congenitally deaf only are considered.

The statistics collected by Sir Arthur Mitchell regarding deaf mutism are given above. He deducts 25 per cent. for acquired deaf-dumbness, and thus arrives at the total of 408. From column 3 he proposes a similar deduction, but really makes one of 10 per cent. only. Any deduction from column 3 appears unnecessary, as the deafness following cousin marriages is almost all congenital. The objection may be urged against this writer's figures that will shortly be urged against those of another careful investigator, Dr. George Darwin, viz., that the total number of cases is

too small to warrant definite conclusions. But Mitchell's figures represent a larger number of institutions.

In 1875, Dr. George Darwin,[1] of Cambridge, made an inquiry into the marriage of First Cousins in England. "It seems probable that in England, amongst the aristocracy and gentry, about 4 per cent of all marriages are between first cousins, in the country and smaller towns between 2 and 3 per cent., and in London perhaps as few as one and a half per cent. Probably 3 per cent. is a superior limit for the whole population. Turning to lunatic and idiot asylums probably 3 or 4 per cent. of the patients are offspring of first cousins. Taking into account the uncertainty of finding the proportion of such marriages in the general population, the percentage of such offspring in asylums is not greater than in the general population to such an extent as to enable me to say positively that the marriage of first cousins has any effect in the production of insanity or idiocy, although it might still be shown by more accurate methods of research that it is so. With respect to deaf mutes, the proportion of offspring of first cousin marriages is precisely the same as the proportion of such marriages for the towns and the country, and therefore there is no evidence whatever of any ill results accruing to the offspring in consequence of the cousinship of their parents." Thus does Dr. Darwin sum up the results of his investigations. But his conclusions regarding deaf mutism are based on accurate returns from only three English institutions, Exeter, Birmingham, and Manchester, and deal with only eight cases of the kind under discussion. Scott of Exeter, who guided Dr. Darwin in the part of his investigation relating to deaf mutism, differs from him. Here is his view of the subject of the consanguinity of parents: "After some thought and a careful examination of the subject, we are inclined to think that one of the main features of the difference amongst the inhabitants of different places is that in districts where the deaf and dumb prevail most, there is little movement or change amongst the inhabi-

[1] G. H. Darwin, *Journal of the Statistical Society of London*, June, 1875.

tants; whilst in districts where such persons are fewest, we find a population of a migratory character. In the former case, breeding in-and-in goes on for generation after generation; whilst in the other it does not, new blood being supplied by the frequent changes taking place amongst the inhabitants. All who are acquainted with agricultural parishes can at once point to certain names which predominate there, and which have predominated there for generations. But this is not the case in large manufacturing towns, many of which, indeed, have only risen up into existence within the last century, and have been peopled with persons coming from every corner of the island; not to mention others, and there are not a few, who might write their birth-place at any point between the Elbe and the Archipelago." [1]

Dr. Darwin, in criticizing Mitchell's conclusions, says, "Dr. Mitchell came to the conclusion that, under favourable conditions of life, the apparent ill effects (of consanguinity in the parents) were frequently almost nil, whilst if the children were ill fed, badly housed and clothed, the evil might become very marked. This is in striking accordance with some unpublished experiments of my father, Mr. Charles Darwin, on the in-and-in breeding of plants, for he has found that inbred plants when allowed enough space and good soil frequently show little or no deterioration; whilst, when placed in competition with another plant, they frequently perish or are much stunted." Dr. Mitchell himself illustrates this by an incident which happened during the course of his inquiry at the fishing village of Burnmouth and Ross, and which shows how much scientific accuracy one sometimes finds in a popular belief. He says, "The general feeling of the people as communicated to me is distinctly against such marriages, which they regard as bad for the offspring. One shrewd old woman, however, added this important remark: 'But I'll tell you, Doctor, bairns that's hungert in their youth aye gang wrang. That's far waur nor sib marriages.'"

A list of deaf-mute offspring following consanguineous

[1] W. R. Scott, *The Deaf and Dumb*, p. 34. 1870.

marriages is given below; it is collected from returns supplied by British headmasters to the author, and represents the facts fairly well as they exist in the institutions of our country at the present time.

Glasgow. Four cases of marriage of blood relations (cousins). In three the children were born deaf; in one deafness did not occur till the age of eight years.

Fitzroy Square, London. Five (in 44 pupils) children of first and second cousins.

Hull. Five (two marriages) children of first cousins. There was also an imbecile child, and only one healthy child in a total of seven children. It is not stated that these children are all from the present pupils, of whom there are forty-four. With the exception of one deaf child, Mr. M'Candlish thinks the whole seven are more or less weak in mind.

Leeds. Four children (in 138) are the offspring of cousins (no other known cause of deafness existing). Three of the four cases are of weak intellect.

Preston (Cross). Seven in 66 the offspring of cousin marriages. In five the parents were first cousins, in one second cousins, and in one third cousins.

Sheffield. Three cases in which parents are first cousins, one case in which a woman married her mother's younger brother—result, five children, three of whom are deaf and dumb; one still an infant, uncertain. The attendance is forty-one, but it is not stated that these cases are all from the present roll. Mr. Stephenson thinks consanguineous marriages also often produce children of weak intellect.

Margate, London. Eleven cases the offspring of cousins, and one of uncle and niece. (Attendance, 312.) Dr. Elliot states that he has had a larger percentage at one time than the above represents.

Exeter. 77 children. Three the result of consanguineous marriages.

Birmingham. Nine children in 142. In these nine families the parents are related, and they contain two, three, two, two, one, one, one, and three children respectively —seventeen in all. There is also a case in which the grand-

parents were cousins. The grandson (the case referred to) is deaf and dumb, and he has a brother deaf and dumb and two sisters partially deaf.

Ealing. In six cases the parents were related. (Total, 55.)

Liverpool. Nine cases of deaf offspring of consanguineous marriages in roll of 136. Amongst 517 who have passed through the school since 1879, there have been eighteen cases of deaf offspring of consanguineous marriages.

Edinburgh. Six children in 100 are children of first cousins (four families). In one case three or four of the brothers or sisters are partially deaf.

Donaldson Hospital. One case the parents are cousins. Roll 110.

Newcastle. Mr Wright's statistics quoted by Dr. Robertson. Case 1—first cousins—four deaf and dumb children, one of whom married, and has three deaf and dumb children. Perhaps this case occurs in Mr. Howard's list (pp. 84, 85), an additional child having meanwhile been born. Case 2—first cousins—three deaf and dumb children and one deaf and dumb grandchild. For this case see Mr. Howard's list, Newcastle, No. 9. There are also three cases of first cousins marrying, in which a single deaf-mute child resulted. In one of these families the rest—a large number—could all hear and speak.

Cambrian Institution, Swansea. Of the born deaf fifteen admitted since 1876 have been ascertained to be the offspring of consanguineous marriages. Present attendance, 61.

Doncaster. Amongst 732 pupils admitted since 1865, twenty-seven are the offspring of first cousins, three of second cousins, five of third cousins, four of brother and sister, and one of uncle and niece. In eleven of these families there are more than one deaf mute; in one or two instances four, and even five. In one case of first cousins father and mother separated on account of the tendency to abnormal offspring in the family, many of whom had intermarried.

The most notable cases in the above list are those the result of union between brother and sister. Of these there were three cases—1, twin girls; 2, boy—father 16 years

years old, mother 14 years; 3, boy. All these four children were intellectually deficient and physically weak. Wounds on the fingers of the girls were slow to heal; the boys were a continual care on the score of health. The present writer had in his private practice, five years ago, a case of issue from brother and sister. The father was 17, the mother 15 years old: the child was small and delicate, and died a little under 3 months' old of marasmus. The child was a boy. He saw, and his nurse was quite clear that he turned toward her when she spoke.

Of 127 pupils on the Doncaster roll, twenty-four belonged to families with more than one deaf-mute member. This is a little under 19 per cent. But the above figures with regard to the same institution show that we have eleven out of forty in which there are more than one deaf-mute member, or 27·5 per cent. where consanguinity has operated.

Referring to the above returns from British institutions, the following table may be constructed. Some of the

Institution.	Total No. of Pupils.		No. and percentage, the issue of blood relations.
Glasgow, - - - -	225	...	3 or less than 2 %
Fitzroy Square, London, -	44	...	5 or over 10 „
Leeds, - - - -	138	...	4 or about 3 „
Margate, London, - -	312	...	12 „ 4 „
Exeter, - - - -	77	...	3 „ 4 „
Birmingham, - - -	142	...	10 „ 8 „
Ealing, London, - -	55	...	6 „ 10 „
Liverpool, - - - -	517	1879-1895	18 „ 3½ „
Edinburgh, - - -	100	...	6 or 6 „
„ Donaldson's Hospital,	110	...	1 „ 1 „
Cambrian Institution, -	200	1876-1895 (approximate)	15 „ 7½ „
Doncaster, - - - -	732	1865-1895	40 or about 5½ „
Preston (Cross), - -	66		7 or over 10 „
Total, - - -	2718	...	130 or nearly 4·78 „
Of which are congenitally deaf,	1630	...	130 or 8 „

institutions have not been included because the total

number of pupils from which the figures are drawn is not clearly stated. Such cases as are described simply as having come "within the experience of an observer," are not included.

The above table probably under-estimates the effect of consanguinity in the production of deaf mutism. Where two ratios are given, the smaller is quoted; *e.g.* at Liverpool there are nine cases amongst 136 on the present roll. Further, if the Glasgow schedules be any guide, the question regarding the consanguinity of parents is often left unanswered. In such cases absence of relationship is assumed. In nearly all the cases quoted the parents are either first cousins or still more nearly related.

Dr. George Darwin drew his deductions from too small a number of cases (eight cases from three institutions representing 366 families). The above table shows how fallacy may thus arise. The Glasgow Institution and Donaldson's Hospital give only four deaf children, the issue of consanguineous union, in a total of 335. This would give a conclusion even more favourable to consanguineous union than that drawn by Dr. Darwin. Such fallacy can be eliminated either by getting the returns from a large number of institutions, as has been done in the above table, or by collecting those from one large institution over a long time, as has been done for the Doncaster Institution. The three largest returns give ratios of $3\frac{1}{2}$ to $5\frac{1}{2}$ per cent., and represent the total pretty accurately. But these figures deal with the total number of deaf in the institutions named, whereas the deaf resulting from consanguineous union belong almost exclusively to the congenitally deaf. These latter form in Britain 60 per cent. of the whole. So that with regard to the congenitally deaf in British institutions, those the result of consanguineous unions exist in the proportion of 8 per cent.

Placed beside the Danish figures of Mygge, and the American figures of the Illinois Institution, we get the following table:

	No. of Deaf Mute Children.	Percentage born to related parents.	Percentage with regard to deaf born only.
American (Illinois), - -	2400	5·5	
Danish (Copenhagen), -	(Mygge's figures),	6·75	7·55
British Institutions, - -	2718	4·78	8
Do., Dr. Mitchell (see p. 112),	544	5·0	6·8
(At the Illinois Institution about 25 per cent. are born deaf.)			

As we have seen, consanguineous unions are in this country from two to three per cent. of all marriages. Dr. Darwin thinks three per cent. "a superior limit." Sir Arthur Mitchell thought 1 in 60 or 70, or about 1½ per cent., about the ratio. Taking two per cent. as probably correct, these tables show that amongst consanguineous unions congenital deafness is from two to three times commoner than when parents are not related.

The Editor of the *American Annals of the Deaf and Dumb*—Mr. Edward Allen Fay—inserts in the undermentioned Journals extracts which have reference to the subject under discussion.

January, 1882. "Professor Hutchinson has, in one of his lectures, mentioned a very interesting fact ascertained in Berlin. Among Roman Catholics, who prohibit marriages between persons who are near blood relatives, the proportion of deaf mutes is 1 in 3000: among Protestants, who view such marriages as permissible, the proportion is 1 in 2000; while among Jews, who encourage intermarriage with blood relations, the deaf mutes are as 1 in 400."

July, 1882. "*The Relation of Religion, Consanguinity, and Social Position to Deaf Mutism.*—In a paragraph bearing this title in the last January number of the *Annals* we referred to some statistics relating to the proportion of deaf mutes among the Catholics, Protestants, and Jews of Berlin, and intimated some doubt as to their trustworthiness. We overlooked the fact that, in an article published in the *Annals*, Vol. XXII., p. 146, Mgr. De Haerne had

given as the authority for these statistics Dr. R. Liebrich, of Berlin, 'himself a Jew by birth, not likely to be misinformed as to the excess of deaf mutes among the Jews, nor to make statements prejudicial to that race.' Dr. Liebrich, like Mgr. De Haerne, ascribed the large proportion of deaf children among Jews to the influence of consanguineous marriages.

"In the same paper Mgr. De Haerne referred to the proportion of deaf mutes among the Protestants and Catholics of Nassau, and promised to make further inquiries on this subject. He has since done so, and sends us the following results:

"'According to the official statistics of the Duchy of Nassau, there were—

In	237,953 Evangelical inhabitants, - -	216 deaf mutes.
In	211,083 Catholic inhabitants, - - -	151 deaf mutes.
In	112 Memnonite inhabitants, - -	no deaf mutes.
In	207 Dissident inhabitants, - -	no deaf mutes.
In	7,112 Jewish inhabitants, - - -	14 deaf mutes.

This gives one deaf mute to 508 Jews, 1101 Evangelicals, and 1397 Catholics.'

"The same statistics show that twenty-one marriages between persons related in the second and third degree produce eleven deaf-mute children. Of these twenty-one marriages there were fourteen between first cousins, twelve of the couples being Evangelical, and two Catholic. Of seven marriages between the children of first cousins, four were of Evangelical, and three of Catholics. The author of this statistical account, Professor Michel, makes the following remarks. The number of the deaf and dumb is in proportion to the facility allowed by ecclesiastical and civil authorities to marriage between relatives."

The following special cases may be noticed here. Mr. Stephenson of the Sheffield Institution sends this case: "A woman married her mother's younger brother. Five children were born, three of whom were deaf from birth; one other is still an infant, and its condition is uncertain.

The Principal of the Birmingham Institution sends this:

"I have knowledge of a case where, by his first wife, unrelated to him, a man had four hearing children. He afterwards married his cousin, and there were four children, the offspring of this second marriage, three of whom were deaf and dumb."

Mr. M'Candlish, of the Hull Institution, sends this: "As the result of a marriage between first cousins, four children were born deaf and one was an imbecile. Two of these were only partially deaf, and at school were consequently further advanced in speech than the other two, who were rather stupid. I think the children of these marriages are all more or less weak in mind, though exceptions occur."

Moos gives the following case: "From the same family there are descended three deaf and dumb children in the second generation. The grandfather was married twice; in the first marriage to a niece, in the second he was not related to his wife. From the first marriage descended two sons and a daughter; from the second one son and two daughters. Except that one of these daughters has a polypus in the ear, none of the children of the second marriage, nor their children (nine in all), have any disease of the ear. On the other hand, three deaf mutes are found among the thirteen grandchildren of the first marriage, and of these three one had a congenital malformation of the right ear." (Here congenital deafness and visible malformation may be supposed to have a common origin.)

"Falk[1] relates an interesting case in which consanguineous marriages were contracted three times in the same family before deaf mutism asserted itself in a frightful manner. A married couple, amongst whose relatives neither deaf mutism nor any other hereditary disease could be traced, had six deaf-mute children. The parents were strong and healthy, and were twenty-six and twenty-one years of age respectively when married. It was ascertained that they were cousins, that the grandparents and great-grandparents were also cousins. While making investigations in the institutions of this city (Berlin), I met with one of these

[1] Quoted by Hartmann, *Deaf Mutism*, 1880.

children, and was told that since Falk's statistics another child, but perfect in every respect, had been born in the same family. Besides that, two children had died so young that it could not be ascertained whether they were deaf or not."

In studying the effects of consanguinity observers have usually collected statistics of these marriages and founded their conclusions thereon. This method is subject to fallacy. Take, for instance, the marriage of cousins. A biased observer may easily find instances of such unions which are not only unproductive of evil in the offspring, but apparently productive of good. Another will as easily produce instances of such unions which result in deaf mutism, epilepsy, and insanity. No unbiased observer, in the meantime, at least, can hope to collect either all the cases of consanguineous marriage, or all the cases of the hereditary transmission of such defects as are supposed to follow such marriages. It is a question whether even a query in the census would elicit the truth. If a consanguineous union were followed by a bad result the contracting parties would incline to conceal it, and, in any case, public opinion on the propriety of such unions would influence the minds of those who were asked to return details of them.

But there is fallacy in another direction. Disease or malformation is not transmitted along a definite curve or in a given ratio from one generation to the one following. It is common to find the grandchildren more like a progenitor than the children of the latter. Why this is so need not concern us here. It is the fact which is important. The transmission of ordinary physical characters by reversion illustrates it, and the transmission of deaf mutism in the Ayrshire family illustrates it with regard to disease or malformation. Confining one's view to a couple of generations, it would be easy to adduce evidence that consumption is not hereditary by collecting cases of healthy parents with phthisical offspring, or phthisical parents with healthy offspring. Mr. Francis Galton[1] compares the hereditary

[1] Galton, *Natural Inheritance*, pp. 175, 176. 1889.

nature of this disease with that of the effects of consanguinity thus: "Consumption tends to be transmitted strongly, or not at all, and in this respect resembles the baleful influence ascribed to cousin marriages, which appear to be very small when statistically discussed, but of whose occasional severity most persons have observed examples."

The statistical method of inquiry into the effects of consanguineous marriages, then, is not satisfactory when taken alone, and inferences drawn from isolated cases, however baleful the effects appear, are unsafe. But if we can, on the one hand, ascertain the effect of consanguinity in cases of incest (which are not common), and, on the other, fix the relative nearness in blood of cousins as compared with father and daughter, or brother and sister, we shall have some light thrown on the propriety of these marriages. On the second of these points, Mr. Galton,[1] in his study of the distribution of stature, submits a table which shows that fathers and sons (or, for our purpose, daughters) should be held to be only half as near in blood as brothers (or sisters), and uncles and nephews (or nieces) to be one-third as near in blood as brothers. Cousins are four and a half times as remote as fathers or as sons, and nine times as remote as brothers (or as brother and sister).

On the first of these points—the occurrence of cases of incest—it cannot be said that we have full information. There is every reason for their concealment. But they cannot be common. In this chapter details of four have already been given, and the issue—five children—were all defective, four being deaf and dumb, and the fifth dying, in spite of careful nursing, before the age of three months. Mr. Huth—no enemy to the intermarriage of cousins—shall be our guide for the rest. In his work on *The Marriage of Near Kin* he collects from various sources the details of 459 such cases, amongst which are eight cases of incest. These latter are as follows:[2]

[1] Galton, *Natural Inheritance*, p. 133. 1889.

[2] As Mr. Huth's book on *The Marriage of Near Kin* is easily obtained, the original sources will not always be quoted here.

Case 62. A marriage between persons related in the second degree (father and daughter or mother and son). Seven children were born, of which one with hare-lip died six days after birth, and the remaining six died before they had reached their third year.

Case 179. A marriage between a man and his half-sister which produced six children. Of these, two, who died young, were tuberculous, and three girls are married. The first of these marriages proved barren. The second produced three children who died young, but the mother in this case was tuberculous. The third marriage produced healthy children. The son was consumptive and has tuberculous children. The mother of the six children was tuberculous.

Case 217. An incestuous marriage which produced healthy children.

Case 453. A case of incest between father and daughter which produced an idiot infant.

Case 454. A similar case to the last. Result, an epileptic and rickety boy.

Case 455. A similar case. Result, a child which died of hydrocephalus at five months old. The father was a drunkard.

Case 456. A case of incest between brother and sister, in which the latter was about fifteen years the elder, and which produced an idiot infant.

Case 457. A case of incest between mother and son which produced a child which died of convulsions 58 days after birth.

These gruesome details are not brought together without a purpose. They show that when parents who are brother and sister unite the result is almost always defective children. If Mr. Huth's case (217), in which the exact relationship is not stated, be excepted, we have, including the four already noticed, in all, five cases of such unions without any healthy offspring. Now, with animals, where natural or artificial selection allows only the best to breed, this result does not follow in the same degree. Inbreeding between brother and sister may go on for several genera-

tions without producing either sterility or *very* defective offspring.

Case 179 is an illustration of the accentuation of the tuberculous tendency by the marriage of half-brother and sister.

Mr. Huth's other cases of incest are between mother and son or father and daughter. No healthy offspring result. Nearly all the children die young. One has hare-lip, one is epileptic and rickety. Only in one case (217), in which the relationship is not stated, is the issue healthy.

Mr. Huth next gives 41 cases of marriage between aunt and nephew or uncle and niece. The result is something like the following. In fourteen families there are deformed children; in five deaf mutes; in ten idiocy or other mental affliction; in twelve are only healthy children born. Other diseases like scrofula, rickets, and phthisis are also present.

Cases 382 to 385 of Mr. Huth's list form an instructive group.

Case 382. A marriage between first cousins which produced ten children. Of these, one stammers, and another has his spine slightly incurved; none of the others have anything the matter with them. One married a person who is not related to him and has two healthy children.

Case 383. Another married his niece and has one child who stammers and another healthy.

Case 384. The stammering case of 382 also married a niece and had six children, of which one stammered, one was an idiot, and one was malformed.

Case 385. The one with the malformed spine of Case 382 also married a niece and has only malformed children.[1] Here an approach is made to the continued inbreeding which is so often practised in animals.

It is not the purpose of this argument to base its conclusions wholly on statistics. Rather is it to show

[1] These four cases are reported by M. Rodet, see "Note pour servir à l'Hist. des Mar. entre Consang.," in the *Congres Medical de France*, 2nd Session, held at Lyons, 1864, pp. 394-399. Paris, 1865.

the *kind* of result which so often follows consanguineous unions, and to view that result biologically. And it is only fair to Mr. Huth to state that he regards his 459 cases as worthless from a statistical point of view, and as not representing the whole population. He presents them because they are useful to show "on what foundation the fear of consanguineous marriage rests." And in doing so he certainly does not lessen that fear.

Let us see exactly how the matter now stands. Bad results follow when in the human race brothers and sisters unite. The result is hardly, if any, better with father and daughter or mother and son. All this Mr. Huth admits. He would forbid such unions in the case of brothers and sisters, because, if they were allowed to marry, "they would do so while yet too young, and the chances of morbid inheritance are greatly increased; since selection cannot be exercised, it is as well to forbid it." He would hinder uncle and niece from marrying because of their difference in age, which, as a rule, is great. Without asserting that the cases of union between uncle and niece above cited are fairly representative of the number of those who thus marry, the *kind* of defect which is so common in those unions suggests a cause similar to those operating when brothers and sisters unite—deaf mutism, malformation, idiocy. And why should they be different? Why draw the line between uncle and niece, and cousins? Biologically they are not separated. It may be convenient to allow cousins to marry because they want to do so, and because a government could not prevent it; it may be expedient to allow such marriages, because, even without marriage, children might be born to cousins; but we cannot agree with Mr. Huth that "the chances of morbid inheritance are practically reduced to nothing." They are, if Mr. Galton is correct, a ninth of those when brothers and sisters marry. If such effects are transmitted, "either strongly or not at all," as Mr. Galton thinks, they will follow less frequently, but sometimes as severely when cousins marry as when brothers and sisters unite. All this is quite compatible with the theory advocated by

the present writer, and also held by Mr. Huth, that consanguinity *per se* is usually productive of no bad result. Perfectly healthy consanguinity never characterizes such unions in man, and perhaps never in animals. But in the latter, by selection, we approach so near it that inbreeding takes a long time before its bad effects are apparent. In man we are so far from it that consanguineous marriage at once accentuates inherent weakness, even if latent, and displays it. Biology surely tells a man not to marry his cousin.

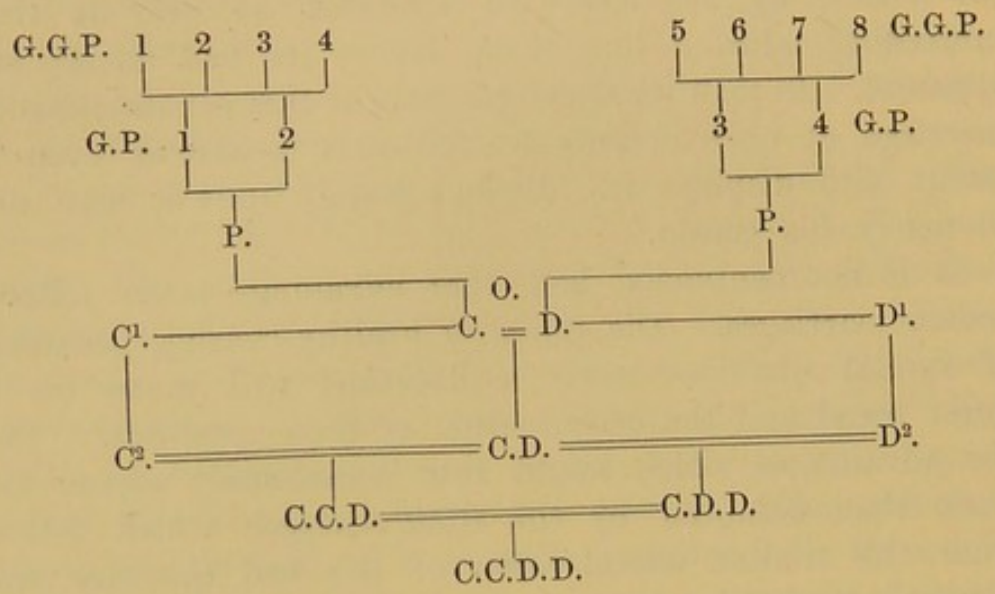
It is not contended here that advantage never follows cousin marriages. The union of healthy cousins, possessed of special qualities worth cultivating, will make for a purer breed and the accentuation of these qualities.[1] But the advantages which might thus occasionally accrue are more than balanced by the disadvantages which follow from the similar accentuation of the bad qualities and diseased tendencies present in almost every family. Mr. Huth thinks that "a man knows the state of health and the disposition of the members of his own family," and urges this as an argument for cousin marriages. Does Mr. Huth mean to say that health and heredity occupy under these circumstances much of the average man's attention? His consumptive cousin is likely to be prettier than his healthy one, and, unfortunately, she is more prolific. Beauty, position, wealth, accident—these, rather than health, determine a suitor's choice.

The following scheme will illustrate the probable effects of cousin marriages, assuming diseased tendencies to be present. The combination of cancer and deaf mutism is a purely hypothetical one. It is not to be assumed that cancer and deaf mutism tend to run together in families.

[1] See the Bourgeois and Seguin Families quoted by Mr. Huth, pp. 389-390.

TO ILLUSTRATE THE TRANSMISSION OF DISEASED TENDENCIES BY CONSANGUINEOUS UNION.

G.G.P. Great-grandparent; G.P. Grandparent; P. parent; C. Cancerous father; D. Deaf-mute mother.



If C married D the chances of cancer and deaf mutism in the offspring CD would be equal. If CD married C^2, his paternal cousin, there would, so far as stated, be no risk of the accentuation of the deafness of D, but the cancerous tendency of C might be increased in CCD. Similarly, on the other side of the tree, increase of deafness would likely occur if CD married D^2, his maternal cousin, but there is no reason for an increase of cancer in the child, CDD. But if CCD married CDD, his or her second cousin, the chances of both diseases occurring in the offspring, CCDD, would be very great. Some would be cancerous and some deaf mute, but perhaps none would be both, and some would escape altogether.' If transmitted tendencies were simply diluted, the attenuation would, in time, become so great that they could be practically disregarded. But the qualities of the parents are not all passed on. Some are dropped, some are transmitted and find expression in the children. Some are transmitted and remain latent for many generations. It is quite certain that some of the transmitted tendencies pass on undiluted. But in every case where well defined tendencies have to

be dealt with the result is as inevitable as that of an equation and could be definitely predicted if we knew the powers of all the forces in a family as we do those of the figures in an equation. In individuals this is not possible, but in fraternities it is (see Mr. Galton's investigations into stature, eye colour, etc).

Returning to the scheme, we see that it is equally clear that good qualities can be increased by consanguinity. This is why, by selecting only the best, and by discontinuing inbreeding in time, breeders can improve their stock and get pure strains. A third case is theoretically possible, that one tendency may neutralize another. For instance, if C be abnormally stout and D abnormally thin, CD may benefit by the union. But we do not know enough of diseased types to treat them in this way. We do not know indeed if they react in this way at all.

Starting from C or D, assuming a common individual O in their place, and proceeding upwards on the tree, O may have the features of any of his progenitors, *e.g.* his four grandparents, or some of all of them, but he cannot have all of all of them.

Practically, the evil of cousin marriages will be greater when the family tendency is a rare one like deaf mutism, than when it is a common one like tuberculosis; for a man will more readily meet with a consumptive wife outside his own consumptive family, than another will meet with a wife tending to deaf mutism outside his own deaf-mute family.

Deaf mutism has usually figured largely in the discussion of the intermarriage of near kin, indeed, this is one of the reasons for the notice of these unions here at all. But it is not the only result commonly attributed to these. The distribution of defect is seen in the following table compiled from Mr. Huth's list.

Admitting that the list is statistically valueless, it must be quite reliable for this purpose, for the authors Mr. Huth cites have, as a rule, the general effects of consanguineous marriages rather than any special effect in view; or if one author tries to bring out in his cases a result

like deaf mutism, another rights the matter by discussing idiocy or epilepsy.

Many of the cases of deaf mutism in the list are individually interesting, but collectively they are of course open to the charge of being selected. Further, although interesting, they bring out no point which has not been fully illustrated already in this chapter. Their number is in 459 families:

Deaf Mutism,		in 58 families.
Idiocy,		„ 57 „
Epilepsy,		„ 20 „
Hydrocephalus,		„ 14 „
Defective Speech, Mutism,	Stammering,	„ 13 „
	Aphasia, etc.,	„ 10 „
Defective Hearing,		„ 11 „
Insanity, Chorea, Squinting, Paralysis, Blindness,		„ 23 „
Polydactylism, Anencephalus, Want of Cranial Arch, Hermaphroditism, Hare-lip, Cleft Palate, Club-foot, etc.,		„ 21 „
Malformations in general (or unnamed),		„ 20 „
Cretinism,		„ 5 „
Chorea,		„ 4 „
Meningitis,		„ 7 „
Convulsions,		„ 21 „
Croup,		„ 11 „
Whooping Cough,		„ 2 „
Lameness,		„ 6 „
Dwarfing,		„ 8 „
Rickets, Scrofula, Spinal Disease, Tuberculosis,		very often.
Albinism,		in 7 families.
Healthy children only,		„ 137 „

Deaf mutism, idiocy, epilepsy, hydrocephalus, and a few other diseases are so prominent and so much allied, that a fault in the cerebro-spinal nervous system, expressing itself now in one direction, now in another, appears to be the best general heading under which to range most of these cases. Meningitis, convulsions, croup, whooping

cough, and the great class of tuberculous diseases belong to this list in a different sense.

Perhaps a more important feature is that in nearly a third of these unions healthy children only are born. Mr. Huth says, "The record of these cases is very valuable since, if it is true that the intermarriage of near kin will, of itself, without any previous taint or hereditary tendency whatever, produce offspring which suffer from some disease of the nervous system, or prove barren, then why do not all marriages of this sort produce these effects?" Where we ask, will Mr. Huth find his pure cultures for such a set of experiments? Unless with these, it will be well not to play with danger in the form of consanguineous union.

The study of the census returns, which forms the last chapter of this part of the work, shows that in spite of our efforts to diminish it, a pretty steady stream of deaf mutism flows into our population as one decade succeeds another. In spite of preventive medicine, in spite of a better knowledge of ear disease, this stream hardly diminishes. Can nothing be done to stem it? Does our analysis of the causes of congenital and acquired deafness suggest no remedy. With regard to the latter the answer comes quick and clear. Scarlet fever, measles, whooping cough, and other causes of acquired deafness must be swept from our midst. Until then, acquired deaf mutism will be with us, and the best treatment of the ear during the course of the exanthemata, will not save the hearing in every case. Greater prominence should be given in the medical curriculum to the study of aural surgery, and during the course of the exanthemata, the throat and ear should receive the most careful attention from the medical practitioner. In this way the ravages in the ear by infectious diseases will be minimized, and the mischief so often caused may be controlled, until these latter are no longer known amongst us. But this very fight with infectious disease, so far as it aims at the prevention of deaf mutism, makes for failure as well as success. And further, the greater the success, the more marked the failure. Infectious disease attacks and kills deaf as well as hearing children. Inas-

Dr. Berniss[1] reported on the Influence of Marriages of Consanguinity upon Offspring. The following table, somewhat modified by Mr. Huth, has been inserted here in its present form, because the writer has failed to find the original in Glasgow.

	No. of Observations.	Average No. of Births.	Per Cent.								
			Defective.	Deaf Mutes.	Blind.	Idiots.	Insane.	Epileptic.	Scrofulous	Deformed.	Died young.
A. Incest with parents, or between brother and sister,	10	3·1	93·5	...	...	61·2	...	3·2	16·1	35·4	...
B. Marriage with niece or aunt,	12	4·42	75·4	1·9	5·6	5·6	1·9	1·9	20·7	26·4	43·3
C. Marriages between blood relations, the issue of blood relations,	56	4·18	53·8	4·2	5·1	12·8	1·2	1·7	18·8	3·8	26·9
D. Marriages between double first cousins,	27	5·7	27·2	1·2	1·2	2·5	3·8	1·2	6·3	1·2	35·0
E. Marriages between first cousins,	580	4·8	24·9	4·2	2·2	8·3	...	1·6	6·2	1·9	22·5
F. Marriages between second cousins,	112	4·58	13·0	1·7	...	3·3	...	1·1	2·9	1·7	16·5
G. Marriages between third cousins,	12	4·92	27·0	5·0	...	1·7	1·7	3·4	16·9	...	13·5
H. Marriages between first cousins, irregularly reported,	24	5·0	17·5	2·5	...	2·5	1·6	...	12·5	...	10·0
Total,	833	4·6	28·7	3·6	2·1	7·0	2·04	1·5	7·6	2·4	22·4
Marriages between persons in no way related,	125	6·7	2·1	0·35	0·1	0·71	0·1	0·35	0·1	...	16·0

[1] *Trans. American Medical Association*, 1858, XII. 334–419. Quoted by Huth, *Marriage of Near Kin*, p. 386.

much as congenitally deaf children are apt to belong to the less robust families in the population, they are carried off by infectious disease in larger measure than the children of the population at large. By removing these causes of death, a larger number of the weaklings, and amongst these a larger number of those with deafness, or a tendency thereto, are spared to produce in their turn deaf progeny. Any interference with the law of the survival of the fittest hinders breeding only from the best and makes for the deterioration of the race. We are not now proposing a plan of action, we are stating a fact. Congenitally deaf children, housed in a well-built and well-drained institution, plainly and well fed, warmly clothed and carefully exercised, become strongly developed boys and girls, and when tested compare favourably with their hearing brothers and sisters in physique. They are spared to become fathers and mothers in a larger ratio than the same class of hearing children outside the institutions. That is a plain statement, the proof of which has been led at some length in the first chapter of this work. But these congenitally deaf cannot marry without transmitting their defect, and they tend to marry amongst themselves and, in many cases, to accentuate that defect. Whilst doing its work as a Christian State, whilst preserving and educating the congenitally deaf, should the Government do nothing towards checking the increase of this unfortunate class? We recognize our duty to our own deaf, and were unworthy of our time and of its spirit did we not rise to it; but have we any right to practise a system which must increase the corresponding burden of our successors without trying to remove the evil results of that system? We fancy only one reply can come to these questions. Our conduct in the management of the congenitally deaf demands our most careful thought, and the defects of our system must be removed. How is this to be done? By the discouragement of such unions as are likely to produce the congenitally deaf. What these are have been already indicated in this work. They are entered into by:

1. Those who are congenitally deaf, or who belong to

families in which congenital deafness has frequently occurred.

2. By those who marry their relatives.

More stringent legislation with regard to the intermarriage of cousins would, in the meantime, probably defeat its own object. But the teachings of biology on the subject of the marriage of near kin should be popularized. With so many causes at work making for the deterioration of the race, we need not add this one of inbreeding. In its closest form all admit its bad effects. When we come down to cousins we begin to speak of its effects being "almost imperceptible," and not only tolerate it, but devise theories to encourage it. Surely this is unwise. Unless we are sure it is safe, why encourage it at all? We know it is often unsafe, and we can never be sure that a latent defect is not ready to evolve itself on the slightest provocation. In a young or new State cousin marriages should be prohibited. In an old State where these have become common, and have thus the sanction of custom and precedent, our motto must be—Educate and discourage. When a true idea of the effects of these unions has wrought itself into the minds of the people, and a healthier sentiment has been created, the question of prohibition may be raised. In England at the present day the state of matters is not above criticism. A law which hinders a man from marrying his deceased wife's sister, but permits him to unite with his deaf-mute cousin, cannot boast of consistency. The above motto, "Educate and discourage," although all that is possible in the meantime, may not be the final word on this subject. To hinder a man from marrying his cousin does not deprive him of a large choice outside his own fraternity; inasmuch as it practically leaves him an open field, it puts no premium on illegitimacy. With an altered public sentiment cousin marriages would become less common and legislation easier. In the meantime we would quote two practical opinions on the question of deaf mutism and consanguineous unions.

"We[1] recommend that the deaf and dumb should be kept

[1] Royal Commissioners appointed to consider the condition of the blind deaf and dumb, *Report*, p. 91, item 26 (1889).

as far as possible from being a class apart. We think that the mixture of the sexes in schools, and especially in after life, is in all cases unadvisable. We also think that the intermarriage of the congenital deaf should be strongly discouraged, *as well as the intermarriage of blood relations, especially when any hereditary tendency to deaf mutism prevails in the family.*"

Even a more decided condemnation of cousin marriages is given in the answers to question 5, in circular sent to Principals of British Institutions (p. 8). Nearly all condemn such unions; several state that in their opinion consanguineous marriage produces more congenital deafness than the intermarriage of the congenitally deaf; and although the question referred to asked for no suggestions for the control of the evil, two of these gentlemen state that, in their opinion, such unions should be prohibited by law.

Mr. Graham Bell[1] thus expresses his opinion:

"As there are few families entirely free from constitutional defect of some kind, a prudent person would do well to avoid a consanguineous marriage in any case, not necessarily on account of deafness, but on account of the danger of weakening the constitution of the offspring. Remoteness of blood is eminently favourable to the production of vigorous offspring; and those deaf persons who have many relatives deaf would greatly diminish their liability to have deaf offspring by marrying persons very remote in blood from themselves."

How to get rid of the unions of the congenitally deaf is a much more difficult question. Not only do we at present preserve them for the production of offspring, but we bring these latter together in schools and institutions, and, when they are older, in clubs and missions, and thus actually encourage their unions. A few lessons in physiology and biology will do little to counteract such influences. The danger of perpetuating their defect should be put clearly before the congenitally deaf; but unless they

[1] A. Graham Bell, Appendix to "Marriage": an Address to the Deaf. Washington, 1891 (Volta Bureau).

are wiser and more deliberate in the choice of their mates than hearing people, they will often marry each other. And as they are likely to saddle the State with the care of their deaf children, their right to marry each other may be seriously questioned. Not only so, but the State has a larger right. The hearing members of a deaf-mute fraternity transmit the defect with as great certainty as the deaf members. Any prohibition then would be only partially successful which did not include these. If the State may hinder congenital mutes from marrying, it may also prevent the union of the hearing members of a severely tainted deaf-mute fraternity either amongst themselves or with normal persons. Such is the teaching of biology on this important subject. Let us see how far it may with advantage be put into practice in our country and in these times.

The objections to exercise of this right by the State are:

1. It would promote illegitimacy and immorality. Such a restriction to be of much value would entail that the congenitally deaf be prohibited all marriage. Unlike the man who would marry his cousin, the deaf born has no choice left. Prohibition, therefore, would tend in the way above indicated.

2. The principle here introduced must, if applied to the congenitally deaf, also include other fraternities severely tainted with disease. It is as desirable to control consumption as deaf mutism, and the former is both more general and in one sense more serious than the latter.

So that, however desirable it may appear, prohibition by law of the marriage of the congenitally deaf is not at present practicable. Our remedy must be sought for elsewhere. We must fall back on the old motto, "Educate and discourage." Perhaps the best way of putting this into practice is that strongly recommended by Mr. Graham Bell.[1] He describes the principles of his scheme of discouragement thus: "(1) Determine the causes that promote intermarriage among the deaf and dumb, and (2) remove them."

[1] A. Graham Bell, *On the Formation of a Deaf Variety of the Human Race*, 1883.

He would retain the "normal environment during the period of education." There is no doubt that the intermarriage of congenitally deaf is promoted by the present system of the segregation of the deaf in institutions. But would this not involve great disorganization and ultimate loss of efficiency in our methods of teaching the deaf? That is a question which belongs rather to the educational part of this work? And further, would the change indicated be of any value at all so long as the deaf and dumb gather in club rooms and missions during the years succeeding the educational period. It is during these years —the years of youth and early manhood—that marriages are made, not when the deaf and dumb are in our institutions.

Commenting on the separation of the sexes in schools the Commissioners remark:

"In adult life this separation of the sexes is still more important, and we think that a grave responsibility will rest on those societies which encourage meetings where both sexes of the deaf meet for lectures, entertainments, or other purposes."[1]

This raises the whole question of educational methods. If deaf mutes are taught a language which is not intelligible to hearing people, if they cannot understand what an ordinary citizen says, they will surely segregate and form their own societies and clubs. Intermarriage of the congenitally deaf will result, and the defect will be perpetuated. The further discussion of this subject does not, therefore, belong to this part of the present work. But the general principle may be laid down that, to diminish the tendency to intermarriage among the congenitally deaf, everything should be done to restore the deaf mute to the ordinary environment of the hearing world.

Nearly forty years ago,[2] Dr. David Buxton discussed this question, and his conclusion was as follows: "There is no sufficient reason for prohibiting the marriages of deaf

[1] *Report of Royal Commission*, par. 568.

[2] Buxton, *On the Marriage and Intermarriage of the Deaf and Dumb*, Liverpool, 1857.

persons with the hearing, but it is at the same time highly inexpedient that the deaf and dumb should marry with each other."

Mr. Graham Bell, whilst considering repressive measures impracticable, suggests action in two directions.

1. The prohibition of the intermarriage of the congenitally deaf.

2. The prohibition of the intermarriage of persons belonging to families containing more than one deaf mute.

Perhaps we are after all approaching the time when such prohibitions may be embodied in legislative enactment. A Bill,[1] intended to make marriage on the part of the congenitally deaf and certain other classes a crime, was introduced into the Connecticut legislature at the last session. Its passage was recommended by the Committee on Humane Institutions, and, but for Dr. Job Williams, Principal of the Hartford School, it would have become a law. After the clauses relating to the deaf and blind were stricken out, the Bill was passed. The following is Section I. of the Bill:—

"No man and woman, either of whom (was born deaf, or blind, or) is epileptic, imbecile, or feeble-minded, shall intermarry or live together as husband and wife, when the woman is under 45 years of age; any person violating, or attempting to violate, any of the provisions of this section, shall be imprisoned in the state prison not less than three years."

Section II. imposes punishment on any one who shall aid or abet such unions, and Section III. deals similarly with those entering into illegitimate unions, should they—one or both—(be congenitally deaf or blind, or) be epileptic, imbecile, or feeble-minded.

CONCLUSIONS REGARDING CONGENITAL DEAFNESS.

The following conclusions may be drawn in connection with this subject:

[1] *American Annals of the Deaf*, October, 1895, p. 310.

1. Congenital deafness is responsible for a large number of cases of deaf mutism.

2. Congenital deafness is hereditary. It may appear in the direct line, being handed immediately from parent to offspring, or the offspring may be deaf because of reversion to the character of an earlier progenitor, the parents themselves having perfect hearing. Further, although it cannot be ascertained that any predecessor in the direct line has been deaf mute, cases often occur in collateral branches of the family which warrant the assumption of a hereditary tendency. The Glasgow, Ayrshire, and other families here given are typical examples of the transmission of congenital deafness, and establish its heredity.

3. The facts about the transmission of congenital deafness are not special to this defect, but are fully supplemented by what we know of the transmission of malformation and disease. Hardly any organ of the body is free from occasional malformation, and probably every malformation is occasionally transmitted. Congenital deafness sometimes occurs together with malformation of other parts, and this suggests malformation of the deeper parts of the ear as one cause of congenital deafness.

4. The external ear is, like other organs, subject to malformation, and this is sometimes transmitted. Malformation of the auricle has been found to be associated with almost entire absence of the deeper parts (internal ear), with the result that hearing was entirely absent on the side thus affected.

5. Consanguinity in parents emphasizes family features in the offspring. Family defect and diseased tendency are particularly liable to become accentuated in this way. When an apparently new feature or defect, such as deaf mutism, appears in a family, it may be the expression of a latent character. Consanguineous marriages produce deteriorated offspring, and deaf mutism, idiocy, etc., when they follow such marriages, may be the partial expression of such deterioration. Amongst animals, when only perfect specimens are used, inbreeding may be carried on to a very great extent without visible bad effect. In the human race,

where every family has some transmissible taint, consanguineous marriages are often immediately followed by deterioration, and should never take place.

6. The marriage of the congenitally deaf and of the hearing members of fraternities severely tainted with congenital deafness, should be discouraged.

CHAPTER V.

ACQUIRED DEAFNESS.

THE statistics given in this chapter regarding the causes of acquired deaf mutism have been gathered from various sources. The older statistics—those of Wilde and Toynbee, etc.—are introduced so that comparison may be made with present day figures. The Glasgow and Newcastle statistics have appeared in the medical journals. The Manchester figures are taken from the reports of the institution of that city. The other English and Scotch figures, and these form the bulk of the modern statistics, have not been hitherto published, and have been supplied for use in this chapter by the Principals of the British institutions. American and European figures are added with the object of enabling British readers to compare the state of matters abroad with that which holds at home.

Taking Table VIII. as representing modern British statistics, we find that 337 out of the total 1410, or nearly 24 per cent., are due to diseases of the brain. These include "meningitis," "water on the brain," "brain fever," "inflammation of the brain," "teething," "convulsions," etc. This proportion is larger than in Wilde's tables drawn from the Irish census of 1851, but is in close accord with the European statistics of Hartmann where—exclusive of cerebro-spinal meningitis—644 out of 1989 cases are said to be due to cerebral affections. If the same exception be made from American statistics —that of cerebro-spinal meningitis—the proportion of cases of acquired deafness due to brain affections is less in

America than in England and the continent of Europe (207 in 1673 cases). But it is with regard to this disease —cerebro-spinal meningitis—that Britain stands alone in the causation of her cases of acquired deafness. Both the European and American statistics show that from a fifth to a sixth of the cases of acquired deafness is due to cerebro-spinal fever alone, whilst at various times and places the proportion caused by this disease has been much greater. In England and Scotland we have little of this disease in its epidemic form. Fagge[1] says: "Scotland, I believe, has been altogether spared by it." This, however, is not so. Dr. Frew,[2] of Kilmarnock, reports six cases which occurred in the village of Galston, Ayrshire, in 1884. As the diagnosis was confirmed by post-mortem examination, and as one of the cases which recovered ended in total deafness, there can be no doubt that this disease, so common in Europe and America, does exist as a cause of deaf mutism in Britain. Dr. Hobby[3] points out how often in America it causes deafness, which afterwards is called congenital. This observer's conclusion regarding cerebro-spinal meningitis as a cause of deafness in America is briefly as follows: That this disease is apparently equally important as a cause of total deafness with scarlet fever, and really much more so, because many called "fever," "congenital," and "unknown" are really cases of cerebro-spinal meningitis. Dr. Roth[4] in 1874 found that all the pupils in the Deaf and Dumb Institution of Bamberg in Upper Franconia—42 in number—were deaf from this cause. This statement illustrates the contrast between our own country and some parts of Germany in respect to the epidemic form of meningitis.

Next to cerebral diseases, by far the commonest causes of acquired surdism are scarlet fever and measles. Indeed,

[1] Hilton Fagge, *Theory and Practice of Medicine*, Vol. I., p. 691. 1888.

[2] Wm. Frew, "Report on Outbreak of Cerebro-Spinal Meningitis," *Glasgow Medical Journal*, 1884.

[3] C. R. Hobby, "Cerebro-Spinal Fever as a Cause of Deafness," *Transactions of the Ninth International Medical Congress.*

[4] Ziemsen, *Cyclopaedia of the Practice of Medicine*, Vol. II. 1875.

if these be taken together, they certainly cause more deafness in Britain than cerebral affections. They account for 469 cases in 1410 amongst the modern British figures. Scarlet fever causes nearly three times as many cases as measles. A glance at the table shows that these diseases operate less severely in some districts than in others, whilst Mr. Illingworth's experience at the Edinburgh Institution suggests what we are quite prepared for in connection with acute infectious disease, viz., that they cause surdism more extensively at one time than another. "Amongst the last hundred admissions at the Edinburgh Institution only three were said to be due to scarlet fever, whereas amongst the previous fifty admissions 20 per cent. were thus caused." (Return sent in reply to circular.) The same fact is indicated by the Glasgow returns, which represent two periods. In the first of these scarlet fever accounts for 16 in 63 cases, or 25 per cent.; in the second for 6 in 110, or only 5 per cent. The same two periods show a similar contrast with regard to measles, two cases occurring in the first, and thirteen in the second list.

These two groups of cases, cerebral affections on the one hand and scarlet fever and measles on the other, account for 57 per cent. of the acquired surdism in Britain, and scarlet fever alone accounts for 23·5 per cent. of the whole (331).

Next to scarlet fever and measles, and appropriately considered along with them, the British statistics show "other fevers" to be important. It is not easy to draw safe conclusions regarding the elements which are included here. Often the term fever is used, and doubtless scarlet fever is sometimes meant. Two statements are warrantable however. Firstly, that amongst "other fevers" typhoid is the commonest in the British statistics; and secondly, there is an almost entire absence of typhus as a cause of surdism. This latter fact is in strong contrast to the case on the continent of Europe, where typhus accounts for almost as many cases as cerebro-spinal fever. Like this last, typhus occurs chiefly amongst the Pomeranian cases, although it is prominent also in the Cologne, Magdeburg, and Erfurt

lists. The headings "nervous fever," "congestive fever," and "fever," in the American tables, probably include many cases of typhus. The immunity of England in respect of typhus as a cause of surdism is doubtless due to the improved sanitary conditions which have made the disease a somewhat rare one in our country. In 1410 cases "fevers" other than scarlet account for 119. Whooping cough accounts for 33 cases, not a large number in such a total; but, as in these cases the return is given unhesitatingly, and not under such general terms as fever, disease, illness, etc., its value is not to be judged merely by the number attached to the heading.

Nearly a tenth of the cases are said—in the modern British returns—to be due to "Injuries to the Head," falls, accidents, etc. This group is very difficult to criticise. The part injured by the fall is not always stated, although the head is oftenest indicated. Then the fall may be antecedent to, but unconnected with the deafness, which may have been congenital or due to some less defined or observable cause. An accident is a good peg on which to hang any subsequent symptoms. Children often have frightful falls without producing either fracture of the skull or other serious damage. Deafness is not a common result of falls in older children, and not a very common result of injury to the head in adults, although in fracture of the base of the skull in adults complete deafness sometimes results. This heading, therefore, is almost as obscure as some of those minor ones which follow, "Disease, Illness, etc."

A remarkable feature of these returns is the rarity with which primary ear disease causes deaf-mutism. In the modern English returns only 18 in 1410 occur, and of these 9 occur in the Glasgow list. In Wilde's list there are 12 cases in 503. In the American returns there are 60 in over 1600 cases; in the European returns 77 in nearly 2000 cases. Admitting that some of the cases included under such general terms as disease, etc., should go under this specific heading it must be thought remarkable that in a condition which has deafness for its essential

feature the ear itself is so seldom the primary seat of disease.

It cannot be expected that syphilis will figure largely in returns furnished through the medium of the institutions. Two cases occur in the Glasgow returns, and these are made usually under the eye of the family doctor. No other British institution returns this as a cause of acquired deafness amongst its pupils. As will be noticed, when speaking of the morbid anatomy of deaf mutism, syphilis is in the opinion of some observers (Dalby, etc.) a common cause of the condition. At the Glasgow Institution, however, only three cases—out of 127 children —of typically syphilitic teeth could be found.

Leaving specific causes, and looking to what remains, we have three headings from which little information can be culled. "Disease," "Sickness," "Illness" convey almost no more meaning than "Unknown causes," and a good deal less than "Miscellaneous causes," when it is remembered that some sections of this last class, although small, are precise, and may reasonably cause great damage to hearing. Amongst these precise causes are mumps, diphtheria, influenza, throat disease, etc. Other less defined miscellaneous causes are epilepsy, paralysis, cold, fright, vaccination, injury at birth from instruments, etc. Although the number of such miscellaneous cases is large in the aggregate, 175 in 1410 British cases, that belonging to any one section is never large. The largeness of the aggregate indicates that often the returns have not been prepared under a medical eye. In the Glasgow cases an unusual number are returned as "Unknown." This is due to the fact that all the cases were rejected in which the causation was not quite clear. In all 98 "unknown" cases are returned. "Disease" (unspecified) may mean either "ear disease" or, more commonly, some more general state. The group is not a large one, and might have been thrown into the two larger ones which follow it in the table. How these various diseases destroy hearing will be discussed in the next chapter.

One of the first reports on the causes of acquired deafness

in Britain was that presented to the statistical section of the British Association by Wilde[1] in 1852. The cases it dealt with were thus classified.

TABLE I.

Scarlet fever,	35
Smallpox,	12
Measles,	7
Fevers,	66
Convulsions and teething,	32
Brain diseases,	15
Injuries of head,	24
Injuries unspecified,	18
Diseases and injuries of ear,	12
Paralysis,	63
Fright,	33
Epilepsy,	7
Whooping cough,	5
Cold,	32
Various causes,	33
Cause unspecified,	109
	503

Toynbee, in 1860, gave the following as the causes of 98 acquired (out of a total of 411) cases.[2]

TABLE II.

Scarlet fever,	36
Fever,	23
Measles,	4
Various diseases—teething, convulsions, hydrocephalus, a fall, fits, a fright, etc.,	35
	98

In the *Forty-fourth Report of the Glasgow Institution* (1865) details of the causes of deafness in 581 cases are given. Of these, 134 are said to be cases of acquired deafness; and of these, 53 are due to unknown causes.

[1] William R. Wilde, *Aural Surgery*, 1853, p. 486.

[2] Joseph Toynbee, *Diseases of the Ear*, 1860, p. 395.

There are 36 cases due to fevers, but even scarlet fever is here included. The value of this return is thus much crippled, and although it is given below, because of its early date, it will not be again referred to, as it cannot be classed with the more accurate modern reports.

TABLE III.

Unknown causes,	53	Vomiting,	1
Colds,	9	Sore ears,	4
Fevers,	36	Croup,	1
Water in the head,	8	Whooping cough,	2
Meningitis,	1	Erysipelas in head,	1
Teething,	1		
Measles,	13		134
Accidents,	4		

A more detailed list is given in the sixty-second Report (1883), and includes the pupils in attendance at that date. As it ends at nearly the date when the first of those children examined by the author entered the institution, it gives along with his report an almost complete list of the causes of acquired deafness in the children at Glasgow for the last twenty years.

TABLE IV.

Scarlet fever,	16	Measles,	2
Water in brain,	4	Gastric fever,	2
Congestion of brain,	3	Bronchitis,	1
Convulsions,	2	Diphtheria,	1
Brain fever,	1	Sunstroke,	1
Inflammation of brain,	1	Inflammation of ears,	2
Disease,	7	Suppuration of ears,	1
Accidents,	8	Not known,	6
Inflammation,	3		63
Cold,	2		

Among 233 cases examined by the present writer at the Glasgow Institution, 110 were due to causes operating after birth, 92 were born deaf, and about 28 correct information could not be got. Amongst the 110 which were certainly born deaf, the causes and the date of onset of the deafness

were definitely given in 85, and these causes are shown in the following table.

TABLE V.

Meningitis and brain fever,	22
Convulsions, fits, and teething,	9
Falls and injuries to the head,	14
Measles,	13
Scarlet fever,	6
Whooping cough,	2
Other fevers,	3
Ear affections proper (suppurative),	9
Syphilis,	2
Cold,	2
Inflammation of lungs,	1
Fright,	1
Injury at birth from instruments,	1
Unknown or unspecified causes,	25
	110

Dr. Robertson[1] gives the following cases from the Newcastle district, the figures in the first column being supplied by Mr. Wright, the Superintendent of the Northern Counties Institution, and extending over a period of fifty years.

TABLE VI.

CAUSES OF ACQUIRED DEAFNESS IN THREE GROUPS OF CASES.

	Children.	Children.	Adults.
Scarlet fever,	97	15	12
Brain fever (cerebro-spinal),	35	10	3
Measles,	26	4	4
Trauma,	14	3	2
Whooping cough,	6	2	—
Sunstroke,	3	1	—
Paralysis,	3	—	—
Fits,	3	—	—
Vaccination,	3	1	1
Gastric fever,	1	3	1
Fright,	1	2	—
Syphilis,	—	—	2
Diphtheria,	—	—	2
Influenza,	—	1	—
Unknown,	—	3	—
Teething,	27	3	—
	219	48	27

[1] Robertson, *Lancet*, September 8th, 1894.

By order of the Committee of the Manchester Schools for the Deaf and Dumb, a report was drawn up in 1881 regarding 157 pupils; and in the Annual Report for 1888, the causes of deafness are given for 204 pupils, from 1881 to 1888.

Of the first set, 88 were born deaf, and 69 became deaf after birth. Of the second set, 120 were born deaf, and 84 became deaf after birth.

The details of the acquired cases are as follows:

TABLE VII.

	1881.	1888.
Scarlet fever,	15	18
Measles,	5	4
Meningitis,	7	5
Teething and convulsions,	7	11
Fevers (nature not stated),	5	8
Disease,	6	14
Whooping cough,	1	1
Mumps,	—	1
Uncertain,	17	3
Accident and falls,	2	6
Vaccination, sunstroke, inflammation, congestion, etc.,	4	13
	69	84

The following table, as indicated at the beginning of this chapter, is made up chiefly from the replies sent in response to circular addressed to the British headmasters, and, including as it does the last three tables, represents the causation of acquired deaf mutism in Britain at the present time.

TABLE VIII.

ENGLISH SCHOOLS.	Meningitis, Brain Fever, etc.	Teething, Convulsions, etc.	Falls and Accidents.	Scarlet Fever.	Measles.	Enteric and other Fevers.	Whooping Cough.	Syphilis.	Suppurative Ear Diseases.	Disease, Illness, etc.	Miscellaneous Causes.	Unknown Causes.	Total.
Preston (Cross), (Mr. Shaw),	4	2	6	5	5	1	—	—	—	2	10	—	35
Birmingham (Mr. Townsend),	9	7	4	5	6	6	—	—	—	—	8	10	55
Exeter (Mr. Jones),	2	5	—	4	2	3	—	—	3	—	8	9	36
Hull (Mr. M'Candlish),	—	—	2	14	4	—	—	—	—	—	4	—	24
Manchester (Mr. W. S. Besant),	12	18	8	33	9	13	2	—	—	—	38	20	153
Newcastle (Mr. Wright),	35	30	14	97	26	—	6	—	—	—	11	—	219
2nd period (Dr. Robertson),	10	3	3	15	4	3	2	—	—	—	5	3	48
Bristol (Mr. Harsant and Mr. Smith),	—	3	1	5	1	1	—	—	—	—	2	2	15
Liverpool (Mr. G. Coward),	22	38	22	61	26	58	10	—	1	—	40	—	278
Leeds (Mr. Kirk),	6	7	7	2	10	—	2	—	—	—	3	9	46
Margate (Dr. Elliot),	12	19	16	7	8	4	6	—	2	13	5	—	92
Swansea (Mr. B. H. Payne),	4	10	2	55	10	17	1	—	—	5	20	—	124
Doncaster (Mr. Howard),	5	4	2	1	7	3	2	—	—	4	1	—	29
SCOTCH SCHOOLS.													
Edinburgh (Mr. Illingworth),	3	10	5	3	4	1	—	—	—	—	4	5	35
" Donaldson's (Mr. Large),	9	6	8	2	1	4	—	—	—	6	3	9	48
Glasgow (Mr. Addison and Dr. Love), two periods,	11	—	8	16	2	2	—	—	3	7	8	6	63
	22	9	14	6	13	3	2	2	9	—	5	25	110
	166	171	122	331	138	119	33	2	18	37	175	98	1410

337 469

806

American statistics may be represented by the American Asylum, the Illinois Institution, and the Georgia Institution.[1]

TABLE IX.

	American Asylum, May, 1877, to May, 1887.	Illinois Institution for 32 years.	Georgia Institution.	Total.
Cerebro-spinal meningitis,	1	299	—	300
Inflammation of brain, brain fever, hydrocephalus, congestion of brain,	29	151	27	207
Scarlet fever,	53	135	5	193
Measles,	8	42	2	52
Diphtheria,	2	12	—	14
Typhoid fever,	4	45	2	51
Intermittent fever,	—	11	—	11
Whooping cough,	4	24	4	32
Pneumonia,	—	22	7	29
Falls and accidents,	10	35	3	48
Gathering in head, diseases in head (presumably suppurating ears),	8	52	—	60
Fever,	5	63	6	74
Nervous fever, congestive fever,	—	13	—	13
Smallpox,	2	2	—	4
Chickenpox,	—	1	—	1
Catarrh, colds,	2	39	1	42
Sickness, nature not given,	8	72	12	92
Spasms, cutting teeth,	5	26	1	32
Scrofula,	2	10	1	13
Mumps,	—	7	1	8
Excessive use of quinine,	—	15	6	21
Rising in the head,	—	—	7	7
Unknown or unstated,	16	273	17	306
Other causes, often ill-defined, each with 1 or 2 cases,	11	47	5	63
Acquired,	170	1396	107	1673
Congenital,	118	490	112	720

[1] Alex. Graham Bell, *Facts and Opinions relating to the Deaf.* (From America.)

European statistics are well represented by the table given by Hartmann.[1]

TABLE X.

	Falk, Berlin.	Breslau.	Meersburg and Gerladsheim.	Nassau.	Magdeburg	Cologne.	Erfurt.	Pomerania.	Total.
Cerebral affections, inflammations, convulsions,	14	12	88	72	97	27	43	291	644
Cerebro-spinal meningitis,	8	—	—	—	5	—	4	278	295
Typhus, - -	8	8	6	—	23	71	16	128	260
Scarletina, - -	12	12	6	5	39	20	12	99	205
Measles, - -	7	4	—	1	10	8	4	50	84
Ear disease, proper,	8	4	5	4	11	13	3	29	77
Lesions of the head,	—	7	4	5	7	7	3	37	70
Other diseases, -	22	26	35	66	42	3	14	146	354
	79	73	144	153	234	149	99	1058	1989

Statistics illustrating the age at which acquired surdism occurs are not of much importance. If the disease which destroys the hearing happens before six or seven years mutism will be apt to follow. The onset of the latter will depend

(*a*) On the amount of speech previously learnt;

(*b*) On the damage caused to general intelligence by the disease producing the deafness;

(*c*) On the efforts used for the preservation of speech already acquired, and for the extension of the deaf child's vocabulary.

[1] Hartmann, *Deaf Mutism*, 1880, p. 75.

CHAPTER VI.

THE MORBID ANATOMY OF DEAF MUTISM.

THE examination of the ears of deaf mutes cannot by itself throw much light on the morbid changes which cause deafness. But it is important. It can be carried out on a much larger scale than is possible with post-mortem examination. And with a good history of the disease which caused the deafness, and a careful examination of the hearing, we may form a fairly complete picture of any case. Mygind doubts the utility of such examinations. And from a pathologist's point of view they are much inferior to those made after death. But in the living subject they are the only objective examinations possible, and in cases of doubtful origin information of an important kind may be gathered. In a case without a history the speculum may tell us whether the case is one of acquired, or if the probability is in favour of congenital deafness. Then with a normal drum head and a fair residue of hearing, the removal of adenoids, the excision of tonsils, or operative measures applied to the nose would be undertaken with greater hope of benefit to hearing than if great destruction of the middle ear were manifest. Hartmann's view appears sound. In discussing the necessity of the use by Deaf and Dumb Institutions of an inquiry sheet, he says,[1] "A note should be made of the existing power of hearing, which should be minutely examined, and of the condition of the organ of hearing. It seems to me, for the interests of the institutions them-

[1] Hartmann, *Deaf Mutism*, p. 43. 1880.

selves, that they should get information about the above questions, as such information . . . is of great importance in estimating the faculties and capability of the pupils." Toynbee[1] was the first English aurist who subjected deaf mutes to systematic examination in this way. In his examination of 411 cases he found that the condition of the ears was very various, and in the majority there was some abnormal appearance, although it was often very slight. Thus, in only 197 out of 411 patients were the ears healthy. Toynbee subdivides the abnormal cases overmuch. He distinguishes between cases in which the surface of the membrane is dull, opaque, too concave, very concave and opaque, meatus contained cerumen and membrane opaque, etc. Now what is a normal tympanic membrane? We often get cases with membrane duller, or more concave, or more opaque than our ideal, and yet the hearing is normal. About the same time that Toynbee was examining his deaf mutes, Politzer[2] examined 100 people with normal hearing, and he found only 25 with a tympanic membrane of normal appearance. Still it is interesting to note that almost half Toynbee's cases had two normal membranes. Of his 313 congenital cases, 172, or nearly three-fifths, had a natural appearance; of the 98 acquired cases, 23, or about one-fourth, had a natural appearance. In his lists the same kind of changes are noted in the congenital and in the acquired cases, in those with a remnant of hearing and those quite deaf. Detached from post-mortem examination, and from the clinical facts, this kind of examination teaches little. Almost the only statement that can be made is, that gross lesions ascertainable by the speculum are commoner in acquired than in congenital cases. Coming now to special causes of acquired deafness, Toynbee found that in 27 cases of total deafness due to scarlet fever, only 1 had an apparently healthy membrane, 7 were concave, dull, or fallen in, 3 cases showed perforations, and 13, or nearly one-half, had

[1] Toynbee, *Diseases of the Ear*, 1860.

[2] Politzer, *Ocularinspection des Trommelfells*, *Wien. Wochenblatt*, 18, 1862.

the membrane absent, and there was catarrh of the tympanic mucous membrane. Of 9 scarlet fever cases with some hearing left, 5 had the membranes perforated, or absent on both sides; in 1 it was absent on one side, in 1 the membranes were dull, in 1 opaque, and in 1 natural. So that of 36 cases of deaf mutism due to scarlet fever, the membranes appeared normal in only 2.

Hartmann's[1] experience differs from Toynbee's. In most cases of typhus and scarlatina resulting in deaf mutism he found the membranes normal; and this fact, together with the history of the cases, led him to conclude that the deafness was generally due to a superadded cerebral affection.

In Toynbee's cases the state of the ears in deafness due to teething, convulsions, hydrocephalus, etc., is in striking contrast to that in scarlet fever. Of 35 of these cases 17 had normal membranes. In only 2 were the membranes perforated, whilst in the remainder the changes were the ambiguous ones of altered lustre, curve, and transparency.

Along with the clinical facts, therefore, examination of the ears teaches a good deal. The above figures regarding scarlet fever and meningitis tell us that when the disease threatens the hearing from the side of the pharynx, the destruction in the middle ear is usually great, when the hearing is destroyed from the side of the brain, the middle ear usually escapes.

The examination of the ears at the Glasgow Institution brought out facts similar to Toynbee's, although the number of cases due to scarlet fever and measles was so small that the same sharp contrasts were not apparent. The results are seen in the tables on p. 156.

Thirty-seven children had their ears plugged with cerumenous masses, or foreign bodies. The latter consisted of pebbles, a bead, pieces of wood, and bits of cotton wool. All these were removed, and all the cerumenous masses were also removed, except in 2 children, who left the institution before the operation could be done. These figures warrant conclusions similar to Toynbee's. Half the cases

[1] Hartmann, *Deaf Mutism*, pp. 78, 79. 1880.

due to brain affections have normal membranes. Non-suppurative lesions, indicated by alterations of curve, lustre, and transparency, are common in both congenital and acquired deaf mutism, and are probably due to the presence of adenoids and enlarged tonsils. Suppurative lesions, active or extinct, are commoner in acquired cases than in congenital, but the latter do not escape, the middle ear becoming the seat of acute median otitis in many cases long after surdism has become established.

TABLE I.

	Acquired Deafness.	Congenital Deafness.	Doubtful.	Total.
Membranes normal (both), -	28	26	7	61
Suppurative otitis media, active or extinct, - -	18	11	3	32
Changes indicating non-suppurative catarrh, - -	34	33	11	78
Unexamined, - - -	1	—	1	2
Meatus too narrow for examination, - - - - -	—	2	—	2
	81	72	22	175

TABLE II.

	Meningitis and Brain Affections.	Falls and Head Injuries.	Measles.	Scarlet Fever.	Ear Affections proper.
Membranes normal, -	10	5	4	1	—
Suppurative lesions, -	2	1	4	1	4
Non-suppurative lesions,	7	5	2	1	4
Unexamined, - -	1	—	—	—	—
	20	11	10	3	8

Dr. Robertson[1] of Newcastle submits the figures given in Table III. (p. 157).

Dr. Robertson's paper further shows that of 35 cases

[1] Robertson, *Lancet*, September 8th, 1894.

of scarlet fever and measles in children and adults, 11 had one or both membranes destroyed, perforated, or cicatrized, and in nearly every case the malleus was absent, whilst in 22 cases of deafness due to brain affections, only 2 had membranes destroyed.

Here the destruction of the contents of the middle ear is well marked in the cases due to scarlet fever, whilst in the cases due to brain affections there is little destruction of the membrane, or apparent alteration in the tympanum.

TABLE III.

	Children.		Adults.	
	Congenital.	Acquired.	Congenital.	Acquired.
Membranes, normal, - -	42	28	16	11
Do., retracted, -	10	6	2	1
Chronic otitis media, - -	6	8	6	4
Do. do., suppurative,	2	5	1	7
Doubtful, - - - -	4	1	2	2
Mixed, - - - -	2	—	2	2
	66	48	29	27

Roosa and Beard[1] examined the ears of 296 deaf-mute children in New York. Of 182 congenital cases, 118 showed membranes altered, and of 114 acquired cases, 80 showed signs of exhausted inflammation.

Amongst the returns sent in by British headmasters to the authors, only one contains details of the examination of the ears—that from Exeter; 76 out of 77 children were examined, about two-thirds of the ears were normal. As the causes of deafness are not given, the table is rather illustrative of the nature of the lesions present in the ears of deaf mutes than of the lesion produced by any one cause. The examination was made by Dr. Russell Coombe (see Table IV., p. 158).

[1] Roosa and Beard, *American Journal of Medical Sciences*, 1867.

TABLE IV.

76 children = 152 ears.

	Both.	1 only.
Perforate,	3	4
Retraction,	28	10
Calcareous membranes,	—	3
Inflamed do.,	1	—
Opaque do.,	1	3
Puckered do.,	7	12
Normal do.,	8	8
Sequestrotomy,	—	1
Polypus removed,	—	2
Granulations present,	—	1
Meatus deformed,	1	1
Healed perforations,	—	3
No details entered,	3	—
	52	48 ears.
	= 104 ears.	

The following are the chief facts brought to light by the examination of the ear in living deaf mutes:

1. A large number, varying from 30 to 50 per cent., have normal membranes.

2. A large number show changes in the membrane—alterations of curve, lustre, transparency, and thickness—similar to those found in hearing individuals, and which may be responsible for no part of the deafness. At the same time these changes are probably connected with the enlarged tonsils and the adenoid growths, which are so commonly present in all children, and in deaf-mute children to the extent of 60 or 70 per cent.

3. A minority show evidence of past or present suppurative disease of the middle ear. These occur amongst both congenital and acquired cases, but are found principally amongst those acquired cases due to scarlet fever and measles.

4. Examination by speculum discovers no lesion characteristic of acquired as distinguished from congenital deafness. Discoverable lesions are commoner amongst the former than the latter, but many of the changes occur subsequently to the onset of the deafness, the anatomical

cause of which almost always lies deeper than those parts which can be subjected to specular examination.

5. The information, therefore, got from this method of examination regarding the ears of deaf mutes as a class, is, taken by itself, neither very definite nor very valuable; but in any individual case, and studied along with the history of that case and the state of the hearing, it is often very important. There is no reason to suppose that the naso-pharynx of the deaf mute should show special characters. The writer found that 70 per cent. of the Glasgow children had enlarged tonsils, adenoid growths, or both. In 33 per cent. these changes were very great, and although he cannot say that they were associated with any special appearance of the membrane, he can state that the same amount of thickening of the tissues of the pharynx and naso-pharynx often causes deafness in hearing children. These figures tally almost exactly with Roosa and Beard's results. These observers found that fully two-thirds of deaf-mute children showed pharyngeal disease, or enlargement of the tonsils.

The clinical study of deaf mutism, with which we have been engaged, shows that every part of the hearing organ, which can be examined by inspection during life, may be normal in a case of total deafness. The converse statement, that every part which can be so examined may appear abnormal, consistently with good hearing, is a truth known to aural surgeons. We know that the essential part of the hearing organ is the internal ear, and, without any detailed examination of the morbid processes which accompany deaf mutism, we may safely predict that the deafness is almost always due to abnormality of the labyrinth. This is true as a general statement. The detailed study of the morbid anatomy of deaf mutism will further show with what exceptions this truth must be taken, and it will throw light on the nature of the essential lesion; it will also tell us of the channels by which the disease usually reaches the inner ear.

When studying deaf mutism it has been found convenient to distinguish between congenital and acquired

deafness. The line which separates these two classes is never definite. Pathologically it is almost absent. With the exception of the rather small number of cases due to congenital malformations, the morbid appearances found in the ears of deaf mutes show nothing characteristic in this respect. Generally, unless helped by a clinical history, we should be unable, at a given autopsy, to say whether the deafness were congenital or acquired.

Before the application of the microscope to the study of pathological anatomy the nature of the changes on which surdism depends was almost purely a matter of speculation.

Holder,[1] in 1669, said: "I am of opinion that the most frequent cause of deafness is to be attributed to the laxness of the tympanum, when it has lost its trace or tension by some irregularity in the figure of those bones (stapes, etc.)."

In 1835 Kramer[2] stated that the chief causes of absence of speech due to deafness were original defects of conformation.

In 1832 David Tod[3] gave it as his opinion that "the tympanum was oftener responsible for congenital deafness than the labyrinth, because the vessels engaged in the development of its various parts are more superficial, and therefore more exposed to the influence of local derangements." In nearly all cases of congenital deafness which this author has seen, "the membrana tympani was so defective as to account for the deafness; the membrane was either absent or abnormally attached to the ossicles and neighbouring hard parts." Tod regarded the Eustachian tube as a process of the tympanum, subservient to it, and used for the escape of its secretions. Almost all tubal and throat affections were said by him to be due to previous disease of the tympanum. The approach of disease from the throat to the ear was not hinted at.

Before describing the morbid anatomy of deaf mutism,

[1] Holder, *Elements of Speech*, 1669.
[2] Kramer, *Diseases of the Ear*, 1835.
[3] Tod, *On the Ear*, 1832.

it is proper that a general review be made of the pathological processes most common in the organ of hearing.

In Chapter v. we found that acquired surdism is most commonly due to acute diseases which threaten the ear from the throat on the one side, and from the brain on the other. *Great* deafness seldom follows "a running ear." Indeed, one of the remarkable features about acquired deaf mutism is that it hardly ever results from primary ear disease at all. Chronic suppuration of the middle ear threatens life rather than hearing. It is easy to cleanse the main cavity of the tympanum in such a case. But the mastoid cells behind and the tympanic attic above form intricately branched cavities, which cannot be cleared out by ordinary means through the external auditory canal. There micro-organisms find the best conditions for their existence and proliferation, and in time the bony wall next the brain becomes diseased. The outworks of the defence thus breaking down, septic material ultimately finds its way into the cerebral circulation, and abscess or meningitis follows. Usually many months, often very many years, elapse before this disaster occurs. Sometimes the mastoid process becomes literally a sac of cheesy or membranous masses. In September last (1895), when doing the mastoid operation in a case in the Glasgow Royal Infirmary, the author found the external mastoid wall so thin that it yielded just as he began to make pressure with the perforator. Great quantities of altered pus were dislodged by the syringe. Within a fortnight another case happened in the same ward, in which, when an incision was made for a subperiosteal mastoid abscess, a sinus in the bone was discovered. But often the course of such a case is different. The bone which separates the mastoid antrum from the sigmoid sinus, or the roof of the tympanic cavity, becomes diseased, and cerebral abscess or meningitis follows. Such is the course of chronic suppurative inflammation. But with acute inflammatory disease the result is different. During the course of the exanthemata in a previously healthy ear the cranial cavity is walled off from the middle ear by an intact and healthy bony partition, which

successfully defends the brain against a short attack, however sharp. But the internal ear is in no way so well defended. The round and oval windows offer little resistance to a violent attack, and disease of the labyrinth follows. Consisting as the latter does of delicate structures enclosed in narrow bony tubes, its destruction is easy. The bony canals are soon occluded by exudation, and the nervous expansions destroyed. It would seem that this may sometimes happen without perforation of the tympanic membrane, although the latter usually precedes or accompanies the disease in the labyrinth thus caused.

The following case[1] illustrates total destruction of the labyrinth by scarlet fever, without any permanent damage to the brain. A. B., the son of a Manchester doctor, and "now aged sixteen years, had at the age of six a most acute attack of scarlet fever, accompanied with some fourteen days' violent delirium, during which his ears became affected. The first evidence of the ear trouble was ordinary discharge, but though the boy was under the care of a specialist the result was total destruction of both labyrinths. Suppuration continued for some months, more or less, and occasionally one ear slightly discharges still. There is no sense of hearing remaining whatever"—(the boy, whom the writer has met, tells him that he *feels* thunder, but cannot hear it). "Both hearing and speech were perfect before the attack of scarlet fever. The boy's mental power, which is above the average, was not impaired by the fever, though a curious uncertain jerkiness in his walk became apparent, and still continues, but there is no loss of power." This young man's education will be noticed later. In the meantime we remark his father's statement, that "he is as bright, cheerful, and happy as he used to be before his loss." We shall see that he is as clever.

When disease attacks the internal ear during the course of a brain affection, it may travel by the internal auditory meatus, by blood-vessels, or by the aqueducts. This is well seen in cerebro-spinal fever. Here the morbid ap-

[1] Reported by patient's father.

pearances are chiefly a deposit of pus and lymph at the base and over the convexity of the brain, as well as over the lower part of the posterior surface of the spinal cord. It often causes deafness. In its course to the internal ear by the auditory canal it follows the auditory nerve, but does not always destroy it. Ziemssen[1] has often found the floor of the fourth ventricle macerated by pus, and the auditory and facial nerves surrounded with purulent exudation, without the occurrence of deafness, during life. Heller and Knapp have, on the other hand, discovered suppurative changes in the labyrinth besides infiltration of the auditory nerve with pus. Heller thinks the inflammation creeps along the sheath of the auditory nerve to the internal ear. The facial nerve is never affected. Some cases examined by Hirsch and Leyden suggest that the loss of speech in this disease may sometimes be a direct result of the meningitis, the centre for speech in the brain being affected; but Ziemssen, while admitting this as a possibility, thinks it rare.

Amongst modern workers, Moos and Steinbrügge, and, more recently, Mygind and others, have helped to give precision to our knowledge of the morbid anatomy of deaf mutism.

The following are the principal changes found on post-mortem examination:

The External Ear.—Malformation of the external ears might not alone cause deafness great enough to result in mutism, but accompanied by similar malformation, as in Gruber's case and those of the author (see pp. 95-6), of the deeper structures, it must, if bilateral, cause deaf mutism. Fortunately such malformation is not usually bilateral. Hartmann[2] has been able to collect from medical literature nine cases where deaf mutism was due to congenital closure of both external meatuses. Two of these appear to have been cured by opening up the membranous obstruction, so that presumably the deeper parts were normal.

The Middle Ear.—The middle ear is a great theatre for

[1] Ziemssen, *Cyclopaedia of the Practice of Medicine*, Vol. II., 1875.
[2] Hartmann, *Deaf Mutism*, 1880.

action in the early stages of those diseased processes which cause deaf mutism. Communicating as it does with the throat, we understand how in scarlet fever, measles, diphtheria, etc., it should be first attacked. Communicating as it does with the inner ear by the round and oval windows, we understand how these diseased processes may spread to the labyrinth. The changes themselves consist of perforation of the membrane; alterations of its curve, thickness, and lustre; calcareous deposits within its substance; change of its structure into osseous material. Changes of this kind affect also the structures closing the round and oval windows, and here these effects must be much more serious to the hearing, for these structures are part of the wall of the labyrinth. The fenestrae have been found contracted, filled with fibrous and osseous tissue, and sometimes absent altogether. Mygind very properly raises the question of the difficulty of ascertaining the origin of such closure or absence, and rightly supposes that such absence is not always congenital, but oftener the result of disease; for many cases of acquired deafness have been chronicled, in which not only the fenestrae have been obliterated by ossific changes, but where the entire labyrinth has been converted into one mass of bone. Whether the intense inflammatory process which produces the osseous formation be pre- or post-natal does not alter the nature of the case. The only pathological distinction which can be admitted here is not between the cases which happen before and after birth, but between inflammatory mischief which obliterates existing structures and true malformation or arrest of development.

Whether simple osseous closure of the fenestrae ever happens without damage to the labyrinth, and, if so, whether it is enough to cause deaf mutism, are open questions. Mygind quotes a case in which some hearing was left with both fenestrae closed, and the labyrinth filled with cholesteatomatous masses. But the boy was four years old when the disease took place. Judging from the effect noticed in adults from the fixation of the base of the stapes, the writer feels sure that the ossifi-

cation of the fenestrae in early childhood would prevent the development of speech. It should be noted here that the middle ear does not exist as a cavity at birth. Kölliker[1] pointed out that "during the whole period of foetal life the tympanic cavity is occupied by connective tissue, in which the ossicles are imbedded, and that only after respiration has been established this tissue recedes before an expansion of the mucous membrane." This cavity, or, rather, this mass of connective tissue, may easily become the scene of perverted activity involving the fenestrae, and spreading to the labyrinth.

The ossicles may be absent, all or any one of them. Michel gives a case where the stapes was absent; there was also congenital absence of the auditory nerve and labyrinth, and malformation of the petrous bone. Absence of the ossicles is a common feature of ear disease in adult life, and does not involve great loss of hearing. Undoubtedly, unless in such cases as Michel's, it is the result of inflammatory disease in the deaf mute, and is usually caused by a disease of so destructive a type as to involve the internal ear as well. Simple anchylosis of the ossicular chain appears to be the chief cause of the deafness in a congenital case given by Politzer,[2] and such a cause, especially if it involve the foot-plate of the stapes, may well cause deaf mutism. The case is as follows:

In a girl, *aet.* 11, said to have been born deaf, the right membrane was cicatrized, the body of the incus was embedded in a mass of connective tissue, the niche of the fenestra rotunda was filled with connective tissue. On the left side, in front of the malleus, there was an oval perforation $2\frac{1}{2}$ mm. in size: the long process of the incus on both sides was a third longer than usual, and was rectangularly bent in the middle. The stapes was retracted backwards and upwards, and its crurae and head were adherent with the upper niche wall of the fenestra ovale. As indicating the congenital nature of this case,

[1] Kölliker, see Quain's *Anatomy*, 8th edition, Vol. II., p. 772.

[2] Politzer, *Diseases of the Ear*, Dalby's translation, 1894.

Politzer states that in middle ear sclerosis he always found anchylosis of the crurae with the lower niche wall.

Moos[1] describes a case which appears to depend on malformation of the middle ear. On the right side the membrane, the malleus, and the incus were wanting, and the Eustachian tube obliterated, whilst the styloid process and the stapes were present. He ascribes these peculiarities to the fact that the three divisions of the ear are separately developed. The external ear—membrane, meatus, and auricle are developed by metamorphosis, from the first branchial cleft of which, in the middle ear, the Eustachian tube is the remnant. From the first branchial lappet are formed the malleus and incus, and from the second the stapes, styloid bone, and the short horn of the hyoid. The case, according to this author, proves (1) that during the various and independent development of the separate sections of the auditory passage derangement may occur in one place, whilst another is unaffected; (2) that the middle ear and the labyrinth develop independently of one another. These facts we have already become acquainted with in studying congenital deafness.

The other ear showed signs of congenital malformation, to which Moos thought later disease had been added. The whole internal ear was obliterated, the auditory nerve, which is independently developed, was present, the cartilaginous part of the Eustachian tube remained, the membrane and ossicles were wanting.

The influence of adenoid growths of the naso-pharynx may here be noticed. Apart from deaf mutism, such thickenings tend to appear during early childhood—the third or fourth year—to persist till near puberty, and then to shrivel up. Deafness from Eustachian obstruction is a common result of the growths. But it is neither so great nor does it happen early enough to cause muteness. Added, however, to the deafness due to labyrinthine disease, or even to that caused by destructive disease confined to the middle ear, it may well be a cause of surdism. Post-nasal growths are very common in deaf mutes. Roosa

[1] Moos, *Archives of Ophthalmology and Otology*, 1871, p. 147.

and Beard appear to think that middle ear inflammation, associated with pharyngeal catarrh, is the commonest cause of congenital deafness. Hartmann, while combating this view, states that he has observed several cases of deaf mutism in which the examination of the membrana tympani, and of the mucous membrane of the pharynx, showed that the deafness had been caused by a naso-pharyngeal catarrh in early childhood. Like Hartmann,[1] the author has met with several cases in which no other ascertainable cause was present. He has not met with any case in which hearing was certainly present at birth and where the evidence was quite clear that speech had been prevented or lost through deafness due solely to post-nasal disease, and he does not think that post-nasal disease commences early enough in childhood to be the prime cause of surdism.

The Internal Ear.—The internal ear being the essential part of the organ of hearing, a detailed description of the morbid changes which have been found here at the autopsies of deaf mutes is important. Disease may conceivably attack the labyrinth without the interposition of the middle ear or the auditory nerve. Voltolini put forward this view. Gruber describes a case:[2] "The tympanic membrane and the structures in the tympanum were unaltered, but the inner ear showed signs of an old labyrinthitis. There were thickening of the osseous structures, degenerative changes, and only rudiments of Corti's organ present. The patient was a deaf mute, twelve years old, who died of typhoid and, according to her relations, heard and spoke well up to the age of three years, when she lost her hearing and speech after an illness of some days' duration. Gruber looks on the case as one of primary labyrinthitis, although a possible explanation is that this condition was a result of a meningitis, no trace of which could be found at the autopsy. Still, familiar as we now are with primary labyrinthitis in adults, there is no reason to doubt that it occurs in children, and that it produces

[1] Hartmann, *Deaf Mutism*, 1880.

[2] Gruber, *Diseases of the Ear*, English edition, p. 518.

changes similar to those detailed above, and, in bilateral cases, deaf mutism.

But a structure so protected and enclosed as the internal ear, and yet so close to the middle ear, is more likely to become diseased through the medium of this more accessible part. And this is exactly what post-mortem examination teaches. Ossific and degenerative changes in the internal ear are generally accompanied by evidence of intense inflammatory mischief in the middle ear. The mode of attack here is well illustrated by a case given by Moos[1]—that of a girl who was rendered completely deaf by scarlatinal otitis at the age of nine years, and who died of purulent meningitis at the age of twelve. The child lost her hearing and had vertigo and staggering gait on the fourth day of the scarlet fever. On the same day purulent discharge of both ears set in. At the post-mortem examination three years later two sets of changes were seen. A recent set, consisting of purulent inflammation of both niches of the fenestrae, recent necrosis of the facial canal and the niche of the fenestra ovalis, bilateral necrosis of the cochlear capsule, inflammatory changes of both vestibules, and destructive changes of both auditory nerves. These were due to the purulent meningitis of which the patient died. The second and older set caused the deafness, and consisted of new-formation of bone in the first whorl of the cochlea, destruction or metaplasia of the lamina ossea into connective tissue. Parts of both scalae were ossified on the left side, some of the semicircular canals were ossified or filled with connective tissue. In addition to this there was destruction of both tympanic membranes, the hammer and anvil were exfoliated in both, and other signs existed of old destructive inflammation in the middle ears of both sides.

An equally interesting case is given by Mygind. Here, too, the cause of deafness was scarlatinal otitis intima happening at the age of $3\frac{1}{2}$ years, and the cause of death purulent meningitis at the age of nine years. Both middle ears suppurated during the attack of scarlet fever, and

[1] Moos, *Archives of Otology*, Vol. XXII., p. 64.

left the child so deaf that the attempt to educate him at a hearing school failed. The suppurative disease continued and developed, and the boy died of purulent meningitis in the Royal Deaf and Dumb Institution at Frederica (April, 1892). The labyrinth of the left side was entirely obliterated and replaced by hard bony tissue. The auditory nerve of this side was normal, but in the middle ear there were neither ossicles nor was there a membrane. On the right side cholesteatomatous masses filled the middle ear, but there was no membrane nor ossicles; the labyrinth had its normal bony outlines, but the membranous structures were missing.

That such is the usual channel of infection of the internal ear in scarlatina and in the exanthemata generally is pretty clear. That it is the only channel by which mischief threatens, Hartmann's experience renders doubtful (see p. 155); that in approaching the internal ear great damage is necessarily done to the middle ear in these cases, is negatived by a case narrated by Uchermann.[1] A boy, who ultimately died of pulmonary phthisis, became deaf at the age of $2\frac{1}{2}$ years from scarlet fever. At the post-mortem the right tympanic membrane and the contents and lining of the tympanic cavity were found to be quite normal. The annular ligament of the stapes was ossified and the bone was immovable. The round window was closed by a bony plate. The only traces of a labyrinth found were a canal, half a centimetre long, filled with fibrous tissue and representing the superior semicircular canal, a small cavity lined with thick periosteum representing the vestibule, and near the ossified fenestra rotunda a short undivided canal one and a half centimetres long. The left auditory canal and tympanic cavity were filled with pus, and the membrane had five perforations in it; the ossicles were movable. The membrana rotunda was ossified. This case is very interesting—a scarlatinal otitis which destroys the left middle ear to a great extent, leaves the same internal ear untouched, while the opposite internal ear is almost obliterated although

[1] Uchermann, *Archives of Otology*, Vol. XXII., p. 208.

the middle ear is normal. As both auditory nerves were normal, the mischief can hardly have approached from the side of the brain.

Like Hartmann, the author[1] has clinical evidence that this feature of invasion of the inner ear in the course of the exanthemata is not uncommon. In four out of ten cases where deaf mutism was due to measles, he found perfectly normal membranes. Still, destructive changes in the middle ear are common in deaf mutism due to measles. Moos[2] gives a case in which a boy, aged three years, developed an affection of the labyrinth in the course of an attack of measles. At the post-mortem examination, in addition to the changes in the middle ear proper, there was a perforation in the membrane which closes the fenestra rotunda, whilst inflammatory signs were present in its neighbourhood. Ossification had begun in the cochlea, although the diseased process was not more than a fortnight old. Thrombosis and degenerative changes were also going on. The changes are traced by Moos to bacterial invasion.

Mygind[3] gives a similar case, in which it was found that the disease had spread from the naso-pharynx to the middle ear, and thence to the mastoid and internal ear. There were no membranous contents in the labyrinth, the right mastoid was sclerotic, and the membrane thickened and calcareous; the left membrane was completely destroyed and the tympanic cavity filled with gelatinous matter.

There can be no doubt that, although less commonly, mischief may approach the inner ear from the side of the brain. This is the mode of attack in cases of meningitis and other brain affections (see pp. 162-3).

Moos and Steinbrügge[4] report the case of a girl born in September, 1869, who lost her hearing in her fourth year from encephalitis. She died in 1881 from an eclamptic seizure, with paralysis of the right side, after

[1] J. Kerr Love, *Archives of Otology*, Vol. XXII., p. 273.
[2] Moos, *Archives of Otology*, Vol. XVIII., p. 49.
[3] Mygind, *Archives of Otology*, Vol. XX., p. 310.
[4] Moos and Steinbrügge, *Archives of Otology*, Vol. XII., p. 304.

an illness of two weeks. The left labyrinth showed colloid degeneration in the connective-tissue layers of the utricle, semicircular canals, and ampullae. The right labyrinth was normal. In the left parietal lobe there was an encephalitic patch, with softening in the adjacent parts extending to the vicinity of the lateral ventricle. The brain was too hardened for thorough examination, but as the right ear was normal, Moos and Steinbrügge think the almost total deafness was due to disease of the cerebral cortex. Both external and middle ears were normal.

When the mischief attacks the internal ear in the course of such diseases as measles and scarlet fever, without damaging the middle ear, or when the same result follows a brain affection without affecting the auditory nerve, a metastasis may account for it, as in the case of the kidney affection accompanying scarlet fever. But such is not the usual course in brain affections. The inflammation in brain disease may proceed, as Moos supposes, by the perivascular and perineural lymphatic spaces, or the micro-organisms which are the immediate cause of the pathological change may proceed by the aqueductus cochleae. Evidence of this latter mode of propagation has been given by Haberman, Mygind, and others. Between the morbid anatomy of epidemic meningitis and that of sporadic meningitis there is no essential difference. Probably the usual channel by which the disease travels is the internal auditory canal, as we have seen already in Ziemssen's and Heller's cases.

Dalby thinks that, next to scarlet fever and measles, syphilis is the commonest cause of deaf mutism in children born with good hearing.[1] Meningitis should rank with scarlet fever, but with that addition we agree with Dalby.

The case of syphilis is peculiar. The exanthemata and other acquired constitutional diseases are not transmitted to the progeny. These latter receive no taint from the parents, and to be rendered immune must take the disease for themselves. But with syphilis it is different. It is the only *acquired* constitutional taint which is certainly trans-

[1] Dalby, *Lancet*, February 10th, 1877.

mitted; the children begotten after the poison enters the parental blood are often still-born, and when they live are often weaklings, marked by evidence of the parental taint. The organ of hearing suffers in syphilis like many other parts, but the true cause of the deafness is seldom given in these cases. Post-mortem evidence of the effects of syphilis in producing deaf mutism is not awanting.

Moos and Steinbrügge[1] give the results of three autopsies of deaf mutes who died of phthisis, in the first of which they suppose the deafness to be due to syphilis. There were changes due to hyperplasia—hyperostosis of the external meatus of the tympanum and antrum, also obliteration of the mastoid cells, also a roof-like projection of the niche of the oval window, and thickening of the promontory. The case was not accompanied by any history.

Dr. Walker Downie has sent the writer the following hitherto unpublished case:

In October, 1891, a lad, *aet.* 17, asked advice at the ear department of the Polyklinik in Glasgow. There was a history of general weakness during childhood, and of a chronic ophthalmia with coincident falling of the hair. During the recovery from the eye affection, which occurred about the age of seven, his hearing began to fail, and in six months he was totally deaf, his last remnant of hearing leaving him suddenly. The family history—which showed a series of miscarriages, premature births, and still-born children—pointed to the entrance into the maternal blood of the syphilitic poison between the first and second pregnancies. The deaf boy was the result of the tenth conception, and his own possession of the taint was shown by the ground-glass look of the cornea of each eye, his serrated upper incisors, etc. He was dull and stupid, and his voice was monotonous. Tested by the tuning fork, bone conduction was found to be absent. On the right parietal region was a hard, smooth, painless swelling, an inch and a half long and fully an

[1] Moos and Steinbrügge, *Archives of Otology*, Vol. xv., p. 123.

inch broad, said to be the result of a blow got two years before, but doubtless a gumma. Under grey powder and mercurial inunctions his hearing probably improved a little.

In June of the following year Dr. Downie was called to see this lad, in company with the family attendant. Convulsions had set in, and there was paralysis of the left leg and arm. A sloughing, fungous mass occupied the site of the swelling on the right parietal bone. The patient was removed to hospital, and an attempt was made to improve him by operation, but he died on the following day.

The following is the report of the post-mortem examination:

The surface generally was pale, and the body very spare. There was a gaping, partly incised wound near the summit of the head, to the right of the middle line, the anterior border of which is immediately above the external meatus. This wound was occupied in its middle part by a soft, haemorrhagic mass, which projected through an opening in the skull. There was a considerable gap in the dura mater, to which the brain substance was partly adherent. There was a corresponding gap in the brain substance, which may be in general described as involving the ascending parietal convolution, except its lower extremity, and a considerable part of the parietal lobe. At the base there was a considerable purulent infiltration of the soft membranes extending somewhat into the sylvian fissure.

Along the right border of the liver were numerous deep cicatrices, but no actual gummata were found. The thoracic and abdominal organs generally were found to be in a highly amyloid state. The right temporal bone was removed and placed in an acid solution to prepare it for section.

On examining the bone externally, the small size of the mastoid process was the only feature in which it appeared to deviate from the normal. After section of the bone, the following changes were found in the ear. The external auditory meatus was found normal in appear-

ance; the tympanic membrane was thin and translucent and free from adhesions. The malleus was healthy and normal in size and form. The incus, which was displaced during the section of the bone, was healthy, but the base of the stapes was incorporated with or ossified to the border of the foramen ovale, immovably fixed to the inner wall of the tympanum. The lining membrane of the tympanic cavity was intact, and the Eustachian tube was patent.

The tympanum was of average size, the attic well developed, but there were no interstices in the bone posteriorly, *i.e.* the mastoid, which, as stated, was unusually small, was solid.

The internal auditory meatus was next examined. At its inner extremity it was of average normal size and calibre, and both the auditory and facial nerves contained therein were healthy. But, tracing it outwards at a distance of 1 cm. from the inner opening, the upper wall became suddenly thickened, encroaching on the canal, and at a further distance of 3 mm. the canal was almost completely obliterated.

The vestibule was so greatly encroached upon as to make it doubtful as to whether any of this space remained. The cochlea was easily examined, and was of average size, but the modiolus and lamina spiralis ossea were so thickened as to occupy an unusually large proportion of the cavity of the cochlea. Of the semicircular canals only a trace of the external-horizontal one could be found, the remaining portions of this part of the labyrinth being lost in a mass of dense bone of ivory hardness. There can hardly be a doubt that these ossific changes were of syphilitic origin, and that the immediate causes of the deafness were partial destruction of the labyrinth and pressure on the trunk of the auditory nerve.

When the whole labyrinth is not destroyed, the part most frequently affected is the semicircular canals. Next in order of frequency comes the cochlea, and lastly the vestibule. Why this order is observed depends probably on the anatomy of the parts. The semicircular canals

and the scalae of the cochlea are narrow, and their lumen is more easily filled up by new deposits than the cavities of the vestibule. Often only one canal is described as absent or destroyed, often the cochlea is described as having a smaller number of turns than usual. In a given case it must be very difficult to distinguish between what is the result of malformation and what is simple obliteration, if the inner ear only is affected. But if a clear clinical history can be got, and if the middle ear be carefully examined, a safe conclusion may be arrived at.

The suppuration in the ears of deaf mutes, which persists in many cases of acquired deafness, is fraught with the same danger to life as in other cases of chronic middle ear disease. The following case, which has not before been published, was sent the writer by Mr. Illingworth, of Henderson Row, Edinburgh, and is extracted from the Clinical Journal of the Edinburgh Infirmary wards.

J. P. T., a deaf mute at the Edinburgh Institution, lost his hearing at five years of age from a fever, which, in addition to the deafness, caused paralysis of the left side of the face. The report states that he had been subject to intermittent discharge from the ears and twitchings of the face. On February 18th, 1890, he was seized with watering at the eyes, pains in the head, and on the following day with vomiting. On admission to the infirmary he had a temperature of 103 degrees, tenderness over the mastoid, and an enlarged lymphatic gland below that process. The auricle protruded a little. There was twitching of the right side of the face and intolerance of light on the eye of the same side. There was no discharge from the ear, but the meatus was filled with hard pus. On the 3rd March Mr. Miller opened the mastoid. He found the bone soft at first, but sclerosed in its deeper parts. After some trouble a current was made to pass between the antrum and the tympanum, the water dislodging cheesy masses. The patient died on the following day. At the autopsy there was found suppuration down the neck below the sterno-mastoid into the mediastinum. There was septic phlebitis of the jugular vein, which had

evidently spread from the lateral sinus, in which were found several purulent clots. There were small abscesses commencing in the temporo-sphenoidal lobe of the brain, and also in the cerebellum, also pyaemic abscesses of the lung. An enlarged gland was found below the mastoid process.

The tendency in the earlier part of this century to find the cause of congenital deafness always in malformation has lessened very much in late years. Recent examinations have done much to show that many of those cases formerly supposed to be due to malformation are really the result of disease—in most cases post-natal. Sometimes, although it may be pretty surely concluded that the deafness is due to disease, it may be impossible to say whether the change be a pre- or a post-natal one. Pathologically, however, this is not an important point, as there is no reason to believe that the changes before and after birth are essentially different. Cases of real arrest of development are not uncommon. Moos and Steinbrügge[1] report a case of total absence of both labyrinths. In the right ear they saw the rudiments of a vestibule which had remained undeveloped, or had become atrophied in the foetal period. In the left ear there was no trace of semicircular canals, ampullae, or cochlea. Both auditory nerves were normal, the atrophic changes had not attacked the facial. They believed the atrophy to be the result of inactivity, and that the conditions described were due to disturbance of the auditory nerve in its development.

They further describe two cases in which the destructive changes in the labyrinth were due to inflammatory mischief in intra-uterine life or in early childhood. The cavities of the labyrinth showed caseous masses and fatty degeneration, and the nerve-structures were to a large extent destroyed.

Edward Cock,[2] at the request of the physician connected with one of the deaf and dumb institutions, examined

[1] Moos and Steinbrügge, *Archives of Otology*, Vol. xi., p. 236.

[2] Cock, *Transactions of the Royal Medical Chirurgical Society*, Vol. xix., 1835.

the ears of five deaf mutes who all died of strumous disease. In three cases the same disease had attacked the middle ear, causing much destruction. In other two cases Cock believed the deafness to be due to malformation, which consisted of partial deficiency of two of the semicircular canals, the canals being deficient in their middle but patent at their extremities. In the second case, in addition to these changes, the membrane of the round window was replaced by bone on the left side. There was no microscopic examination, and there is no note about the cochlea.

Scheibe[1] describes a case in which the autopsy showed the deafness to be due to nervous atrophy. The brain was not examined. The atrophy was confined to the nerves of the cochlea, saccules, and posterior ampulla, the nerves of the utricle and the other ampullae being unaffected. There was no trace of any former inflammation.

Nuhn[2] gives a case. In the vestibule there were no membranous contents, the cochlea formed a large cavity and had no membranous contents. There were no membranous semicircular canals. There was no auditory nerve, and the meatus auditorus internus was contracted; the tractus spiralis was absent. The cranium was asymmetrical.

Michel[3] describes a case. On the left side the middle of the posterior and superior semicircular canals were absent. On the right the posterior half of the superior, and the anterior two-thirds of the posterior semicircular canals were absent, the remaining parts being contracted. The vestibule was enlarged towards the external canal, which was absent. The auditory nerve was hard, without any microscopical abnormalities.

In another case of Michel's, there was no mastoid process, no labyrinth, and no auditory nerve, whilst the petrous bone itself was deformed.

[1] Scheibe, *Archives of Otology*, Vol. XXI.

[2] Nuhn, quoted by Mygind, *Deaf Mutism*, 1894.

[3] Michel, *Memoir on the Congenital Anomalies of the Internal Ear*, 1863.

Politzer[1] gives the following congenital case in which the auditory nerve was affected:

D. M., *aet.* 61, said to have been born deaf—the external and middle ears were normal, the membrane of the fenestra rotunda was very thin and movable, there was hydrocephalus internus chronicus, pachymeningitis chronica, the striae acousticae were faintly developed, the stem of the left auditory nerve was gelatinously degenerated.

In Nuhn's case complete absence of the auditory nerve was noted. This is a malformation which has been rarely noticed at the autopsis of deaf mutes. Atrophy of special branches has also been noted in the foregoing pages. As long as the nerve remains in communication with a healthy nerve centre atrophy of the auditory trunk probably does not happen (Moos). But partial atrophy, or even atrophy of the whole trunk, is not uncommon, and here the cause is probably some affection of the brain, the evidence of which may have quite disappeared at the date of the examination. Careful examination of the brains of deaf mutes appears to be rarer even than that of the internal ears. An investigation of such cases is likely to discover destructive changes at the auditory centres.

Writers on deaf mutism have spent much time in bringing together all the post-mortem examinations which have been made of the temporal bones of deaf mutes. The present author questions the utility of such a complete picture as this aims at. Many of the examinations are incomplete, many have not extended as far as the inner ear at all, others have dealt only with the bony structures of the labyrinth. In many the microscope has never been used. In this chapter it has been the object to choose cases which disclose the nature of the lesion by which the labyrinth is destroyed in deaf mutes and to show the channels by which the mischief reaches the inner ear. In spite of the number of post-mortem examinations which have been made in cases of deaf mutism, those in which there is at once a clear clinical history and a careful examination of all sections of the

[1] Politzer, *Diseases of the Ear*, Dalby's translation, Vol. II., 1894.

ear and of the brain, are still rare. Enough however exists to show:

1. That acquired deaf mutism is usually due to disease of the internal ear, which has spread by the middle ear and caused inflammatory changes involving destruction of the membranous labyrinth and of the nerve structures which it supports. In a smaller number of cases the danger approaches from the side of the brain, and more rarely the damage to the inner ear is due to a primary labyrinthitis.

2. In congenital deafness the changes on which the deafness depends are not essentially different from those described above, except in the cases which depend on arrest of development and malformation. They consist of obliteration of the normal nervous structures by inflammatory new-formations—chiefly osseous. It is not possible to estimate the proportion of cases due to malformation, but it is undoubtedly smaller than was formerly supposed. After a series of years it cannot be decided in many cases whether a given structure has never existed or has been obliterated.

CHAPTER VII.

DIAGNOSIS, PROGNOSIS, AND TREATMENT OF DEAF MUTISM.

DIAGNOSIS.—The diagnosis of deaf mutism is difficult only in the very young. There can be no doubt that the sense of hearing is present in the early months of life. Speech, however, does not develop with the same regularity or uniformity, and in a hearing child may first appear as late as the third or fourth year. Later than that the absence of speech in a hearing child is usually due to aphasia, if it be not part of the idiotic habit. Deaf mutism is not readily mistaken for idiocy, although idiocy may be present with the former, including and accounting for it. The absolute test for all these conditions is the test for hearing. These have been so carefully detailed in Chapter III. that further discussion of them is here unnecessary. All tests must be applied behind the back of the listener or with his eyes covered. There must be no question of lip reading.

Feigned deaf mutism can always be detected, although "Dumb Lizzie," the prototype of Scott's Fenella, appears to have withstood all ordinary tests. If sudden and unexpected loud reports do not surprise the suspected individual into giving evidence of hearing, then the administration of an anaesthetic would supply the half-conscious moments when the suspect must be off his guard.

The general character of deaf mutes has been discussed in an earlier chapter. Apart from the absence of hearing and speech, the signs and symptoms of deaf mutism are

not characteristic. Inspection of the ear gives nothing distinctive. Every institution contains cases of middle ear suppuration, but these do not differ from the same condition in hearing children. About 8 or 10 per cent. of Glasgow children require treatment for this condition on admission. About 10 per cent. also admit that they have pain in the ear occasionally, and chiefly at night. Giddiness is seldom complained of, and noises in the ear appear to be rare.

PROGNOSIS.—The outlook in cases of deafness of that degree, which is followed by dumbness, *i.e.* cases of surdism, is necessarily grave. This is so:

1. Because it occurs generally in early childhood, when its presence is difficult to ascertain.

2. Because it is generally due to damage to the internal ear, the auditory nerve, or its connections in the brain.

In congenital cases improvement sometimes begins spontaneously. Politzer[1] says, "I have only observed complete cure in one case. It was in a boy three years old who was examined in 1862 and found to be a deaf mute with no perception of sound. In his sixth year, however, the child was presented by his mother, with the information that his hearing had gradually developed within a year, and that he now heard quite well. On careful testing, I indeed found normal hearing on both sides, but speech was faulty and indistinct. When I was consulted in 1878 by the youth, then nineteen years of age, I found normal hearing on the right side, but on the left the membrana tympani was perforated in consequence of suppuration of the middle ear of a year's duration; the hearing distance for the acoumeter was a third of a metre; for whispered speech, a metre; and for speech, normal." The two following cases also illustrate this as well as the improvement resulting from treatment. B. F. was born deaf, and no signs of hearing were observed till she was four years of age, when she began to hear loud shouting. She did not speak till she was twelve years of age, when inflation was tried in Kansas City. When the writer saw her in December, 1894, she was still very

[1] Politzer, *Diseases of the Ear*, translated by Dalby, 1894, p. 706.

deaf, but heard enough to admit of conversation in very loud tones. He removed adenoid masses from the naso-pharynx. This was followed by further improvement in hearing, and she can now carry on conversation more easily, and indeed acts as the interpreter between her younger deaf brother and the writer. She is 14 years old.

A. F., *aet.* 5, was also born deaf. When three years old he heard and spoke nothing. About this time his hearing began to appear without treatment. Now he distinguishes vowels and a few numbers imperfectly. He is brother to the above B. F.

Cases of this kind suggest two important points:

1. Congenital deafness does not mean total absence or destruction of the internal ear, and there may be a development of the organ, and certainly there is sometimes a development of its function long after birth.

2. Treatment applied to the middle ear and naso-pharynx may remove causes which accentuate an already existing deafness due to absence or destruction of parts of the internal ear.

The prognosis, therefore, in congenital deafness is not altogether bad. So strongly was the father of these two patients convinced of this, that he has every confidence that his boy of five will, in time, hear like his girl of fourteen. He does not stake their chances so much on treatment as on the proof he has that their hearing has improved, and is now improving spontaneously.

In acquired cases, the prognosis appears to depend on:

1. The amount of remaining hearing.

2. The presence of curable disease in the accessible parts of the organ of hearing—the middle ear and naso-pharynx.

3. The date of onset of the deafness.

That the remaining hearing of a deaf mute is not a stationary quantity the writer feels quite sure. Many deaf children admitted to our institutions with a remnant of hearing are found when tested to have lost much of that remnant. On the other hand, whilst teachers of the deaf seldom witness that improvement which admits of their pupils being removed to hearing schools, they sometimes

notice quite an appreciable improvement in hearing. The question of working upon and trying to improve this remainder of hearing is perhaps an educational one, but as it has a physiological side it will be discussed when speaking of the treatment of deaf mutism.

It must often occur that the deafness is not due to one cause. A cerumenous collection, a tympanum badly ventilated from disease in the nose or naso-pharynx, may make all the difference between merely a high degree of hardness of hearing, compatible with the acquisition of speech, and true surdism and its resultant dumbness. In giving an opinion, it is necessary to bear in mind that these latter conditions seldom are the chief cause of the deafness, and that the disease of the internal ear is the principal, and in most cases the original, cause. It is also the most inaccessible to treatment.

With regard to dumbness, the date of the onset of deafness should be carefully noted. That degree of deafness occurring at eighteen months, which will prevent speech, is quite compatible with its continuance and development when occurring at five or seven years.

TREATMENT.—The history of men's attempts to restore the hearing of their deaf fellows would fill a larger work than this. In the light of modern pathology most of those efforts appear ridiculous. Were it not that they were sometimes made by those whose character and devotion stamped their motives as simple and pure, the record of those efforts had better have been buried and forgotten as charlatanry and quackery. But even now we cannot afford to indulge too much in condemnation of older methods. We know most of them to be useless, sometimes hurtful, hardly ever rational or scientific. But modern treatment gives no brilliant results. We cannot cure deaf mutism now, in the sense of a radical cure, any more than they could in the seventeenth century. And what is more, the clear light of recent pathological research tells us that in most cases we had better not try. Here, as in some other departments of medical treatment, we are reduced to a kind of agnosticism, and turn discouraged from the

deaf mute himself to the study of what has caused his deafness.

All this makes older methods of treatment interesting, and warrants the introduction here of some examples of it.

One of the most curious of these is associated with the name of Ramirez de Carrion,[1] the famous Spanish teacher of deaf mutes, and belongs to about the middle of the seventeenth century. It is as follows:

"First the deaf mute ought to purge himself according to the state of his constitution; and then he ought to be given a special purgative of black hellebore, either in the form of a pill or of a decoction of an eighth of the root of this plant. The author took three ounces of this decoction, into which at night he put two eighths of agaric, and having strained it, added two ounces of syrup of epithyme. Having cleared out the head with this medicine once or twice according to necessity, the hairs on the crown of the head are shaven, leaving a space the size of the palm of the hand, and to this shaven part he applied a salve consisting of 3 ounces of brandy, two eighths of saltpetre and of purified nitre, and 1 ounce of oil of bitter almonds. This composition is boiled until the brandy is consumed, then 1 ounce of naphtha is added; it is then well stirred with a spatula, and reduced to the consistency of a liniment. With this salve the shaven part of the head is anointed once daily, chiefly at night, when the patient goes to sleep. By morning, after the patient has cleared out all the ducts of the brain, the ears, nose, and palate, chewed a grain of mastic or a little liquorice, or, what will be better, a paste of liquorice juice, mastic, amber, and moss, combed back his hair neatly with an ivory comb, and, lastly, washed his face well, he is to be spoken to at the crown of the head, *i.e.* the shaven part; and it is wonderful how clearly the deaf mute perceives the voice which he could not in any way have heard by the ears.

"If the deaf mute does not know how to read he

[1] Bonet, *Method of Teaching Deaf Mutes to Speak*, with a Historical Introduction by A. Farrar, F.G.S. (himself a deaf mute), 1890, p. 55. (Original work, 1620.)

must first be taught the alphabet, and every letter of it must be repeated several times until he can pronounce it, and then he is to proceed to acquire a knowledge of the mode of pronunciation, and thus he must persevere daily until, from the pronunciation of letters, he attains to that of words; and common domestic objects are to be shown him that he may learn their names; and, finally, a number of words are to be spoken together so that he may be able to join them in proper order in discourse. In the first fifteen days the deaf mute learns names at so marvellous a rate that, without a very retentive memory, he cannot make use of them; facility is, however, acquired by practice, and it causes wonder to see the eagerness with which he tries to constantly break out in words."

During the eighteenth century activity was great in the search for cures of deafness. Itard collected cases of supposed cure, and applied many of the remedies. Blisters, the actual cautery, and the moxa were applied to the mastoid. This last application is really a slow cautery. It is a soft, woolly substance prepared from the dried young leaves of Artemisia Chinensis and Artemisia Indica, and is burned on the skin to produce an eschar. Failure must have followed the use of these measures, for soon Itard was attracted to Merle's drops. These, the property of a botanical physician of Bordeaux, were, of course, a secret remedy. Like the heroic counter-irritants above described, no claim is made that they were generally successful, but they are credited with one or two cures. On Merle's death his widow gave Itard the prescription, which is as follows:[1]

℞	Pulverized Asarabacca, - - -	Two drachms.
	Rose leaves, - - - - -	One pinch.
	Horse radish, - - - - -	One drachm.
	Parsley pert, - - - - -	One pinch.
	White wine, - - - - -	Eight ounces.

Boil to one-half, strain, and add Sea salt—two drachms.

But at Paris Itard could not with the famous drops produce the results reported from Bordeaux.

The performance by Sir Astley Cooper in 1800 of the

[1] Scott, *The Deaf and Dumb*, 1870.

operation of myringotomy, or perforation of the tympanic membrane, opened a new field for effort.

In England, in Germany, in France, and in Holland the deaf and dumb had their membranes punctured and even removed wholly or in part. But, although extensively tried, the treatment was soon abandoned. Itard reported on it as useless in the great majority of deaf mutes, and of temporary and slight advantage in the remainder.

During the earlier decades of the present century empiricism and even worse were but too conspicuous in the treatment of deaf mutism.

John Harrison Curtis,[1] who describes himself as "Aurist to His Majesty," etc., and who tells us "that there are very few of the higher ranks of society labouring under deafness or imperfection of the organ of hearing who have not done him the honour to consult him," pretended to restore the hearing of the deaf mute. Curtis found the chief cause of congenital deafness to be "a viscid mucus which fills up the ears of children at birth." He objects to the opinion held by an eminent deaf-mute teacher, "of the impossibility of detecting the causes of congenital deafness, or of the attempts that may be made to rectify them." He gives the details of several cases of cure by the removal of wax, "blistering behind the ear continued gently open so as to form an issue." Wilde justly ridicules Curtis' work, and finds an excuse in his and similar publications for the adverse nature of foreign criticism of English aural surgery.

Ten years later Tod[2] published his work on *Aural Surgery*. His treatment of deaf mutism was general and local. The general consisted of fresh air and suitable food, laxatives, and emetics. These were ordered "so that parts might be developed which till birth had been either malformed or non-developed." Local remedies were

[1] J. H. Curtis, *Cases Illustrative of the Treatment of Diseases of the Ear, both Local and Constitutional*, with Practical Remarks relative to the Deaf and Dumb, 1822.

[2] David Tod, *The Anatomy and Physiology of the Organ of Hearing*, with Remarks on Congenital Deafness, etc., 1832.

employed with the view to "the production of a certain action in the nutritious vessels, so as to induce them to secrete, if possible, those textures which the primordium and embryo have been unable to develop, or to direct the powers of life to the faulty phenomenon in such a manner as to cause the existing structure to act agreeably to the ordinary intentions of nature." For this purpose ammonia, ether, and the mineral and vegetable acids were used locally. Blisters to the nape of the neck and behind the ears were vaunted, and in cases with tubal complications errhines were recommended. Tod regarded the disorders of the throat and naso-pharynx as secondary to similar disorders in the middle ear.

In 1835 Kramer wrote his *Diseases of the Ear*, a work which, within two years, was translated into English. After giving a complete statement of all the accounts of deaf mutes that have been said to be cured, Kramer adds: "I venture to declare distinctly that hitherto no single deaf mute has been cured, that is to say, has been rendered capable of communicating like a person who hears well, with his fellowmen in an unrestrained manner by means of hearing under all circumstances" (p. 305).

And yet, two years later, Dr. Turnbull, of Russell Square, London, began his famous cures of deafness. Turnbull made a Scotch tour, and gave demonstrations in Aberdeen, Edinburgh, and Glasgow. *Chambers's Journal*[1] condemned him, and shortly afterwards retracted the condemnation, praising Turnbull and his methods to the skies. "Experiment (describing the cure) in time showed that in cases of deafness arising from low nervous energy—a class to which nearly all the deaf and dumb belong—the organ may be more or less successfully treated by applying to it a weak alkaloid. This Dr. Turnbull rubs gently on the tympanum (*sic*) by means of an instrument tipped with chamois leather, and generally in ten minutes the effects are manifest."

Amongst the documents in the Glasgow Institution for the Deaf and Dumb are several of exceptional interest

[1] Chambers, *Edinburgh Journal*, Jan. 8th, 1842.

with regard to the Turnbull cases. Mr. Robert Kinniburgh and Mr. Duncan Anderson were at that time (1840) the teachers respectively of the Edinburgh and Glasgow schools. Both were able men, familiar with scientific method. They applied themselves to the exposition of the Turnbull frauds, and succeeded. These "cures" are representative of almost all attempts to "cure" the deaf, and their treatment by Mr. Kinniburgh and Mr. Anderson deserves further notice. Mr. Kinniburgh's letter in reply to Messrs. Chambers's article was published on the 28th February, 1842, but was only privately circulated. Wilde says he possessed a copy. The present writer quotes from the original, which is before him. Mr. Anderson's contribution is a letter to Mr. Kinniburgh, describing Dr. Turnbull's demonstration at Glasgow. The facts and quotations are in this case also from the original.

In Edinburgh Dr. Turnbull is stated to have "effected the entire cure of Miss Catherine Walker, of Kelso," who was educated at the Institution for the Deaf and Dumb in that city. Mr. Kinniburgh points out that this girl was never quite deaf, and after the Turnbull cure he visited her, "and found her hearing much the same as when she left the institution thirteen years before."

Miss Walker, in a letter written in 1863, twenty-three years after her cure, and from which the following is a quotation, says: "I always heard a little, and was taught to articulate by Mr. Kinniburgh. At the suggestion of a friend I went to Dr. Turnbull, who improved my hearing a good deal for a few weeks; but at the end of that time the improvement gradually died away, and my hearing has since continued much the same as it was before I went to him."

During these weeks Miss Walker's imagination must have been stimulated by the excitement of her "cure," for the Messrs. Chambers say that, in a letter before them, she states "that she at first experienced considerable annoyance from the noise of vehicles in the street."

Another case of congenital deafness reported in the

article referred to as "cured" by Dr. Turnbull was that of Andrew Armstrong, son of the county officer for Roxburghshire. Mr. Kinniburgh tested him before his cure, and found "that he could distinguish sounds from one end of his schoolroom to another—forty feet; that he distinctly repeated words after him, and that with the right ear he could distinctly hear the ticking of a watch at a distance of more than a foot."

After the "cure," a repetition of the tests gave exactly the same results.

Three deaf and dumb children in the Edinburgh Day School are amongst those credited to Dr. Turnbull by the Messrs. Chambers as "children who formerly did not hear, and now do so." Mr. Drysdale, their deaf-mute master, writes in 1863, and the quotation is again from the original letter: "In answer to your note regarding the deaf and dumb, I may say that the statement regarding the children reported to have been cured by Dr. Turnbull was not true. Perhaps they heard for a short time while under his treatment, but they were as deaf as ever shortly afterwards, and remained so." Other Turnbull "cures" are discussed by Mr. Kinniburgh and exposed effectively. All are cases of partial deafness and slight ability to speak, the subjects of which are roused to make a special effort in the hope of being "cured," but soon relapse to their former condition. No permanent improvement either in hearing or speech is effected. Turning now from the results of the doctor's practice to a study of his methods, Mr. Anderson describes a meeting of "Dr. Turnbull and his friends at the Argyle Hotel here" (Glasgow). "The newspaper contains an account of what took place, which an ordinary observer would call impartial, but which I hesitate not to pronounce a biassed description of a sleight-of-hand exhibition expressly intended to create a sensation in Glasgow."

Before the demonstration began, some one called out that there was a gong in the room; the doctor said it was not needed. "Dr. Anderson" (A. D. Anderson, M.D., physician to the Deaf and Dumb Institution, is probably

here referred to) "then hinted that to ascertain fairly the degrees of hearing the deaf mutes possessed before the application of the medicine, they should be tested. The evidence of the parents and friends was enough for this, replied Dr. Turnbull." The cure was then administered. "The doctor, having removed the cotton out of the ears of the mute, slapped two books close to them. The young man nodded, at which the meeting exhibited signs of approbation." Mr. Graham rose, and proposed that the doctor should go behind, as the young man both saw the motion of the books and felt the air coming against his ears, and, added Mr. Graham, "I saw the hairs on the young man's head moving by the concussion of the books." (Disapprobation by meeting.) "Next the doctor proceeded to some specimens of articulation. He stood before the young man's eyes with his lips in the position for the sound of 'O,' then sounded it in the mute's ear, who very naturally made the best imitation he could from having seen the lips of his instructor. In the same manner the doctor managed to have the word 'papa' produced. I know that the word 'papa' drew tears from at least one parent in the room. One of the girls who was not able to say 'papa' by seeing the lips of the doctor, was kindly assisted by his fingers being applied to her lips."

"It may be possible," adds Mr. Anderson, "to restore hearing to one born deaf; but that he, on hearing 'O' or 'papa' for the first time should be able to produce it by the lips is impossible and absurd."

The whole of this Turnbull correspondence—which is a very lengthy one—is worthy of reproduction, but in its extended form it is not suitable for a work like this. The alkaloid veratria was the active ingredient in the "drops" used. In addition to this, two manœuvres were practised by Turnbull. "Finding cured persons relapse in consequence of a defect of wax, the doctor was prompted to use his ingenuity in endeavouring to discover the means of sustaining that secretion." Chambers's article tells how the doctor, reflecting on the effect produced by the appli-

cation of the mouth of the child to its mother's breast, applied the principle to the ear by constructing a syringe with an india-rubber mouth exactly fitted to the aperture of the ear. "The plan was successful, the blood-vessels resumed a free circulation, and the flow of wax recommenced. It strikes us that we have rarely known a more beautiful instance of a simple natural principle being taken advantage of by human ingenuity for a humane end." The other manœuvres consisted of the application of a pneumatic extractor, the tube of which was introduced into the mouth of the patient, "and applied to the orifice of the Eustachian passage," so that communication might be opened between the previously rarefied air of a receiver "and the orifice, from which a discharge of mucus is soon made into the tube, which is then withdrawn." Rather a delicate operation this for a man to perform, who, according to Wilde, saw two of his patients in 1839 become the subject of coroner's inquests, after he had performed on them the exceedingly simple and usually harmless operation of catheterization of the Eustachian tube. One of the most deplorable aspects of this story of quackery and charlatanry is that which shows that educated men and members of the medical profession were duped. If *Chambers's Journal* is to be trusted, several professors of the Aberdeen University were deceived, and two hospital surgeons, one of them attached to the Ophthalmic and Auric Institution, gave documentary certificates of the cures. "And," writes one of these surgeons, "I here witnessed the application of your remedy to the ears, and bear testimony to their [the deaf mutes] having in my own presence obtained the sense of hearing, and by my own tuition in a few minutes afterwards acquired the power of articulation." And this in Aberdeen! No wonder Wilde adds, "I wonder was it broad Scotch they spoke?"

We have seen that Kramer was a pessimist with regard to the treatment of deaf mutism. Wilde was, if possible, more so. Both of these eminent aurists very rightly dissociated themselves from the "cures" of their time.

But the dread of being classed with the authors of such "cures" probably hindered them from initiating more scientific treatment. Wilde[1] says: "Except by miraculous interference, I do not believe the true congenital deaf mute was ever made to hear; and those who lose their hearing so early in life as never to have acquired the faculty of speech, come into the same category." And again, "I must say I do not think it honest in any legalized practitioner to attempt the cure of complete deaf dumbness, notwithstanding the advice of Mr. Williams, that a cure ought always to be attempted."

Harvey[2] thought many cases of deaf mutism were due to "teething." He gives a case in which a twin child, aged two, recovered his hearing. After blistering behind the ears, scarification of the gums every two or three days, and doses of calomel and chalk, a visible change occurred in three or four months; and at three years old, though somewhat deaf, the child talked nearly as well as the majority of children do at that age. He recommends this treatment in all cases of suspected deafness. It should be noticed that teething may mean almost anything in a young child. When it does cause deafness, it is generally another name for meningitis. Possibly Harvey's case was only one of late development of speech.

Toynbee's[3] treatment resolved itself into counter irritation behind the ear, the use of the syringe when discharge was present, and, where a remnant of hearing was present, the use of the ear tube or trumpet. When no hearing remains, he frankly acknowledges the futility of treatment.

The treatment of deaf mutism divides itself into that dealing with the diseases which cause the deafness, and that directed to the removal of the deafness. In this country the careful management of the exanthemata—particularly scarlet fever and measles—opens up the largest field for effort. Preventive treatment will do much here.

[1] Wilde, *Aural Surgery*, 1853.
[2] William Harvey, *The Ear in Health and Disease*, 1854.
[3] Toynbee, *Diseases of the Ear*, 1860.

Any earache, any discharge from the middle ear, any blocking of the nostrils preventing proper removal of mucus from or ventilation of the naso-pharynx, should be at once attended to.

Adenoid growths of the naso-pharynx are very general in our midst. The writer finds this condition present to an extent which produces symptoms in a large percentage of the children he has to deal with in private practice. It is almost always present in catarrhal deafness in children (non-suppurative catarrh of the middle ear). It is very often the cause of the failure of ordinary treatment in suppurative catarrh. At his clinique at the Glasgow Royal Infirmary the writer always removes these growths when present, and is able to cut short many cases of suppurative disease and of catarrhal deafness at once. The routine examination for, and removal of these growths from the naso-pharynx has enabled him almost entirely to render the tedious treatment by the Politzer bag unnecessary in young children. At the Deaf and Dumb Institution at Langside, Glasgow, more than half the children were found decidedly affected by these growths. The careful examination of the throat and naso-pharynx of every deaf-mute child, and the removal of these growths or of enlarged tonsils, should be practised:

1. If there is any reason to suppose that they contribute to or accentuate the deafness;

2. If in an oral pupil the articulation is not quite satisfactory;

3. On ordinary surgical principles, if they produce any other symptoms unconnected with the hearing or speech.

In cases of deafness occurring after birth, the early recognition and treatment of the ear affection is all-important. At the Glasgow Institution for the Deaf and Dumb we have often to deal with cases in the diagnosis and treatment of which the aural speculum has never been used. The teachers there constantly protest to the writer about the manner in which the parents of deaf children are put off by medical men. These parents are told by their doctors to let their children alone, as

hearing is sure to appear at the age of five or seven years. Now, advice of this kind not only displays ignorance of ear disease, but is a paltry attempt to cover that ignorance, and results most disastrously to the deaf child. Many cases involving disease of the middle ear, both suppurative and non-suppurative, are amenable to treatment at their onset, but three or four years later have as one symptom incurable deafness. The spread of knowledge in the profession about ear disease will in time lessen this evil. Meanwhile it is the duty of medical men to see that every case of disease of the ear occurring in the young receives immediate attention.

The ears of deaf mutes must be treated on ordinary principles. Plugs of cerumen, pieces of cotton wool, and other foreign bodies should be removed. The source of any discharge should, if possible, be discovered and treated. After the removal of adenoid growths, enlarged tonsils, etc., the air douche should be applied regularly for a month or two if there is a large remnant of hearing left, and particularly if the cause of deafness be, even in part, in the middle ear. In these cases of semi-deafness, where there is some remaining hearing to work on, musical training should be added. A piano or violin may be used as the stimulus to the half-dormant sense of hearing, and, along with daily exercises on the hearing of the voice, in which the ear may be assisted by ear trumpets, something may thus be done to increase hearing power, or at least the power to discriminate between sounds of different qualities.

In one sense the treatment of deaf mutism includes the education of the deaf mute. This is not the place for the discussion of educational methods. There is, however, one method which, from its physiological aspect, calls for notice. Whether oral instruction has in it stimulus enough for the development of latent hearing is a question on which teachers do not agree. Probably the voice is not used loudly enough to reach the auditory nerve in most cases. Where a large remnant of hearing is left it may be heard, but with a small remnant more is needed. The writer has advocated for the semi-deaf a combination

of the oral method with one which appeals solely to the remaining hearing, and has called this combination the Oro-acoustic method. As early as 1892 he, along with Mr. Addison, presented a statement to the directors of the Glasgow Institution on this subject. When tested, about 13 per cent. of the Glasgow children heard a good deal and spoke a little. This hearing was such that distinct and loud talking could be heard and partially understood either with or without the help of ear trumpets. Now these children, placed among those who are deafer, have no inducement to listen, and get deafer under the sign system. Even oral training will not preserve, and much less develop, their speech and hearing. In America, Mr. J. A. Gillespie, of the Nebraska Institution, has advocated the Acoustic method, and he finds that 15 per cent. of deaf children can be taught by the impaired sense of hearing. In answer to question 11 of circular sent to headmasters, Mr. Howard, of Doncaster, states that in his school 15 per cent. receive special attention in the matter of the further development of hearing. Where acoustic training is tried, the voice should be aided by the use of ear trumpets, conversation tubes, and other carriers and gatherers of sound.

Lately Urbantschitsch, of Vienna, has brought up this subject. He has reduced acoustic training to a system by which separate vowels are first used; after they have been appreciated, consonants are tried; and ultimately whole sentences are spoken to the deaf child. Gratifying results are reported.

It is difficult to estimate properly such improvement. Nearly all very deaf children appear totally deaf on entering our institutions. So incapable are they of understanding the sounds which reach their ears that tests for hearing in untaught deaf mutes are quite valueless. How much then of the apparent improvement in hearing is due to teaching—teaching which makes the child appreciate what it has always heard? That the view here suggested is largely held by many intelligent teachers is shown by the replies made to question 11 in the circular (see Introduction). The answer from

Mr. Townsend, of Birmingham, expresses the view referred to: "Assuming that such apparent improvement manifests itself, may it not be an increased power of discriminating as between the different sounds of words through concentrated effort and attention, and assisted to some extent by an acquaintance with lip reading, that will account for this, rather than any actual development or increase of hearing power?"

It should be stated that in Urbantschitsch's cases the training is ultimately carried on so that the speaker's lip movements cannot be observed.

An interesting case is related by the headmaster of Leeds: "The hearing of one girl certainly seemed to have improved very much, and she spoke well. The parents tried to remove her at 14, on the ground that she was not deaf. The case came before the Justices. The girl read the lips well, but when, acting on my suggestion, she was turned with her back to the speakers, she entirely failed to carry on the conversation."

With the exception of Mr. Van Praagh and the headmasters of Exeter, Doncaster, and one or two others, I have not found much support for the theory that oral teaching alone improves hearing.

Nearly all other teachers think that no very great improvement in hearing accompanies oral training. The present author thinks pure acoustic training applicable to only a small number of the deaf—those with a good remnant of hearing. Combined with the oral training, it has a more extended utility.

Probably the success of the acoustic method depends very much on the ability of the teacher to devote his whole attention to a small number of pupils. It is useless to attempt it in a class of eight or ten. The teacher's efforts must be on a line with the deafest child in the class, and those who hear better are necessarily dragged down to oral or sign work as a consequence. But with two or three children on the borders of surdism, a determined teacher may produce good results by carrying on his instruction through the auditory nerve, having

recourse to oral help when his voice cannot be distinguished.

The education of the deaf by the ringing of bells and the production of other shrill sounds is not a new practice. Itard experimented with it. But, used in the light of a careful examination of the ears, and with the help of modern surgical treatment, acoustic training is only now beginning to be properly appreciated.

Leaving the case of the individual deaf mute, let us see what help this clinical study lends towards the settlement of the ever-burning question of educational methods. Are we to have the oral system only, or the silent system, or the combined system, or what? Does a careful study of the deaf mute and the cause of his deafness say how all are to be educated? It does not. Such a study pronounces in favour of no single system.

There is nothing about deaf mutes which makes the education of all by *one* method compulsory. What have deaf mutes in common? Not the degree of their deafness. Some are just beyond hearing ordinary conversation, just outside the range of a teacher's voice; others are stone deaf, and cannot hear a clap of thunder. Not their dumbness. Some enter the institutions with a fair vocabulary, others never spoke a word in their lives. Not the degree of their intelligence. Some border on idiocy, others are as bright and intelligent as any hearing child. They have nothing in common except their inability to study in the Board schools. But that does not say there is only *one* other method of teaching them. Depending as deaf mutism does on causes so various, associated as it is with mental capacity of such unequal degree, accompanied as it is by remains of hearing and speech so different in amount, it cannot be managed to the best purpose on any one system. The semi-deaf should never be dragged down to the silent system until oral and acoustic training have failed. It is equally absurd to attempt to make good oral pupils of stone-deaf children of poor intelligence. If the deaf are to be educated successfully, each child must be treated on his merits.

An example is worth giving. Take the case of the boy quoted on page 162—total deafness occurring at six years old, but leaving the subject of the disease undamaged intellectually. In September, 1895, I met this lad in Arran, and after dark, with the aid of an oil lamp shining on my face, I learnt his history from his own lips. The ferryman at Whiting Bay told me that unless he changed the subject, he could converse with him for a whole forenoon without having to repeat almost anything. When the subject was changed, repetition was sometimes necessary for a little at first. The boy's father tells me that "he has lately passed first class in the Junior Oxford Local Examination (with distinction in German). His master desires him to study for an Oxford degree. He leaves school at Christmas (1895) for mechanical engineering. He devours all ordinary books he comes across, and keeps talking to everybody, and largely on this account his natural voice is greatly preserved. His language is certainly more than enough for all purposes. He has never learnt signs." The lad himself assures me that he has no desire to use signs, and is convinced that he will never need to do so. Now, why throw away this lad's speech at six years of age and teach him signs because he is stone deaf? On the other hand, if, instead of scarlet fever, his hearing had been lost through a brain affection, which at the same time damaged his intelligence, what advantage would oral teaching have been to him? Even a large remnant of hearing would not save acquired speech in such a case.

All this means a complete reconstruction of our educational system. In every large community two schools for the education of deaf mutes should exist. Through the first school all pupils should pass. Attached to this institution should be an aurist, and at his disposal there should be the services of a surgical nurse. All foreign bodies or plugs of wax should be removed from the ear. Active suppuration should be managed by appropriate treatment, and its cause, if a removable one, taken away. The hearing of all children should be tested on admission,

and the general intelligence noted. This school is an oral and acoustic school. The teachers are here in a position to use the oral or acoustic methods or to combine them, as the child's hearing and intelligence indicate. At the end of a year, less or more, the question of the ultimate method of education must be decided. Many—the present writer thinks most—of the children would be found unfitted for oral treatment. But a large minority—say about 30 or 40 per cent.—would remain in the oral school, and pass on to its higher branches. These would consist (1) of the semi-deaf, and (2) of smart, intelligent children with good eyesight, who, in spite of their complete deafness, promised to make good articulation pupils. At this stage all oral pupils should have the naso-pharynx carefully examined. Over 50 per cent. of them will be found to have obstruction in the back of the nose, which is incompatible with correct articulation in hearing children. This should be removed. In the meantime treatment for the development of hearing must not be ignored. By the use of the air douche and by musical and other acoustic exercises, the best must be made of the remaining hearing.

It may be objected to this scheme that it converts our institutions into surgical hospitals. This is not so. None of these operations require anaesthetics. All of them are absolutely free from danger. Further, apart from their effect on hearing and speech, their performance conduces to general well-being. The mouth is not a breathing organ, but the closure of the back of the nose by the growths referred to makes it so. Air therefore enters the lung unwarmed and unpurified, and throat and chest affections result. Then only new pupils need be dealt with—say about a seventh of the entire attendance annually, and only about a half of these would need treatment. That would mean in a school like the Glasgow Institution about 10 or 12 cases per year (out of a total attendance of 150).

The second school would be a sign or silent school. With such children as we have in Glasgow it would contain the majority of the pupils. Here no attempt would

be made to carry on pure oral work. Many of the children would lip-read either here or after they passed out to the world. The possession of lip-reading would be an accident in these children, but a helpful one, and would in no way hamper their progress on the silent or any combined system. It would be no necessary part of their education.

The writer believes that by the adoption of this dual system of education the present war about methods would be ended.

The percentages given above, as representing the relative attendance at the two schools, are, of course, somewhat hypothetical. They appear to be correct for the pupils now in the Glasgow Institution. But they will vary with each district, with the hearing and intelligence of the children, and, above all, with efficiency of the teaching staff. Large classes will give disappointing results.

For the successful education of the deaf the one essential is enthusiasm. Many teachers have this already, but, outside of those who teach, it is rare amongst those who are responsible for the education of the deaf. It is not enough to house comfortably, to feed well, and to think sympathetically about those children who do not hear.

Governors of institutions should know something of deaf mutism, else they cannot initiate or carry out the best methods of education. A School Board unversed in ordinary educational methods would not be tolerated, and a Board of Governors unlearned in the special requirements of the deaf mute will fail in its first duty.

CHAPTER VIII.

THE CENSUS RETURNS.

THE census returns, giving the numbers, ages, and distribution of the deaf and dumb population of the United Kingdom of Great Britain and Ireland, are now complete for a period of five decades, 1851 to 1891, and these provide a vast amount of important information.

The following table shows the results of each census:

TABLE I.

	Number Deaf and Dumb.	Ratio to Population.
1851.		
England and Wales, - -	10,314	One in 1,738
Isles in British Seas, - -	84	„ 1,704
Scotland, - - - -	2,155	„ 1,340
Ireland, - - - -	4,747	„ 1,380
	17,300	
1861.		
England, Wales, and Isles, -	12,236	One in 1,640
Scotland, - - - -	2,335	„ 1,311
Ireland, - - - -	4,930	„ 1,174
	19,501	
1871.		
England, Wales, etc., - -	11,518	One in 1,972
Scotland, - - - -	2,087	„ 1,609
Ireland, - - - -	4,467	„ 1,212
	18,072	
1881.		
England, Wales, etc., - -	13,295	One in 1,954
Scotland, - - - -	2,142	„ 1,744
Ireland, - - - -	3,993	„ 1,296
	19,430	

	1891.	
England, Wales, etc., - -	14,192	One in 2,043
Scotland, - - - -	2,135	„ 1,885
Ireland, - - - -	3,365	„ 1,398
	19,692	

At the outset it is necessary to point out that the returns of the numbers of the deaf and dumb are faulty in one respect, viz., the enumeration of children under five years of age.

In the whole population of the country, children under five years of age exceed in number those of the following period (five to ten years of age) by about 12 per cent., and those of the succeeding period (ten to fifteen years of age) by about 25 per cent. With the deaf and dumb it is otherwise.

TABLE II.

AGES OF DEAF AND DUMB—ENGLAND AND WALES.

	Under 5 years.	5 to 10 years.	10 to 15 years.
1851	548	1,672	1,605
1861	555	1,753	1,785
1871	442	1,595	1,614
1881	498	(3,508)	
1891	422	1,833	2,092

About three-fourths of the deaf and dumb children under five years of age escape enumeration, and in addition a few also escape who are over five years of age. These together amount to about 10 per cent. of the deaf and dumb population, which should be reckoned as follows:

TABLE III.

CORRECTED AVERAGES, 1891.

	Number Deaf and Dumb.	Ratio to Population.
England, Wales, etc., -	About 16,000	One in 1,812
Scotland, - - -	„ 2,400	„ 1,677
Ireland, - - -	„ 3,600	„ 1,307
	Total, about 22,000	Average, one in 1,685

It is probable that the later returns (1881 and 1891) are more accurate than the preceding returns. The census of 1871 raised hopes that the deaf and dumb were rapidly diminishing in numbers, but these hopes have not been realized.

A comparison made between the returns of 1861 and those of 1891 show conclusively that the deaf and dumb do not increase at the same rate as the ordinary population (see also Table VI.).

In Scotland, where the general population increased 31 per cent., or nearly a million persons, during that period (1861 to 1891), the deaf and dumb decreased 8 per cent.—200 persons.

In Ireland the ordinary population decreased nearly one-fifth, or 19 per cent.; but the decrease amongst the deaf and dumb amounted to nearly one-third, or 32 per cent.

England and Wales show an increase of 45 per cent. amongst the ordinary population, and of 16 per cent. amongst the deaf and dumb.

DISTRIBUTION OF THE DEAF AND DUMB.

The returns give the numbers of the deaf and dumb in counties and registration districts, but no attempt has been made in Great Britain to distribute the children at school amongst their respective counties. Hence the counties containing large schools show an increased ratio of deaf dumbness in comparison to those without schools.

Kent is an example of this. If the inmates of the London Asylum (Margate) are included in the returns, the ratio of deaf dumbness (1891) is one in 1500; but, on the other hand, if the natives of Kent only are taken as belonging to Kent, the ratio is one in 2500. To obviate this anomaly Table IV. is given showing the deaf and dumb in five large areas: 1. England (South-East); 2. England (West) and Wales; 3. England (North): 4. Scotland; and 5. Ireland.

Table IV.

1891.—DISTRIBUTION OF THE DEAF AND DUMB IN FIVE LARGE AREAS IN THE UNITED KINGDOM.

I. England (S.E.).

	Population.	Deaf and Dumb.
London, - - - - - - - - -	4,211,743	2,128
South-Eastern Counties—		
Surrey, Kent, Sussex, Hants, and Berks,	2,867,538	1,393
South Midland Counties—		
Middlesex, Herts, Bucks, Oxon, North Hants, Hunts, Beds, and Cambs, - -	1,863,469	843
Eastern Counties—		
Essex, Suffolk, Norfolk, - - - -	1,575,311	716
	10,518,061	5,080

One deaf and dumb in 2,070.

II. England (W.) and Wales.

	Population.	Deaf and Dumb.
South Western Counties—		
Wilts, Dorset, Devon, Cornwall, and Somerset, - - - - - -	1,908,998	999
West Midland Counties—		
Gloster, Hereford, Salop, Stafford, Worcester, Warwick, - - - - -	3,244,717	1,760
Monmouth and Wales, - - - -	1,776,405	935
	6,930,120	3,694

One deaf and dumb in 1876.

III. England (North).

	Population.	Deaf and Dumb.
Northern Counties—		
Durham, Northumberland, Cumberland, Westmoreland, - - - - -	1,863,163	853
North Western Counties—		
Lancashire and Cheshire, - - - -	4,665,884	2,108
Yorkshire, - - - - - - -	3,218,882	1,673
North Midland Counties—		
Leicester, Rutland, Lincoln, Notts, and Derby, - - - - - - - -	1,806,415	784
	11,554,344	5,418

One deaf and dumb in 2,132.

IV. Scotland. V. Ireland.

	Population.	Deaf and Dumb.
Scotland, - - - - - - - -	4,025,647	2,135
Ireland, - - - - - - - -	4,704,750	3,365

Scotland—One deaf and dumb in 1,885.
Ireland—One deaf and dumb in 1,398.

The proportion in these five areas is as follows :

England (North), - - - -	100	deaf and dumb.
England (South-East), - - -	103	„ „
England (West) and Wales, - -	113	„ „
Scotland, - - - - -	113	„ „
Ireland, - - - - - -	153	„ „

Table v. gives the number of deaf and dumb in thirteen areas. The census of 1871 is very remarkable. A glance will show that it does not fit in with either 1861 or 1881, and no explanation is forthcoming to account satisfactorily for such an anomaly.

TABLE V.

DISTRIBUTION OF THE DEAF AND DUMB IN THIRTEEN AREAS.

	1851	1861	1871	1881	1891
1. London, - - - -	1,325	1,819	1,733	1,972	2,128
2. S.E.Counties (ex.Metropolis),	836	1,022	965	1,436	1,393
3. S. Midland Counties, - -	649	789	672	823	843
4. Eastern ,, - -	669	729	635	654	716
5. S. Western ,, - -	1,295	1,321	1,097	1,058	999
6. W. Midland ,, - -	1,325	1,613	1,466	1,690	1,760
7. N. Midland ,, - -	694	748	682	705	784
8. N. Western ,, - -	1,237	1,582	1,677	1,872	2,108
9. Yorkshire, ,, - -	1,042	1,222	1,226	1,481	1,673
10. Northern ,, - -	471	577	626	770	853
11. Wales and Monmouthshire,	771	814	739	834	935
12. Scotland, - - - -	2,155	2,335	2,087	2,142	2,135
13. Ireland, - - - -	4,747	4,930	4,467	3,993	3,365
	17,216	19,501	18,072	19,430	19,692

TABLE VI.

COMPARISON BETWEEN 1851 AND 1891.

	1851. One Deaf and Dumb in	1891. One Deaf and Dumb in	
1. London, - - - -	1,783	1,979	A fall of 10 per cent.
2. S.E. Counties (ex. London),	1,948	2,058	,, 6 ,,
3. S. Midland Counties, -	1,902	2,210	,, 14 ,,
4. Eastern ,, -	1,665	2,200	,, 24 ,,
5. S. Western ,, -	1,393	1,911	,, 27 ,,
6. W. Midland ,, -	1,610	1,844	,, 13 ,,
7. N. Midland ,, -	1,750	2,304	,, 24 ,,
8. N. Western ,, -	2,014	2,213	,, 9 ,,
9. Yorkshire ,, -	1,717	1,924	,, 10 ,,
10. Northern ,, -	2,058	2,184	,, 5 ,,
11. Wales and Monmouthshire,	1,542	1,900	,, 18 ,,
12. Scotland, - - - -	1,340	1,885	,, 29 ,,
13. Ireland, - - - -	1.380	1,398	,, 1 ,,
Average, - - -	1,582	1,916	A fall of 17 per cent.

NOTE.—In Tables V. and VII., column 1851, 84 deaf mutes in "Isles in British Seas" have been omitted, hence the difference between the total and that in Table I.

Table VI. shows the density of the deaf and dumb

population in 1851 and 1891 respectively. The tendency throughout the country appears to be towards uniformity as regards percentages. In 1851 the "Celtic fringe" contained a high proportion of deaf and dumb, but in 1891, owing to increased numbers in England, the discrepancy (except in Ireland) was inconsiderable.

The slight diminution in the S.E. counties (except London) is solely owing to the transfer of the London Asylum to Margate in 1862 and 1875. The opening of Dr. Stainer's Homes in London, by attracting children from the provinces, has also had the effect of increasing the ratio in the metropolis.

TABLE VII.

SHOWS WHERE THE INCREASE HAS TAKEN PLACE.

Area.	Number of Deaf and Dumb.		Increase or Decrease.
	1851.	1891.	
I. England (South-East), - -	3,479	5,080	Increase 1,601
II. England (West) and Wales, -	3,391	3,694	,, 303
III. England (North), - - -	3,444	5,418	,, 1,974
IV. Scotland,- - - - -	2,155	2,135	Decrease 20
V. Ireland, - - - - -	4,747	3,365	,, 1,382
	17,216	19,692	

In searching for causes of increase or decrease of deaf dumbness, it is useful to notice the localities which are highest and lowest in the ratio.

Ireland, with its diminishing population, stands out as the worst portion of the United Kingdom in regard to the number of its deaf and dumb (one in 1398). This may arise from the fact that emigration is generally confined to the strong and healthy, and that the deaf and dumb are left behind on account of their affliction.

In England one county alone, that of Hereford, approaches the ratio of the sister island.

TABLE VIII.

HEREFORDSHIRE.

Year.	Population.	Deaf and Dumb.	Ratio.
1851	115,489	94	One in 1,228
1861	123,712	107	„ 1,156
1871	120,837	72	„ 1,673
1881	118,147	77	„ 1,534
1891	113,346	73	„ 1,552

As there is no school for the deaf and dumb in the county, the ratio given above would be about one in 1300, if the Herefordshire children who are at school at Margate, London, Birmingham, etc., were added.

One reason of the high rate of deaf dumbness in this county may be the lack of immigration, the population being a decreasing one.

In 1851, Huntingdonshire took the highest place in the list of English counties: population 64,183, 20 deaf and dumb,—one in 3209. In 1891 the population was 50,289, with 19 deaf and dumb,—a ratio of one in 2646; whilst its neighbour, Rutlandshire, with its small population of 22,123, and only six deaf and dumb, headed the list with one in 3687.

No value can be attached to the relative position of these two counties because of their small area. Probably Rutland owes its position at top of list to the migration of its deaf mutes to the nearest industrial centre.

AGES OF THE DEAF AND DUMB.

In the report of the Census Commissioners for England and Wales (1861) there is the following statement: "The diminution of the proportion of the deaf and dumb after the age of 15 can only be accounted for by their mortality being at a higher rate than that of the general population."

1861.

	Deaf and Dumb.
Age, 10 to 15 years, - - -	169 per million.
35 to 45 „ - - -	115 „
75 to 85 „ - - -	99 „

This may be taken as correct for England and Wales, but in Scotland the relative ages of the deaf and dumb and of the ordinary population vary only ½ per cent. (practically not at all). In Ireland, on the other hand, the adult deaf mutes are more numerous (proportionately) than the ordinary population (see Table X.).

Migration from Ireland of the healthy has apparently left that country a legacy of adult deaf mutes, which, however, is fast disappearing. The statement of the Commissioners for England quoted above has also lost some of its weight. In Table XI. it is shown that, while the deaf and dumb children have increased 648 (20 per cent.), the adults have increased 3302 (equal to 50 per cent.).

In the Vital Statistics, Table XII., the survivals amongst the deaf and dumb are shown to be much less than amongst the ordinary population, especially of those of the age of 5 to 15 years.

TABLE IX.

AGES OF THE DEAF AND DUMB.

1881.

	Under 5 years.	5 to 15 years.	Over 15 years.	Total.
England and Wales—				
Population, -	3,520,864	5,947,727	16,505,848	25,974,439
Deaf and dumb, -	498	3,508	9,289	13,295
Scotland—				
Population, -	510,591	855,015	2,369,967	3,735,573
Deaf and dumb, -	68	563	1,511	2,142
Ireland—				
Population, -	575,983	1,238,007	3,360,846	5,174,836
Deaf and dumb, -	35	775	3,183	3,993

Leaving out the children under five years of age, we get the following table:

TABLE X.

	Proportion per hundred.	
	5 to 15 years.	Over 15 years.
England and Wales—		
Ordinary population, - -	22	78
Deaf and dumb, - - -	27·5	72·5
Scotland—		
Ordinary population, - -	26·5	73·5
Deaf and dumb, - - -	27	73
Ireland—		
Ordinary population, - -	nearly 27	over 73
Deaf and dumb, - - -	20	80

TABLE XI.

ALTERATION OF PROPORTION OF CHILDREN TO ADULTS IN ENGLAND AND WALES.

Year.	Deaf and Dumb. 5 to 15 years.	Over 15 years.	Proportion per hundred.	
			Children.	Adults.
1851	3,277	6,542	33·37	66·63
1861	3,538	8,135	30·3	69·7
1871	3,209	7,848	29	71
1881	3,508	9,289	27·5	72·5
1891	3,925	9,845	28·5	71·5

TABLE XII.

VITAL STATISTICS—(ENGLAND AND WALES).

1851.	1891.	Survived. Per cent.
Deaf and dumb over 15 years, 6,540.	Deaf and dumb over 55 years, 1,464.	22·4
Population over 15 years, 10,288,139.	Population, over 55 years, 3,029,605.	29·4
1851.	1891.	Survived. Per cent.
Deaf and dumb, 5 to 15 years, 3,277.	Deaf and dumb, 45 to 55 years, 1,304.	40
Population, 5 to 15 years, 3,743,296.	Population, 45 to 55 years, 2,496,874.	66·6
1861.	1891.	Survived. Per cent.
Deaf and dumb, 5 to 15 years, 3,538.	Deaf and dumb, 35 to 45 years, 1,852.	52·3
	Ordinary Population,	73·8
1871.	1891.	Survived. Per cent.
Deaf and dumb, 5 to 15 years, 3,209.	Deaf and dumb, 25 to 35 years, 2,201.	68·5
	Ordinary Population,	80·2
1881.	1891.	Survived. Per cent.
Deaf and dumb, 5 to 15 years, 3,508.	Deaf and dumb, 15 to 25 years, 3,024.	86
Population, 5 to 15 years, 4,494,652.	Population, 15 to 25 years, 3,934,652.	87·5

If time and space permitted, similar tables for Scotland and Ireland could be added to show that the former has a better record than England and Wales, and Ireland an inferior one.

The census returns also include tables of the occupations of the deaf and dumb. These are not sufficiently complete for comparison. In England and Wales no fewer than 6864 deaf and dumb persons over 10 years of age are undescribed as to occupation, and the numbers of scholars, paupers, lunatics, and widows given in the census of 1861 are not contained in that of 1891.

THE SEXES.

The proportion of males and females (deaf and dumb) is about six males to five females. The ratio of males is greatest in early life, but the females possess greater tenacity of life, and at 65 years of age they show equality as regards numbers. In 1891 the number of deaf and dumb children of the age of five to fifteen years was 3925 (one in 1660), and only 18 deaf and dumb persons had reached the age of eighty-five years, a proportion of one in 2429,—of these 18, 8 were males and 10 females.

THE DEAF.

Throughout the census returns much greater attention has been devoted to Ireland than to Great Britain, and, for the former country, tables have been regularly issued since 1851 showing the number of persons returned as (*a*) dumb not deaf, (*b*) dumb, idiotic, and paralytic, etc.

In 1891 two new tables were introduced into the census returns for England and Wales, and also for Scotland: (1) Deaf only from childhood, and (2) Deaf only, others. In England and Wales 15,088 persons (6240 males and 8848 females) were returned as deaf only, and in Scotland 1482 persons. In Ireland 1099 persons were returned as dumb, not deaf.

COMBINED INFIRMITIES.

In England and Wales in 1891 there were 607 persons suffering from combined infirmities, which included dumbness.

Blind and dumb, - - - - - -	82.
Dumb and deranged, - - - - - -	500.
Blind, dumb, and deranged, - - - -	25.

DEDUCTIONS.

It is satisfactory to find that deaf dumbness is not increasing as rapidly as the population of the United Kingdom. The ratio in 1851 was one in 1582, and in 1891, though Ireland showed stagnation, it had fallen to one in 1916.

It has been stated that the *western* portion of the whole country shows a higher proportion of deaf dumbness than the eastern. Careful observation proves that in districts where there is little immigration, and where "hereditary" diseases have the greater chance of transmission to posterity, the malady of deaf dumbness prevails. Up to the present time the western portion of the kingdom has been liable to this preponderance.

The adoption of small areas for enumeration is calculated to mislead. In the census returns for Ireland a family of 11 deaf and dumb persons is given, and this family alone causes the ratio of the district to be exceptionally high. In another case there are two deaf and dumb persons in a family of 29 children, but the effect in this case is slight. The county of Selkirk also shows the necessity for deductions from large areas instead of small. The census returns give the following ratios:

Selkirk—	1871.—	Deaf and dumb,		712	per million.
„	—1881.—	„	„	266	„
„	—1891.—	„	„	180	„

The population of this county is from ten to eleven thousand, and the number of the deaf and dumb has changed as follows: 1871, *eight;* 1881, *three;* 1891, *two;* the reduction (migration?) of six persons causing an enormous fall in the rate per million.

The weakest point in the census returns is the absence of all information with regard to the "heredity" of deaf dumbness. Some tables in the Irish census returns are quite worthless, and might be replaced by others showing the number of deaf mutes in a family, number of deaf-mute relatives, however remote, and particular attention should be given to find out the relationship (if any) between the parents of the deaf and dumb. Until these tables are provided no satisfactory conclusions can be arrived at.

Through the courtesy and kindness of the Agents-General we are able to present a statement of extent of deaf mutism in the most important colonies of Great Britain.

TABLE XIII.—DEAF MUTISM, IN 1891, IN THE AUSTRALIAN COLONIES AND NEW ZEALAND.

Colony.	Population.	No. of Deaf Mutes.	Male.	Female.	Ratio.	Source of Information.
Western Australia, - -	49,782	11	7	4	1 in 4,525	Agent-General in London.
South Australia, - - -	320,431	234	134	100	1 in 1,370	Agent-General in London.
New South Wales, - -	1,123,954	383	210	173	1 in 2,934	Census Report, 1891.
Tasmania, - - - -	146,667	54	27	27	1 in 2,716	Census Report, 1891.
Queensland, - - - -	393,718	154	—	—	1 in 2,557	Census Report of Victoria, 1891.
Victoria, - - - -	1,140,405	364	204	160	1 in 3,133	Census Report, 1891.
New Zealand, - - -	626,658	{166 / 46}[1]	24	22	1 in 2,956	Agent-General in London.
	3,801,615	1,412			1 in 2,692	

Or at the rate of 25 per cent. less than in England.

TABLE XIV.—DEAF MUTISM, IN 1891, IN THE DOMINION OF CANADA.

Province.	Population.	No. of Deaf Mutes.	Male.	Female.	Ratio.	Source of Information.
Ontario, - - - -	2,114,321	1,603	887	716	1 in 1,319	The Statistical Year Book of Canada for 1893.
Quebec, - - - -	1,488,535	2,108	1,074	1,034	1 in 706	
Nova Scotia, - - -	450,396	495	270	225	1 in 909	
New Brunswick, - - -	321,263	354	204	150	1 in 907	
Manitoba, - - - -	152,506	102	63	39	1 in 1,495	
British Columbia, - -	98,173	44	31	13	1 in 2,231	
Prince Edward Island, - -	109,078	87	45	42	1 in 1,254	
The Territories, - - -	98,967	26	16	10	1 in 3,806	
	4,833,239	4,819	2,590	2,229	1 in 1,003	

Or at the rate of about twice as many as in England.

[1] This is composed of 166 deaf mutes above 15 years old, and 46 between 5 and 15 years, attending the School for Deaf Mutes at Sumner, May, 1895.

Note.—No allowance has been made for the deaf mutes under 5 years of age in either the Canadian or Australian colonies.

Table XV.—SOUTH AFRICA (BRITISH).

Province.	Population.	No. of Deaf Mutes.	Males.	Females.	Ratio.	Source of Information.
[1] Natal, - - - -	46,788 British, 41,142 Indians, 455,983 Natives,		—	—	1 in 1,904	There are no deaf-mute statistics in Census Report.
[2] Cape Colony, - - -	1,527,224	802	475	327	1 in 1,904	Agent-Gen. for Colony.

Or almost the same as that of Great Britain.

[1] Rate taken as same as that of Cape Colony. [2] No allowance for children under five years old.

Table XVI.—UNITED STATES OF NORTH AMERICA, CENSUS 1890.

	Population.	No. of Deaf and Dumb.			Ratio.
		Males.	Females.	Total.	
[1] United States, - - - -	62,500,000	22,783	18,500	41,283	1 in 1,514

38,158 were whites, of whom 33,929 were native born, and 4,229 were foreign born. 3,125 were coloured, of whom 1,775 were males and 1,350 females.

[1] No estimate made for deaf amongst the children under five years.

The following shows the distribution of the deaf and dumb in the United States, and also compares the prevalence of deaf mutism in 1890 and 1880.

	Rate per million. 1890.	1880.
United States (entire area), - -	659	675
North Atlantic, - - - -	670	686
South Atlantic, - - - -	634	655
North Central, - - - -	731	729
South Central, - - - -	581	613
Western, - - - - -	430	467

In addition to those reported deaf and dumb there were reported 79,895 so deaf as to be unable to hear loud conversation but able to speak. Of these 493 were children (five to ten years old), 2648 youths (ten to twenty years), 27,841 (twenty to fifty years), and 48,198 were in old age (fifty years and over). Of the deaf only, 39·3 per 1000 were of school age; of the deaf and dumb 385·4 were of school age.

TABLE XVII.

CENSUS OF INDIA (1891).

Population.	No. of Deaf Mutes.	Males.	Females.
287,223,431	196,843	120,497	76,346

Or 1 in 1,459 persons.

The following table gives a review of the deaf mutism of various countries,[1] and includes most European States. It gives the number of deaf mutes per million living, as well as the ordinary ratio.

[1] No allowance is made for children under 5 years.

TABLE XVIII.

	Rate per million.		
Switzerland,	2,452	or 1 in	408
Austria,	1,307	,,	765
Hungary,	1,263	,,	792
Sweden,	1,023	,,	977
Prussia,	1,019	,,	981
Finland,	1,018	,,	981
Canada,	997	,,	1,003
Norway,	950	,,	1,052
Germany (exclusive of Prussia),	931	,,	1,074
Portugal,	750	,,	1,333
Ireland,	715	,,	1,398
India,	685	,,	1,459
United States,	659	,,	1,514
Denmark,	650	,,	1,538
Greece,	646	,,	1,548
France,	626	,,	1,600
Italy,	537	,,	1,862
Scotland,	530	,,	1,885
Cape Colony,	525	,,	1,904
England,	489	,,	2,043
Spain,	459	,,	2,178
Belgium,	445	,,	2,247
Australasia,	371	,,	2,692
Holland,	335	,,	2,985
Ceylon,	231	,,	4,328

Table XIII. deals with Australia and New Zealand, where the deaf-mute rate is about one-half that of Ireland, or about a third less than Great Britain as a whole. South Australia has a high deaf-mute rate, equal to that of Ireland; all the other colonies are lower even than England. Table XIV. deals with the Dominion of Canada. Its separate provinces exhibit great differences in deaf-mute rate. Quebec is exceptionally high; Nova Scotia and New Brunswick pretty high; Ontario very like Ireland; Manitoba like Scotland; Prince Edward Island higher than either Scotland or Ireland; whilst British Columbia and the North-West Territories approach Australia in their low deaf-mute rates. Table XV. shows the Cape Colony to be like England in having a very moderate deaf-mute rate.

Nothing but the most general statements can be made as to the causes of these divergencies in the deaf-mute rate of the divisions of the British Empire, for as at home so in the Colonial censuses no attempt is made to separate between congenital and acquired deafness, and we have no returns for colonial institutions parallel to those for the institutions of Great Britain. But the low rate in the Australian colonies is probably due partly to the fact that emigrants have amongst them a smaller number of defectives than those who stay in the mother country, and partly to the fact that there has not yet been time for the development of the bad effects of consanguineous unions in these new countries. The first of these facts probably accounts for the relatively high rate of Ireland, a large proportion of the defectives being left behind.

In the case of Canada the differences are great and are difficult to explain. The statement that the newer parts of our empire have the lowest deaf-mute rates is generally true; and, in the Dominion, the newer provinces have a lower rate than the older. Quebec, Nova Scotia, and New Brunswick are comparatively old States, and are more on a parallel with the mother country in many respects than the western provinces of the Dominion or the Australian colonies. But they have all a higher deaf-mute rate than Britain. Without knowing to what extent the cases of deaf mutism in Canada are congenital, a minute comparison with Britain cannot be made, but there is more zymotic disease in Canada than in England; and there is more in the Province of Quebec, which has the highest deaf-mute rate in the Dominion, than in all the other provinces put together.

Amongst 5560 deaths from zymotic disease amongst children under one year, 3424 occurred in the Province of Quebec, and 1234 in Ontario, although the latter has the larger population. Further, the deaths from zymotic disease are greater in Canada than in Australia. The deaths per million are as follows: Canada, 3283; England, 2541; Victoria, 2369; New South Wales, 2260.[1]

[1] *The Statistical Year Book of Canada for* 1893.

In the United States of North America we have a comparatively new country, and probably a low congenital deaf-mute rate. In many respects it gives a parallel to our colonies. Its general deaf-mute rate is higher than that of Scotland, almost as high as that of Ireland, much higher than those of England and of our Australian colonies. But at least 60 per cent. of American deafness is acquired, and much of it is due to a disease which is almost absent from the British Empire—cerebro-spinal fever. The newer Western States have a lower deaf-mute rate than the older Eastern States.

Causes which increase Deaf Mutism.	Causes which decrease Deaf Mutism.
1. Mountainous nature of a country, *e.g.* Switzerland.	1. Flatness of country, *e.g.* Holland and Belgium.
2. Older geological formations.	2. Newer formations.
3. Moderate child mortality.	3. High death rate amongst children.
4. High male birth rate.	4. High female birth rate.
5. Jewish religion.	5. Catholic religion.
6. Sparseness and stasis of population and consequent consanguineous marriage.	6. Dense population and absence of consanguineous marriage.
7. Poverty.	7. Good social position.
8. Small land valuation.	8. High valuation.
9. Consumption of pork, potatoes, etc., and use of cows as draught animals.	9. Use of meat in food.
10. Manual and labouring pursuits.	10. Professional and business occupations.
11. Untaxed population.	11. Taxed population.
12. Infertility of soil.	12. Fertile soil.

Racial and other radical differences make any comparison between India and English-speaking countries very difficult, but it is interesting to note that the deaf-mute rate of India is not much greater than that of the United Kingdom.

It is with regard to European countries that most writers on deaf mutism have drawn up statistics. A detailed criticism of what has been written in this connection would involve much useless labour. In the two columns of the above table are arranged those causes which are usually supposed to make for a low and a high deaf-mute rate.

Others might be added, some of them more curious than the above. It were better to classify those already given, and see how they correspond with what we know of the actual causes of deafness in individual cases. Dwellers in mountainous countries are comparatively free from the ravages of infectious disease, and the child-mortality is consequently low, at least from this cause; the deaf-mute children are therefore spared to be classed as such in later years. Here, too, the population is sparse, there is little movement amongst the people, and consanguineous marriages are commoner than in the cities of flat countries. The food of the people is of poor quality, little meat is eaten, and the land is not fertile. We would expect in such circumstances a high congenital, but a low acquired, deaf-mute rate.

On the other hand, in flat countries epidemic diseases commit greater ravages, more deaf children die of them and never appear in the deaf-mute statistics. There may be a relatively high acquired deaf-mute rate, but there is less chance of the increase of congenital deafness, for consanguineous marriages are less common than in the higher and more thinly populated districts. The soil is more fertile, and the people's food of better quality. Geological formation and religion have nothing to do with deaf mutism, unless in so far as they influence the hygienic surroundings and social customs of men and women. Consanguinity and poverty make for increase in deaf mutism.

Darwin's related plants did well if they had more room and better soil than their unrelated competitors, but without these advantages they became defective. Without infectious disease, without consanguineous marriage, and in a country where food is plentiful and hygienic conditions satisfactory, deaf mutism would reach a minimum.

In Europe, Switzerland heads the list. (See Table 18.) Much of the Swiss deaf mutism is really cretinism. Austria and Hungary follow. In the province of Carinthia, in Austria, with a population of 348,730, there are 962 deaf mutes, or 1 in 363. The province lies between the Noric Alps, its northern boundary, and the Carnic Alps, its southern boundary, with the River Drave flowing through its entire length from east to west. Taking 1 in 1350 as about the average for Europe, we find that Switzerland, Austria, Hungary, Sweden, Prussia, Finland, Norway, and Germany are above the average. Portugal and Ireland are about the average. Holland, Belgium, Spain, England, Scotland, Italy, France, Greece, and Denmark are below the average. Out of Europe, Canada is above the average, but all other parts of the British Empire are below the average. The rate for the United States of North America is a little below the European average.

In Britain we saw that male deaf mutes existed in the ratio of 6 to 5 females similarly affected. A similar preponderance of the male sex amongst deaf mutes exists over our whole empire, and in the United States. The ratios are approximately as follows:

Countries.	Males.	Females.
United Kingdom,	5	$4\frac{1}{6}$
Australian Colonies,	5	4
Canada,	5	$4\frac{3}{4}$
Cape Colony,	5	$3\frac{4}{5}$
United States,	5	4
India,	5	$3\frac{1}{6}$

For the principal countries on the continent of Europe the ratios are approximately as follows:

Countries.	Males.	Females.
Austria,	5	4
Hungary,	5	$4\frac{1}{2}$
Sweden,	5	4
Prussia,	5	$4\frac{1}{3}$
Norway,	5	$3\frac{2}{3}$
Denmark,	5	4
France,	5	$4\frac{1}{3}$
Italy,	5	$3\frac{2}{3}$
Spain,	5	$3\frac{1}{4}$
Belgium,	5	4
Holland,	5	$4\frac{1}{2}$

This preponderance of male deaf mutes is thus universal, and is all the more remarkable when we remember that in almost every country there are more females than males. But it is not permanent. In Britain, at the age of 65, deaf mutes of the two sexes are equal, and there are more very old deaf-mute women than men. In Canada the single deaf-mute men exceed the single deaf-mute women, the married deaf-mute men exceed the married deaf-mute women, but there are 148 deaf-mute widows to 108 deaf-mute widowers. Several reasons have been assigned for the male preponderance amongst deaf mutes. Amongst these are the greater death rate amongst male children, the greater liability of male children to ear and brain disease, etc. At present we have no statistics which give the means of settling this question. If into the census schedules were inserted questions relating to the causes of deafness amongst deaf mutes, the deaf relatives of deaf mutes, and the extent of consanguinity amongst parents, this and many more important questions might have light thrown upon them.

CHAPTER IX.

HISTORICAL SKETCH OF THE ORIGIN AND PROGRESS OF DEAF-MUTE EDUCATION.

"To instruct the deaf no art could ever reach,
No care improve them, and no wisdom teach."

THIS couplet of the Roman poet Lucretius well represents the attitude of antiquity towards the unfortunate class of whom we treat, and inspired as the ancients were by such sentiments, it is not to be wondered at that we read little of any attempts to ameliorate their lot. True it is that mention is made by Pliny of one Quintus Pedius, who was taught to paint, but this seems to be the only case during the classical age of even the slightest attempt at the education of the deaf.

They were treated, not as "deaf," but as "dumb," and this dumbness was considered by the credulous people of that age, as it is in this, to be owing to some defect of the brain, some incapacity of the vocal organs, or, it may be, to the possession of some diabolical spirit, which rendered the poor "dummy" a being to be dreaded and shunned by everybody who did not wish to be defiled or corrupted, or who had any regard for the safety of his own body and soul.

As a "dummy," therefore, our deaf man was treated—by the Spartans not suffered to live; by the Romans deprived of civil and legal rights; pronounced senseless by the great master of philosophy, Aristotle; and banned by the great apostle of Catholicism, Augustine, on the ground that as "Faith comes by hearing," it was impossible

for the deaf man, not hearing the word of God, to have faith, and therefore, according to Pauline theology, he must be eternally damned.

In spite of these opinions, we find recorded many cases of "dumb" men recovering the use of their speech, though, as Bulwer says, "the opinion of most men being that originale deafenesse and dumbenesse is not curable but by miracle, it having never been done by any other than the Divine art of miracle-working faith," it seems doubtful whether the cases recorded were really deaf mutes in the modern sense of the term, and at this distance of time it is highly improbable that we shall ever be able to say.

The case of the son of Croesus mentioned by Herodotus is well known, but the following story, for which the author is indebted to Dr. David Murray, author of the book on *Japan*, in the "Story of the Nations" Series, shows that such notions about the deaf or dumb as the above were not confined to the western nations or the western Asiatics, but are common to humanity, and as widespread as the globe itself:

"The Emperor Suinin, the eleventh of that name, who is said to have reigned ninety-nine years, and to have died at the age of 141, had a son who was dumb. This child was born at the time when his mother was living in a castle or stockade belonging to her brother, who had tempted her to conspire against the life of her husband, the emperor.

"On the plot being discovered, she fled to this brother, and it was while the troops of the emperor were attacking the stockade or palace in which they had taken refuge that the child was born. Anxious to save it, she brought it to the palisades in sight of the emperor, and cried out to him to take it under his care. He was deeply moved by her appeal to him, and forthwith planned to rescue both the child and its mother. The child was rescued, but the mother perished in the burning palace along with her brother."

The account of the child's restoration to speech runs as follows:

"So the way they led about and amused the august

child was by making a two-forked boat out of a two-forked cryptomeria from Ahidza in Wohari, bringing it up and floating it on the pool of Ichishi and on the pool of Karu in Yamato, [thus] leading about and amusing the august child.

"Nevertheless the august child spoke never a word, though his eight-grasp beard reached down to the pit of his stomach. So it was on hearing the cry of a high-flying swan that he made his first utterance.

"Then [the Heavenly Sovereign] sent Yamanobe-no-Ohotaka to catch the bird. So this person, pursuing the swan, arrived in the land of Harima from the land of Ki, and again in his pursuit crossed over to the land of Inaba, then reaching the land of Taniha, and the land of Tajima, [thence] pursuing round to the eastward, he reached the land of Afumi, and thereupon crossed over into the land of Minu, and, passing along by the land of Wohari, pursued it into the land of Shinanu, and at length, reaching in his pursuit the Koshi, spread a net in the estuary of Wanami, and, having caught the bird, brought it up [to the capital] and presented it [to the sovereign]. So that estuary is called the estuary of Wanami. It had been thought that, on seeing that bird again, he would speak; but he did not speak, as had been thought.

"Hereupon the Heavenly Sovereign, deigning to be grieved, augustly fell asleep, when, in an august dream, he was instructed, saying: 'If thou wilt build my temple like unto thine august abode, the august child shall surely speak.' When he had been thus instructed, [the Heavenly Sovereign] made grand divination to seek what Deity's desire this might be. Then [it was discovered that] the curse was the august doing of the great Deity of Idzumo. So when about to send the august child to worship [at] that great Deity's temple, [he made divination to discover] by whom it were well to have him attended. Then the lot fell on King Ake-tatsu. So he made King Ake-tatsu swear, saying, 'If there is truly to be an answer to our adoration of this great Deity, may the heron dwelling on the tree by the Pool of Sagisu here fall [through my]

oath.' When he thus spoke, the heron that had been sworn by fell to the ground dead. Again, on his commanding it to come to life, [in answer to his oath] it then came to life again.

"Moreover, he caused to wither by an oath, and again brought to life again by an oath, a broad-foliaged bear oak on Cape Amakashi.

"Then [the Heavenly Sovereign] granted to Prince Ake-tatsu the name of Prince Yamato-oyu-shiki-tomi-toyo-asakura-ake-tatsu.

"So when the august child was sent off with the two princes, Prince Ake-tatsu and Prince Una-kami, as his attendants, it was divined that [if they went out] by the Nara Gate they would meet a lame person and a blind person, that [if they went out] by the Ohosaka Gate they would likewise meet a lame person and a blind person, and that only the Ki Gate—a side gate—would be the lucky gate; and when they started off, they established the Homuji Clan in every place they arrived at. So when they had reached Idzumo, and had finished worshipping the great Deity, and were returning up [to the capital], they made in the middle of the River Hi a black-plaited bridge, and respectfully offered a temporary palace [for the august child] to dwell in. Then when the ancestor of the rulers of the land of Idzumo, whose name was Kihisa-tsu-mi, having made an imitation green-leafed mountain, placed it in the lower reach of the river, and was about to present the great august food, *the august child spoke*, saying, 'What here resembles a green-leafed mountain in the lower [reach of the] river, looks like a mountain, but is not a mountain. Is it perchance the great court of the deacon who holds in reverence the great Deity, Ugly-Male-of-the-Reed Plains, that dwells in the temple of So at Ihakuma in Idzumo?' [Thus] he deigned to ask.

"Then the kings who had been sent in august attendance [on him] hearing with joy, and seeing with delight, set the august child to dwell in the palace of Nagabo at Ajimasi, and despatched a courier [to inform the Heavenly Sovereign].

"Then the august child wedded Princess Hinaja for one night. So, on looking privately at the beautiful maiden [he found her] to be a serpent, at the sight of which he fled away alarmed. Then the Princess Hinaja was vexed, and, illuminating the sea-plain, pursued after them in a ship; and they, more and more alarmed at the sight, pulled the august vessel across the mountain folds, and went fleeing up [to the capital]. Thereupon they made a report, saying, 'We have come up [to the capital] because thy great and august child has become able to speak through worshipping the great Deity.' So the Heavenly Sovereign, delighted, forthwith sent King Una-kami back to build the Deity's temple.

"Thereupon, the Heavenly Sovereign, on account of this august child, established the Totori Clan, the Torikahi Clan, the Honinji Clan, the Ohoyume and the Wakayuwe."[1]

Mankind was not destined by its Creator to live for ever in ignorance and superstition. The history of the human race shows a gradual progression from darkness to light, and the history of the education of the deaf is no exception to this rule. As Arnold says, "the Day Star, long desired and waited for, at last arose. He 'made the deaf to hear, the dumb to speak, and the blind to see.'" In the miracle of healing, as related by Mark, vii. 31-37, Arnold sees the beginning of the education of the deaf and dumb, and who amongst us shall contradict him? It is worthy of note that our Lord in performing this miracle makes use of various outward signs, doubtless, as a learned commentator remarks, "with special regard to each particular case, so as to produce the deepest and most lasting effect, or to draw out the faith of the sufferer."

His action was in strong contrast to that of His misguided follower St. Augustine, who could not see that faith was possible by means of the outward sign as well as by the spoken word.

Our Lord's example did not find many immediate followers. Professor Ramsay, in his *Christianity under the*

[1] Extract from Vol. x., *Supplement to Transactions of the Asiatic Society of Japan*, p. 187.

Roman Empire, relates the miracle of the dumb man of Khonai as follows:

"From Hierapolis the two Apostles (Philip and John) went to Khairetopa, and, after working wonders there, and predicting the apparition of Michael, they proceeded to other cities. Then there gushed forth a healing spring at Khairetopa. Long before the church was built, a small chapel existed on the spot. It was the work of a pagan, a native of Laodicea, who became a convert after his dumb daughter was cured and made to speak by the miraculous fountain. The father and daughter are introduced for this one purpose, and remain nameless."

Then we have the story, as related by the Venerable Bede, of how St. John of Beverley, who lived in the eighth century, taught or cured a deaf youth; and, as many writers on the subject seem of opinion that this was the first attempt to teach a deaf mute to speak, and therefore the beginning of the Oral system, we give the story for what it is worth.

"When he came he asked him to put out his tongue, took hold of his chin, and made the sign of the cross on his tongue. When he had thus crossed and blessed it, he ordered him to draw his tongue back, and to speak, saying, 'Speak me one word; say, Yea, yea.' And forthwith the ligaments of his tongue were loosened, and he spake as he was commanded. The bishop then tried him with single letters, and asked him to say A, and he said A; to say B, and he said B, etc.; and when he had pronounced these correctly, the bishop gave him syllables and whole words to speak. After he had pronounced all these distinctly, he made him speak long sentences, which he did."

It must remain an open question, as Hartmann says, whether this was indeed a first attempt to teach a deaf mute to speak; Arnold, following Walther and others, holds that it was a real attempt, though the credulity of the people of those times ascribed it to a miracle. It is not at all improbable that the good bishop really attempted to teach the deaf man to speak, for it is known that he was deeply learned in the sciences and

arts as practised in that generation, and which were not so inconsiderable as we may be disposed to think. Despite the dictum of Aristotle and of Augustine, the true relation between deafness and dumbness was not unknown even at that early age, for Mygind mentions that "Alexander of Aphrodisias, a medical author, not particularly well known, who lived in the third century after Christ, seems to have understood the relation between deafness and dumbness. He rejects Aristotle's doctrine of a connection between the nerves of the ear and the organs of speech, and states in his Προβλήματα I., 138, that it is the want of hearing which deprives the deaf mute of the power of speech."[1] Had Bishop John obtained any inkling of the doctrines of this obscure author, and did they set his mind cogitating on the subject when brought into actual contact with a deaf mute? Who can tell? One thing is certain. St. John and his compatriots were not merely unlearned shepherds wandering over the northern wilds, teaching a people still wilder than themselves. They inherited the traditions and the culture of the Culdees, that Irish priesthood which was once famous all over Europe for learning and piety. Had not York, moreover, given to Europe the greatest scholar of the age, Charlemagne's chancellor, the learned Alcuin, and may we not surmise that, despite the ravages of the barbarian northmen, culture still existed in some of these out of the way places? These men, moreover, had not then bowed the knee to authority, the authority of great names, which Rome was then struggling to foist upon this kingdom, as she had successfully done upon others. Men still thought for themselves, and, aided by the shrewd northern mother wit, it is quite possible that our good bishop had made some progress towards the evolution of a method for educating the deaf. There is no doubt that many isolated efforts, more or less successful, would be made towards the solving of this problem, long before the writings of Cardan, to whom we shall presently refer, had placed the true principles before the world, and the labours

[1] Mygind, *Deaf Mutism*, London, 1894.

of the Spanish teachers, followed by those of Heinicke and De l'Epée, had demonstrated their general applicability.

If we wanted to ascertain the origin of the art in the isolated but successful attempts we read of, it would be difficult to assign the precise period of this invention, for many isolated cases of successful tuition must have occurred, and yet have been unknown to their contemporaries, and still more so to their successors. It is only to chance that we owe the example quoted by Rudolph Agricola: "I have seen," he says, "an individual deaf from birth and consequently mute, who had learned to understand everything that was written by others, and who himself expressed all his thoughts by writing, just as if he had the power of speech."

That such a thing was incredible seems to have been the general opinion even of the learned of that age, for we read that "Ludovic Vives, a learned Spaniard, treats the account as a myth, because he thought it impossible."

But the human mind cannot be held in bondage. The renaissance of learning, the invention of printing, the revolt of Luther and the other reformers against the Papacy, prepared the way for new doctrines, not in religion only, but in arts and sciences, and every domain of human thought and work. To Jerome Cardan (born at Pavia in 1501), physician by profession, philosopher and mathematician by natural taste and genius, belongs the honour of placing the theory of the instruction of the deaf on a sound and lasting basis. Of him Degerando writes: "Esprit ardent, investigateur infatigable, bizarre, superstitieux et audacieux tour à tour; entrainé par son imagination à des spéculations mystiques, jetant quelquefois sur la nature et sur l'homme un regard observateur et pénétrant, Jérôme Cardan cultiva à la fois la médicine, les mathématiques, presque toutes les branches des connaissances humaines, sema dans chacune des germes féconds, sans prendre le soin de les cultiver, et mérita de prendre rang parmi les modernes réformateurs de la philosophie. Il avait associé l'étude de la psychologie à celle de la physiologie, et avait donné une attention par-

ticulière aux organes des sens et à leurs fonctions ; il s'était beaucoup occupé aussi des écritures secrètes ou abrégées."[1]

The great work that he accomplished, so far as it related to the deaf and dumb, consisted in his demonstrating that connected thought and reasoning is possible without the intervention of the spoken word, a doctrine the converse of which, following Aristotle and the schoolmen, was generally held by the learned of that age, and is not quite banished even in this. Thus Cardan laid down the principle which the experience of several generations of silently taught deaf mutes abundantly confirms, namely, that a deaf mute can be rendered capable by education of "hearing by the eye and of speaking by writing. He can conceive, for example, that the word *bread*, as it is written, signifies this object when it is shown to him, and his memory will retain this signification. He is able to put down his thoughts in writing, and also receive and comprehend the thoughts which others express in writing." Hence he argues that the deaf mute ought to be taught to read and write ; for, though the enterprise is no doubt difficult, it is notwithstanding possible. Not only so, but a great number of ideas can be expressed by mimic signs. With hearing people writing is associated with the spoken word, and through the spoken word with the thought ; but it is possible to associate the written word directly with the idea or thought, without the intervention of the spoken word, as is done, for example, in hieroglyphic writings, of which the character is entirely of an ideographic nature. And he further adds, "Deaf mutes know and honour God, and, since they have an intelligent soul, nothing should hinder them from cultivating the arts and sciences, and achieving the highest attainments."

How different this from the dictum of a modern philosopher (Max Müller), whose terse epigram, "Without speech no reason," would condemn a large class of intelligent human beings to the category of brute beasts ?

Cardan's speculations resulted in no practical work for

[1] Degerando, *Education of Congenital Deaf Mutes*, Paris, 1827.

the deaf, so far as he himself was concerned. He was a theorist rather than a practical teacher; but the good seed was sown, and soon began to germinate, though in another country than his own. Within a century from the time when Cardan's speculations were published, a trio of distinguished men arose, whose work has exercised a most profound influence on the cause of the education of the deaf for all time. These three men were the Spaniards, Pedro Ponce de Leon, Ramirez de Carrion, and Juan Pablo Bonet. The former of these, Ponce de Leon, is said to have been born at Valladolid in 1520, and to have belonged to one of the most noble families in Spain. Becoming a Benedictine monk, firstly in the monastery of S. Benito, at Sahagun in Leon, and afterwards in that of S. Salvador, at Oña, not far from Burgos, he taught with success several deaf youths of noble families to write, speak, and read the lips. What led to his taking up this task is not known, nor can it be said with certainty whether he was an original discoverer of the methods he used, or whether he learnt from some one who preceded him. The probability is that, as with other discoveries and inventions, he, aided by chance hints derived from an extensive reading in all that was known of philosophy and science, discovered for himself the way to teach this class. At any rate, he seems to have been remarkably successful, for we read that he claimed to have taught his pupils to "speak, read, write, and reckon; to pray, to assist at the Mass, to know the doctrines of Christianity, and to know how to confess themselves by speech; some of them also to learn Latin, and some both Latin and Greek, and to understand the Italian language; and one was ordained, and held office and emolument in the Church, and performed the service of the Canonic Hours; and he also, and some others, arrived at a knowledge of natural philosophy and astrology; and another succeeded to an estate and marquisate, and entered the army, and in addition to his other attainments, as has been related, was skilled in the use of all kinds of arms, and was especially an excellent

rider. And besides all this, some were great historians of Spanish and foreign history; and, above all, they were versed in the Doctrine, Politics, and Discipline from which Aristotle excluded them."

The results here detailed are, to say the least, remarkable, and Mr. Farrar—himself a deaf mute of much learning and ability, and from whose excellent Historical Introduction to the English translation of Bonet's work we have culled the preceding paragraph, says: "We might well doubt the startling results he tells us he obtained with his scholars, for admittedly they greatly exceed anything we can point to in our day. Considerable allowance must be made in the case of one who, having achieved what had hitherto been held to be impossible, was naturally desirous of making the most of it. An exuberant imagination and Castilian boastfulness have produced a picture full of brilliant effects. But it agrees in the main with the independent testimony of the various eye-witnesses which we have quoted. And, when all due qualifications have been made on account of their inflated style, and the facts sifted and shorn of some of their gilding, the results are sufficiently remarkable to excite our interest and respect, and sustain Ponce de Leon's claim to be regarded as the first to create a method which rendered speech of practical value to deaf mutes, and so upset the theories which had long prevented its application."[1]

The method of Ponce de Leon seems to have been to first teach the pupil to "write the names of objects, then articulation, followed by the association of the written words with their spoken forms." Writing thus had a prominent place. Lip-reading does not appear to have had any attention as a regular accomplishment, its place being taken by signs. There is no distinct trace of the use of a manual alphabet.

Ponce de Leon died in 1584, and in 1620, thirty-six years after his death, appeared Bonet's famous book,

[1] *Method of Teaching Deaf Mutes to Speak* (Bonet). Translated by H. N. Dixon, M.A., F.L.S., with a Historical Introduction by A. Farrar, F.G.S.

Reduccion de las Letras, etc., a work which, in the absence of Ponce de Leon's own account of his method, which was, so far as we know, never published, and seems to have been destroyed, the first published method of educating the deaf and dumb. A well-executed translation from the original Spanish, by H. N. Dixon, M.A., F.L.S., with a Historical Introduction by A. Farrar, F.G.S., is now obtainable by the English reader.

Carrion, a contemporary of Bonet's, published a work in 1629, in which, *inter alia*, he claims to have instructed several deaf mutes, including Luis de Velasco, whom Bonet has generally had the credit of instructing. The question is fully discussed by Mr. Farrar in his introduction to the translation of Bonet's work.

The knowledge of the interesting and instructive facts just cited did not long remain confined to Spain.

Sir Kenelm Digby, a gentleman of intelligence and learning, who formed one of the brilliant suite which accompanied Charles, Prince of Wales, to Madrid, saw the result of Bonet's work, and in his *Treatise on the Nature of Bodies*, published in Paris and London, 1644 and 1645, he related, for the benefit of his countrymen, some of the wonderful things he had seen, and, amongst others, that of "the Spanish lord, who was born deafe, that if a gun were shot off close to his eare he could not heare it, and consequently he was dumbe; for, not being able to heare the sound of words, he could neither imitate nor understand them."

The reader will notice that here the true nature of language, as acquired by imitation, is well brought out.

After describing how this young man had been brought to such perfection of speech and lip-reading, that "he would not lose a word in a whole daye's conversation," he says, "It is true, one great misbecomingness he was apt to fall into whilst he spoke, which was an uncertainty in the tone of his voice; for, not hearing the sound he made whilst he spoke, he could not steadily govern the pitch of his voice, but it would be sometimes higher, sometimes lower; though, for the most part, what he

delivered together he ended in the same key as he began it. But when he had once suffered the passage of his voice to close, at the opening of it again, chance, or the measure of his earnestness to speak or reply, gave him his tone, which he was not capable of moderating by such an artifice, as is recorded Caius Gracchus used when passion, in his orations to the people, drove out his voice with too great a vehemency or shrillness. He could discern in another *whether he spoke shrill or low,* and he would repeat after anybody any hard word whatever, which the prince tried often, not only in English, but by making some Welshmen that served his highness speak words of their language, which he so perfectly echoed that I confess I wondered more at that than at all the rest, and his master himself would acknowledge that the rules of his art reached not to produce that effect with any certainty."

It seems very strange and unaccountable that a man who could not hear the sound of a gun fired close to his head should be able to discern in another whether he spoke shrill or low, while he could not hear his own voice sufficiently to modulate it. So far as the writer's experience goes, deaf persons who possess a little hearing can perceive the sound of their own voices better and sooner than they can perceive that of others. The only explanation that seems possible is that he judged of the loudness of the sound by the visible external signs of exertion which the speakers would unconsciously put forth, and which his trained eye would easily detect, while those around him, who, like Digby, were unacquainted with what is possible in this direction, and were too much overcome with amazement at the novelty of the thing to be very critical, would not notice any difference in the person speaking except the increase of sound. Even those whose minds are engaged in the study of such matters differ widely in their interpretation of the same facts; for while Bulwer, our first English writer on the subject, seems implicitly to accept all Digby's statements without reserve, Dalgarno, like a cautious Scot, expresses great doubts on the subject, and goes so far as to accuse the priest of "legerdemain."

Be this as it may, Digby's account of the wonders he had seen in Spain set men a-thinking, and within the short period of half a century after his narrative had appeared, our literature was enriched by a quintette of works of great value, works which would well repay the earnest and careful study of all teachers at the present time, could they be collected and reprinted in a handy form. These works are Bulwer's *Philocophus*, published 1648; Wallis' *De Loquela*; and *A Letter to Robert Boyle, Esq., concerning the said Doctor's Essay of Teaching a Person Dumb and Deaf to speak and to understand a language, etc.*; Holder's *Elements of Speech*, 1669; Dalgarno's *Didascalocophus*, published at Oxford, 1680, and since then reprinted by the Maitland Club, Glasgow, in 1834; and Sibscota's *Deaf and Dumb Man's Discourse*, London, 1670. These books are chiefly philosophical treatises concerning the nature of language, and contain elaborate analyses of the different elements of speech, etc. The teaching of the deaf from birth is dragged in, as it were, to illustrate the new theories which were then beginning to prevail; and, according to the bent of the author and the particular object of his study, we find greater or less attention given to the teaching of artificial speech. Thus Wallis and Holder, whose studies seem to have led them in the direction of the teaching of articulate speech, devote much or most of their attention to a minute analysis of the different sounds and combinations of sounds of which speech is composed; while Dalgarno, on the other hand, who, in his *Ars Signorum*, endeavours to realize that chimera of the learned, a "universal language," gives greater attention to the best manner of teaching *language*, written or spoken, which, as far as the deaf are concerned, he seems to think will be best acquired in its written form. He makes use of a hand alphabet of ingenious construction, entirely differing from the Spanish double-handed or the single-handed alphabet—an alphabet which has been resuscitated of late years by Mr. Graham Bell, who has used it with success to teach written language to a deaf-mute child without the intervention of speech. It is

worthy of note that none of these writers adopted the Pure Oral theory, which the German school of late years has evolved, that speech should in every case precede writing. Thus Arnold says of Wallis that "it was by writing rather than by speech that he taught them to understand what was written to them by others." Holder again, after describing how you may teach a deaf mute by means of a finger alphabet, says, "And you may, when you please, have the recreation of surprising those with admiration who shall hear the deaf person pronounce whatsoever they (though with privacy) shall desire, without your seeming at all to guide him with your eye or mouth, otherwise than by beckoning him to speak, whilst you secretly describe it with your fingers." On reading this one feels that Dalgarno would have been quite justified in accusing Holder of "legerdemain." Again he says: "After thorough practice of syllables, etc., you are to teach him the knowledge of words, but it would do well in the meantime to make him speak and write some sentences to inure him to connexion of speech. And here you may easily shew him visible bodies and colours,

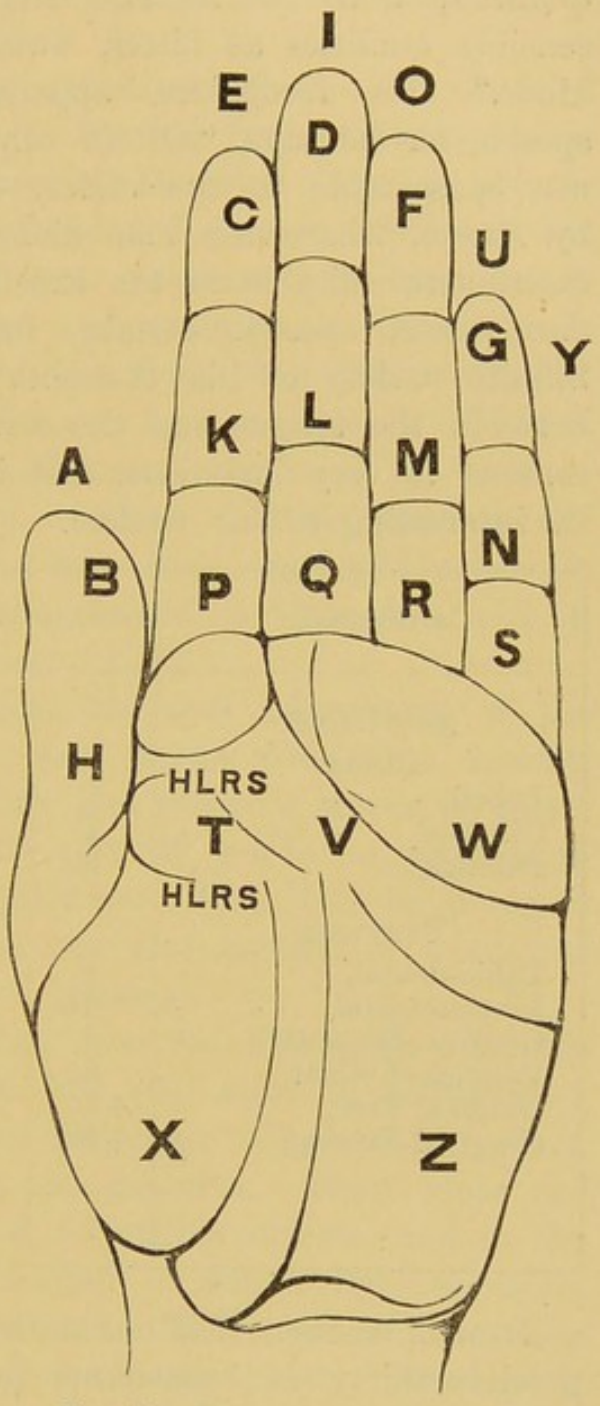


FIG. 12.—DALGARNO'S ALPHABET.

and tell him the names of them, and you may *by signs* make him understand local adverbs, and some others of qualities, well, ill, as also such adjectives as represent sensible qualities as bitter, sweet, etc., and many other kinds." He recognizes, apparently, the superiority of speech, for he says, "Of all other there is none for this use comparable to the variety of instructive expressions by *Speech*, wherewith man alone is endowed, as with an instrument suitable to the excellency of his soul, for the most easie, speedy, certain, full communication of the infinite variety of his thoughts by the ready commerce between the tongue and the ear." His table of the consonants is very ingenious, and is here given as likely to be interesting to our readers.

Articulation.	Spiritual.	Vocal.	Naso-Spiritual.	Naso-Vocal.	
APPULSE.					
Close.					
Labial, - - - -	P	B	+M	M	3
Gingival, - - -	T	D	+N	N	3
Palatick, - - -	K	G	+Ng	Ng	3
Pervious.					
Labio-dental, - -	F	V	+F	+V	2
Lingua-dental, - -	Th	Dh	+Th	+Dh	2
Gingival-Sibilant, - -	S	Z	+S	+Z	2
Palatick-Sibilant, - -	Sh	Zh	+Sh	+Zh	2
Gingival Free, - -	+L	L	+L	+L	1
Gingival Jarring, - -	+R	R	+R	+R	1
	7	9	0	3	19

It will be seen that our author considers that there are possible thirty-six consonants in the language, but owing to the difficulty or otherwise of pronouncing them those marked with a cross are not used, and we have consequently nineteen to deal with in teaching in addition to the vowels.

Wallis did not confine his efforts to the teaching of speech. According to Degerando, his method consisted of four elements: *writing* and *reading*, the *manual alphabet*,

logical induction aided by examples, and *gestures* or *signs*, confined solely, however, to the signs used by the pupil himself. He claims to have taught several deaf mutes with success by this method.

The results achieved by these workers in the cause of the deaf mute were slow in bearing fruit. Henry Baker (1698-1775), a son-in-law of De Foe, kept a private school for deaf mutes in London for some time, and his Book of Lessons in four MSS. volumes has been lately unearthed by the industry and research of the Rev. T. Arnold; and in 1760 Braidwood founded in Edinburgh the school which was made famous by the visit in 1772 of Pennant, and still later of Johnson, while on his tour to the Western Highlands of Scotland. These teachers endeavoured to keep the methods they employed as secret as possible, but Braidwood's method is thus described in Arnot's *History of Edinburgh*, 1779:

"He begins with learning the deaf articulation or the use of their vocal organs; and at the same time, teaches them to write the characters and compose words of them. He next shows them the use of words in expressing visible objects and their qualities. After this he proceeds to instruct them in the proper arrangement of words, or grammatical construction of language."

"The deaf (Mr. Braidwood observes) find great difficulty in attaining pronunciation, but still more in acquiring a proper knowledge of written language. Their only method of conversing is by signs and gestures. Their ideas are few, being entirely confined to visible objects, and to the passions and senses, the former of which they delineate by figures, the latter by gestures. The connection between our ideas and written language being purely arbitrary, it is a very hard task to give the deaf any notion of that mode of conversing, theirs being only hieroglyphical. Another and still a greater difficulty is to enable them to comprehend the meaning of the figurative part of language. For instance they soon understand *high, low, hard, tender, cloudy*, etc., when applied to matter, but have not the slightest conception of these qualities when applied to

mind. Notwithstanding these difficulties, the deaf attain a perfect knowledge of written language and become capable of speaking and writing their sentiments in the most distinct manner, and of understanding fully what they read. Being thus advanced they are capable to learn any art or science (musick excepted) and to translate one language into another. Mr. Braidwood's pupils are under his tuition from three to six years, according to their age, capacity, and conveniency. When we visited this academy we found that the boys not only could converse by the help of the artificial alphabet they learned by putting the fingers into certain positions, but they understood us, although perfect strangers to them, by the motion of our lips. In this manner they actually conversed with us, returning an answer to us distinctly, yet slowly, *vivâ voce.*" A good idea of Braidwood's method of procedure may also be learned from a book entitled, *Vox Oculis Subjecta*, published in 1783 by a parent whose son Braidwood taught. One pupil of Braidwood's, the Rt. Hon. Francis Humberstone M'Kenzie, Baron Seaforth, achieved high distinction, or rather, as chief of the clan, had greatness thrust upon him. This gentleman became deaf from scarlet fever at the age of twelve, or, according to another authority, at the age of sixteen years. It is said that for a time he also lost his speech. In 1783 he succeeded to the chieftainship of the Clan M'Kenzie, becoming afterwards Governor of Barbadoes, in which capacity he acted with great humanity and public spirit. He raised the regiment called the Seaforth Highlanders, of which he was the first colonel, though we do not hear of his taking part in actual warfare. A vignette portrait of him, wearing the bearskin of the regiment, is given in Keltie's *Scottish Highlands*, II., 617-18. He was the last Caberfae, thus fulfilling the prophecy of the Brahan seer, that the male line would become extinct when a deaf Caberfae appeared. We have not been able to learn if he relied much on lip-reading.

In the meantime the light was gradually spreading in other countries. Van Helmont, at Brussels, had conceived the idea of experimenting with deaf mutes in the hope of

bolstering up his theories regarding the form of language natural to man, and, amongst other wonders, claimed to have taught a deaf mute in three weeks to answer questions addressed to him; but (and there is great virtue in a but) it was necessary that he should be spoken to slowly, and with the mouth well open. "This deaf mute," he adds, "afterwards learnt in a very short space of time the Hebrew language by his own efforts, and without a master, after having learnt by the method indicated to read and combine the letters, solely by comparing the Hebrew text with a German translation."

Notwithstanding this wonderful success, Amman, a Swiss physician who practised at Amsterdam, and had already commenced to teach deaf mutes, says that Van Helmont confessed to him that "when he saw and heard me teaching, he acknowledged, with the greatest candour, that I had not only not borrowed anything from him, but that I had greatly surpassed him in practical results." If this were so, then Amman's results must have been very wonderful indeed. If we may fully believe what he himself recounts of his success, it was certainly something to be proud of; for he records of a young lady whom he taught, that in two months this charming young person not only read with an articulation sufficiently distinct, but put down in writing what was slowly pronounced before her; she spoke on all subjects with intelligence; although deaf, she listened with her eyes to those who spoke, and answered correctly to questions which were addressed to her.

Amman wrote a work, entitled *Surdus Loquens*, which has been several times reprinted, and of which an English translation was made by Daniel Foot in 1694, and more recently by Charles Baker, of Doncaster, in 1873. Degerando says that "Van Helmont and Amman are the veritable chiefs of that school of writers who, in treating of the education of deaf mutes, have made the essence to consist in the artificial restoration and use of the voice."

Amman and Van Helmont had no immediate successors in the country of their adoption, but the seed which

they sowed was destined to bear fruit in the neighbouring territory of Germany, where it blossomed under the fostering care of logicians and savants into the full-grown plant which we now know as the German system.

The credit of first placing the German system on a solid foundation belongs to Samuel Heinicke, the son of a small landholder, born at Nantzschütz in 1723, who, designed by his father to succeed him as a farmer, went his own course, and after tempting fortune as soldier, schoolmaster, and singing master, eventually settled down to a successful career as a teacher of deaf mutes. He had studied Latin, French, and music, in addition to the ordinary schooling. "Nature," says Arnold, "had made him a teacher, quick, versatile, fruitful in expedients, and facile in adapting his methods to the capacity of his scholars." That he was not lacking in self-confidence, we may judge from his statement that *he achieved in a few months more than others had done in as many years.*

These *others* included, in addition to the cases of Van Helmont and Amman above mentioned, his fellow-countryman, Camerarius, who records a case of a deaf mute, blind from his third year, who passed the University examinations with great success, was made a doctor of laws, and lectured at Cologne with great renown—quoting from memory alone many works *that he had neither seen nor read*; also Schott, Kerger, Raphel, who taught his eldest daughter to speak so well that, "in speaking, she could hardly be distinguished from others. Printed works and writing traced on the hand she freely read. Her composition was good, her acquaintance with the doctrines of religion were extensive, and her inferiority in society could hardly be perceived." When, in addition, we mention Lasius, Arnoldi, and others, who may be considered the pioneers in Germany of the work which Heinicke permanently established, it will be seen that he was certainly not over-burdened with modesty. Nor was he of a generous disposition, for he sedulously concealed his method from the public, with the object of making as much money out of the business as it was possible for

him to effect. Notwithstanding these defects of character, his work has stood, and will continue to stand, the test of time.

His great success as a teacher attracted the attention of the Elector Frederick Augustus of Saxony, under whose patronage, and with whose support, Heinicke established at Leipsic in 1777 a Deaf and Dumb Institution, which may be regarded as the parent of all the institutions and schools at present flourishing in Germany. Arnold considers that it is hardly just to call Heinicke the founder of the German system, as he only gave a more logical application to the principles taught by Bonet, Wallis, and Amman. If he was not the founder, he was at anyrate a good foster-parent; for though it is difficult, as Degerando says, to find out what was the particular invention which he claimed for himself in his teaching, yet it is certain that he was one of the first to affirm strongly and bring into notice the theory that, in the education of the deaf, speech was to hold the first place, and become the sole instrument of language and mental development.

Degerando thus sums up the work which Heinicke accomplished: "Independently of his *Observations on the Dumb and on Speech*, he has discussed the merit of divers manners of instructing deaf mutes, comparing them with those which he had imagined; he has written of the manner of thinking peculiar to deaf mutes, and marked the errors which one is liable to fall into, through false methods, in the treatment of their infirmity and their instruction; he drew up a new alphabet for his pupils, with some specially suitable reading lessons; he has put at their disposal a *History of the New Testament*, and he had the merit of being the first to compose books specially suitable for the deaf and dumb. Moreover, in addition to his *Traité des Découvertes importantes en Psychologie, et sur le Langage Humain*, he inserted a great number of articles on the subject in the scientific and literary journals of Germany." It seems a pity that an uncertain temper and brusque manner should have cast such a shadow over the reputation of a man who

worked so hard, and with such ability and success, for the welfare of the deaf.

Meantime events in France were gradually shaping themselves towards the elucidation of a system which was to have a world-wide influence on the education of the deaf, an influence which still lingers amongst us and is all-potent in some places, and will in all probability make itself felt for all generations.

As in other countries, various isolated attempts were made by ingenious and benevolent people, whose hearts were touched by the sad condition of mutes with whom they were brought into contact in the various relations of life. Amongst these early cases may be mentioned the deaf mute Guibal, whose will, written by his own hand, was allowed by the Parliament of Toulouse, 1679; Saboureux de Fontenai, whose education was commenced in 1746 by a builder named Lucas, and a specimen of whose composition is given by Degerando in the shape of a long extract from a letter written by him to a lady in 1764. This young man had the advantage of two other early French teachers, viz., P. Vanin, and Pereira. The latter, a Spanish or Portuguese Jew, is considered by Arnold to have been the real pioneer of the work in France. We learn that he divided the period of instruction into two parts, which he called "pronunciation and intelligence." By the first he taught his pupils to read and pronounce the French language, though without understanding anything of it, except the most familiar phrases and words of common daily use. In the second period he taught them all the rest of their instruction, viz., to understand the value of the words contained in all the parts of a discourse, to make proper use of them, either in speaking or writing conformably to the rules of grammar and the particular genius of a language.

The first part of the course, he considered, only required twelve to fifteen months, the second part needed a much longer period. Like the early Spanish and English teachers, he made great use of dactylology, employing a one-

handed alphabet to give his pupils practice in repetition of words and sentences, and to direct their pronunciation. This alphabet of his differed from the two now generally in use in that he tried to figure the sound rather than the actual written letters, the combination *ch*, for instance, having in his system but one sign.

Pereira acquired much fame by his achievements, had his work noticed by the philosophers Rousseau and Diderot, and his pupils' attainments certified by the French Academy on three distinct occasions, but as he tried to keep his methods secret, he, like his contemporary Ernaud, did little or nothing for the real furtherance of the cause, beyond, perhaps, preparing the public mind to entertain the idea that it was possible, after all, to educate the deaf.

The real credit of popularizing the idea that the instruction of the deaf and dumb was not only possible, but a necessary Christian duty, belongs by common consent to the Abbé de l'Epée, who must be regarded, as Degerando says, not merely as the instructor, but veritably the father of the deaf and dumb everywhere. This benevolent man was born at Versailles in 1712, of a noble family, and in easy circumstances. Educated for the church, his duties as a *curé* brought him into contact with two young girls, sisters, who had been deaf from birth. Touched with pity at their desolate condition, he set himself to try and find means to alleviate their sad lot. His success was great and surprising. His school soon rose in numbers, and on it he expended his modest fortune of £600 per annum, seeking aid from no one, but denying himself the necessaries of life rather than that his *protégés* should go without the bodily, mental, and spiritual food which he henceforward made it the business of his life to supply to them.

In his first attempts he used writing, associating the words with the objects; but a perusal of the Spanish book, *The Art of Teaching the Deaf and Dumb to Speak*, put him on a new track, and considerably enlarged his views of the work before him. The perusal of Amman's *De Loquela* would tend in the same direction. He experimented

with success in the teaching of articulate speech, and a close perusal of his work on *The True Manner of Educating the Deaf and Dumb* shows that he had thoroughly mastered the theory of the art of teaching the deaf to speak, and that only perseverance, time, and opportunity were lacking to enable him to achieve as great results by this method as have been attained by any before or since. Full of French vivacity, however, without assistance, and burning to instil the doctrines of Christianity into the hearts of his numerous disciples, the teaching of these ideas by speech alone was too great a task even for his ardent nature; and so he conceived the brilliant idea of taking the crude gestures which the uneducated deaf make for the purpose of communicating as far as possible their wants and wishes, and working them up into a systematic language, which should be to the deaf for all time what the mother tongue is to every hearing child of Adam. By long practice he so perfected this new instrument, that his pupils were able to write down from his dictation long sentences on all manner of subjects.

Fascinated by his discovery, he gave up the teaching of articulate speech, and confined himself to giving instruction to his pupils in this novel language. At first the public were apathetic, but by and by his system began to attract notice. Royalty smiled on him, learned bodies vied with each other in patronising him, rivals attacked him, his pupils adored him; and, as the immediate result of his painstaking and self-denying efforts, institutions for the education of the deaf began to spring up in every civilized country, and the movement thus begun has never stopped, but has gone on widening and widening with each succeeding year.

Amongst those who attacked De l'Epée's system was the German Heinicke, but as he would not publish his own method, and shrouded it in mystery as far as possible, while De l'Epée took every opportunity of showing the uses and advantages of his own, it is no wonder that the public and the societies, who were called in to judge between them, should have given the preference to the

one who, at any rate, did not ask them to take matters on blind trust, but appealed to what they saw placed before their eyes. It is to this open-mindedness of De l'Epée's, joined to the great ease with which the deaf and dumb can learn to converse by this method, that the French system owes its wide-spread influence. As an instance of the way in which the system was spread, we may mention the story of its introduction into America.

A young minister, Thomas Gallaudet by name, wishing to learn how to teach the deaf and dumb, so as to introduce it into his native country, applied to Dr. Watson of London and then to the Braidwoods for information and advice; but found to his astonishment that it was considered by them as a secret art, not to be lightly imparted to any one. Gallaudet then turned his steps to Paris, where he met with a very different reception; after staying there a considerable time, he returned to his native land, along with a deaf and dumb man named Clerc, and together they started the work in America, which has now grown to a magnitude which quite overshadows anything that has been done in any European country. The direct result of this obstructive action of Braidwood and Watson was that the French system of artificial signs obtained first hold in that new country. Several generations of deaf mutes were educated by its means, and a sentiment in its favour was created which is still all-powerful, notwithstanding the frequent assaults which have been made upon it in recent years by enthusiastic Oralists. In making these remarks, we wish to guard against the assumption which is common in certain quarters, that the followers of De l'Epée confined themselves simply to the teaching of mimic gestures and the use of the sign language. This was their first care undoubtedly; but it is certain that De l'Epée's successor, the Abbé Sicard, and those who followed, made use of it for the purpose of teaching, more or less perfectly, the written language of the country to their deaf pupils. Hence it is utterly false to assume, as Hartmann does, "that the French deaf mute can only hold intercourse with those who have learned the sign

language." If Hartmann had read some of the writings which Clerc, the deaf and dumb teacher who accompanied Gallaudet to America, and also those of other deaf mutes educated on the French system, he would surely never have ventured on such a rash statement.

The instruction of the deaf and dumb was now no longer confined to isolated cases, or regarded merely as a subject of philosophical curiosity. It had been demonstrated that as a class they were capable of receiving instruction like their fellow-beings in all the subjects of a liberal education, and this being once fully established, Christian benevolence immediately began to respond to the calls made upon it, and schools began to rise in every centre where arts and sciences flourished. A free school for deaf mutes was established at Vienna in 1779—taught at first on the French system, but afterwards on the German; and this was followed by the one at Prague in 1786.

Prussia followed suit in 1788 by the establishment at Berlin of a Royal Institution under the guidance of Eschke, a son-in-law of Heinicke. In our own country the subject was not allowed to drop. In 1780 a public institution had been talked about, but little or no progress was made till 1792, when a society was formed in London with the title of the Asylum for the Deaf and Dumb.

The first teacher was Watson, a nephew of Braidwood, who some time previously had removed his private school from Edinburgh to Hackney. Dr. Watson, in 1809, published a work on the *Instruction of the Deaf and Dumb.* About this time also appeared a translation of the Abbé de l'Epée's book on the same subject. Watson's system was on the lines of the early Spanish and English teachers, and his book may be considered as a full exposition of the British Combined System. He used speaking, writing, reading, drawing, and natural signs as his means of instruction.

He thus describes his own system:

"Writing and reading occupy the first rank: the lip alphabet and artificial pronunciation are taught early in order to enlist the service of speech; the manual alphabet is used to join these two orders of signs to those of writing;

the use of gestures and of pictures accompany these different materials as a means of interpretation, which serve to facilitate the explanation of the meaning of words and to help their association with the ideas. In this way each word is fixed in the memory by a quadruple chain; four ways are open to get at the knowledge of them."

Mr. Watson was of opinion that this multiplicity of means served to impress the words better on the memory and intelligence of the pupil, without producing any complication or embarrassment to him. He commenced by teaching, as aforesaid, articulation and lip-reading, writing, and reading, taking all on together. Each sound was taught separately. The pupil saw the teacher pronounce the sound, or word, which he imitated, then wrote on the slate, learning at the same time to spell on his fingers.

Signs and pictures were used to recall to the mind objects which were not present to the eye of the pupil, but of the two Mr. Watson used signs in a much less degree than the French teachers, and made a much more extended use of pictures. He set himself to observe the signs made by his pupils amongst themselves, and employed these to illustrate his lessons; but he was opposed to the elaboration of these signs into an artificial language. He thought so highly of picture-teaching that he composed a book of pictures specially for the use of his pupils.

He speaks of the use of signs as follows:

"What should we expect from a European who should undertake to teach his own regular, copious, and polished language to a South Sea Islander, who was henceforward to live among Europeans, and whose scanty vocabulary extended only to a very few words, barely sufficient to enable him to express, in a rude manner, what was required by the uniformity of his condition and his paucity of thoughts? Should we suspect that the teacher would set about new modelling, methodizing, and enlarging this rude and imperfect language as the readiest method to make the Islander acquainted with the European tongue; especially, though this new-modelled language were the thing practicable, which I apprehend few will contend for, could be

of use but to these two persons? Does this supposition appear ridiculous? how much more fanciful and useless is an attempt to methodize signs for the instruction of the deaf and dumb?

"Would it not be a more natural and rational mode of procedure for the teacher to begin by watching the objects and occasions to which his scholar applied the words of his barbarous speech; that, by knowing *these*, he might gradually substitute the words of the language to be taught, using the *former* only as an introduction to the *latter*?"

Other institutions were not slow in springing up, after the example thus set by the metropolis. The Edinburgh Institution was established in 1810, under the guidance of Mr. Kinniburgh. This was followed in 1819 by the establishment of the "Glasgow Society for the Education of the Deaf and Dumb," or, as it came to be popularly called, the Glasgow Deaf and Dumb Institution. Considerable trouble was experienced in the first years of its existence in finding a suitable teacher. The changes were many and numerous; but at last, in 1831, the Directors were fortunate in securing the services of one who, for the long space of forty years, guided its destinies with rare skill, tact, and devotion, and succeeded in turning out a set of pupils who in written language have had very few equals and no superiors. This was Mr. Duncan Anderson. At the beginning of his career he, like most of the early British teachers, gave up much of his time to the teaching of speech; but gradually relaxing his efforts in this direction, he concentrated his energies on the teaching of written language, in which his pupils, as we have said, excelled greatly. Unfortunately Mr. Anderson never published an account of his system, and consequently we are left without an authoritative exposition of his method; but an effort will be made to reconstruct it as far as possible from the recollections of his old teachers and pupils.

In conjunction with Mr. Baker of Doncaster he drew up a series of pictures illustrating the common forms of language, as applied to the common facts and incidents of everyday life. These pictures were at the time exceedingly

valuable, though they have now become rather obsolete, owing to their diminutiveness, and not exactly corresponding in all respects to the features of present-day life; but the idea was a good one, and, as far as the state of engraving in those days went, well executed. Mr. Anderson also drew up a graduated Dictionary for the use of the deaf, which was very useful.

Amongst other workers and writers of the past generation whose works exercised a profound influence on the course of deaf-mute education in this country, mention must be made of Charles Baker of Doncaster, and Scott of Exeter.

The former is well known as the compiler of a variety of lesson books which, drawn up in the first instance for use amongst the deaf, have been extensively used in hearing schools, not only in this country, but on the Continent and all over the world.

Scott, on the other hand, has not been so well known as he deserved to be. His work on the Deaf and Dumb, published at Exeter in 1870, shows a grasp of the principles underlying the work which can only be obtained by a gifted mind after long reflection and much experience; while one or two lesson books which he constructed, and notably his *Reading Made Easy* and *First Book of Exercises in English Composition* are constructed in a manner which show him to have been a thoroughly practical teacher, an opinion which intercourse with some of his old pupils, whose fluency of language is surprising, tends greatly to confirm. His main object, like that of Anderson, Baker, and others, was the teaching of written language. Signs were freely used to explain the meaning of the written words and sentences which were put up on the board for the pupils to learn; the objects referred to were pointed out whenever possible, and pictures used whenever the actual objects could not be had. Action teaching, so much in vogue at the present day, was not neglected. Moreover, it is a great mistake to assume, as is too often done by advocates of the Pure Oral method, that systematic signs were generally taught to the pupils after the manner of De l'Epée or Sicard. That this was done in a few

schools cannot be denied—the writer's early experience was acquired in a school where signs were really taught on the original French method—but men like Scott and Anderson went beyond that point, and only made use of the signs which they saw their pupils using, for the purpose of quickly illustrating and explaining the meaning of words and phrases, the explanation of which, by any other method, would take up more time than in their opinion the thing was worth. Any one who is in doubt on this point may easily be convinced by reading the Report of the Conference of 1851-1852, where it is expressly laid down that the use of signs should be discouraged as much as possible.

While the English teachers, following the example set them by the French and American schools, had thus been gradually giving up all attempt to teach speech to the deaf, so that in some schools it was abandoned altogether, and in others it had dwindled down to a poor hour or half-hour's drill in articulation, which had little if any connection with real language teaching, the German school was gradually perfecting its method, through a long course of experiment, till it reached a point of perfection such as it had never before attained.

Taking as its fundamental principle the dictum that "Human thought is impossible either by gestures or by writing, but most assuredly by the spoken word only,"[1] the logical German mind set itself to work out a system of education for the deaf based on this principle. After many experiments and many failures the Pure Oral or German system was evolved, by means of which the deaf can, its advocates claim, be restored to society as living members, speaking and lip reading so well that they are able to take their place as members of the community on terms almost of equality with hearing and speaking people. The evolution of this system is due in the first place to Moritz Hill who, following the footsteps of Heinicke, improved the system, by purifying it of some of the signs which, in spite of his theories to the contrary, still encumbered

[1] Arnold, *Teacher's Manual*, quoting Walther and Fornari.

his teaching, and secondly to Arnold of Riehen, whose pupils, according to the testimony of many who witnessed the results of his teaching, attained to a perfection of speech and lip-reading which was simply marvellous, and indeed almost incredible even to those who witnessed them.

Stimulated by the results obtained by these and other distinguished teachers, an agitation was begun about twenty-five years ago for the introduction into this country of the German or Pure Oral system, an agitation which has led to many improvements since it was commenced. The starting of a college for training teachers of the deaf on the Pure Oral system at Ealing, Middlesex, and the association for promoting the Oral teaching of the deaf at Fitzroy Square, London, were among the first fruits of this new movement. The controversy between the advocates of the two systems, which had lulled somewhat since Heinicke and De l'Epée's time, broke out with renewed vigour. A conference in London in 1877, which led to many important changes, notably the introduction of Oral teaching into the Manchester School, and paved the way for the great European Conference at Milan, in 1880, when the majority of the delegates, many of whom had previously followed the French method, declared enthusiastically in favour of the Pure Oral system. The flowing tide was with the Oralists; several European governments took up the work as a national undertaking, and passed laws rendering the education of the deaf compulsory, and in most cases directly favouring the Oral system.

Our own country, somewhat slower in matters educational than its rivals abroad, acted with characteristic caution. Before passing any law on the subject, it was thought desirable that due inquiry should be made as to the need of education for the deaf and dumb, and it was only after much agitation and pressure from the friends of the cause that in 1885 a Royal Commission was appointed to make inquiry with a view to legislation. The result was the issue of a Report which, while not satisfying absolutely the extreme partizans on either side, has formed

the basis of legislation which we may confidently hope will be of untold benefit to the generations yet to come. Moreover the issue, along with the Report proper, of the voluminous evidence taken from experts, and the accounts of the visits to schools and other matters pertaining to the inquiry, furnish a mine of material which is of the highest value to all students of the subject.

The issue of this Report has been followed by the passing of an Act which, in Scotland, came into force on the 1st January, 1891, and in England, on 1st January, 1894, making compulsory the attendance of all deaf children at school from the age of seven to sixteen, and placing on School Boards and School Authorities the obligation of seeing the Act enforced, and of providing proper instruction for all who, through poverty, are unable to provide it themselves.

Nor has our country been unfruitful in literature pertaining to the subject. In addition to the valuable reports of the various conferences which have been held from time to time since 1877, the establishment of the *Quarterly Review of Deaf-Mute Education*, published by a committee whose headquarters is Stainer House, Paddington Green, London, W., has provided a medium for the exchange of professional opinion which has long been wanted in this country—a medium which our American brethren have enjoyed for many years in the admirable *American Annals of the Deaf*.

The chief honours in the literary department of the work have been easily carried off by the venerable Thomas Arnold of Northampton, whose monumental works—*A Method of Educating the Deaf on the Oral Method* and *The Teacher's Manual*—have been adopted as text-books by the Colleges of Teachers in this country, and, we believe, are largely sought after in America. Amongst other writers still living, Dr. David Buxton holds a foremost place.

The establishment at Washington, U.S.A., of the Volta Bureau for the collection and diffusion of information regarding the deaf, by Professor Graham Bell, the cele-

brated inventor of the telephone, promises likewise to be of immense value to all workers in the cause, and we may hopefully trust that the day is not far distant when everything that can be suggested by science for the good of the deaf will be carried out; and if it is not possible for their ears to be unstopped, at least let us hope that their education by the eye and the touch will be so perfected that they will fall little short of their hearing brothers and sisters in everything that pertains to the character of good and loyal citizens.

CHAPTER X.

THE UNEDUCATED DEAF MUTE.

In order to fully understand the greatness of the task which any one who undertakes to educate a deaf-mute child has to achieve, it is necessary to obtain a clear idea of the state of mind in which deafness places those who suffer from it. It has been shown that the old idea that deaf-dumbness was caused by some imperfection of the vocal organs, or by mental incapacity, has no foundation in fact, yet this idea still holds in many places among the common people, though it is slowly giving way before the diffusion of knowledge now so rapidly going on, and especially since the agitation in favour of the Oral method has shown that it is possible to teach deaf mutes to *speak*, thus placing them in the popular opinion on the same plane of intellectuality as the hearing.

With the view possibly of heightening the apparent difficulty of their task, and thereby increasing the public appreciation of their own ability, many teachers have painted the condition of the uneducated deaf mute in the blackest colours, and have written them down as little better than brute beasts, incapable of distinguishing between right and wrong, vain, conceited, and sensual, fond of setting others by the ears, suspicious and jealous, fond of praise, and afraid of death. Though there may be some truth in this view, it is undoubtedly exaggerated, and certainly not applicable to all. Instances are quite common of untaught deaf mutes who have lived honest, peaceable, and contented lives, and have given evidence of consider-

able abilities. The story of an uneducated deaf mute of Ayrshire, taken from a paper published a few years ago by Mr. James Paul, missionary to the deaf at Kilmarnock, and himself a deaf mute, will show this:

"Joseph Watson was born some seventy-seven years ago, when there was no school for the deaf and dumb in Scotland. He grew up without any knowledge of reading, writing, or language. He learned his trade as a weaver, and afterwards started on his own account as a barber, with wonderful success till his death. He was intelligent and industrious. He possessed a measure of wit, which could make long faces 'laugh and grow fat.' Any hearing or deaf person could easily understand him by signs. He often lamented his want of education. He made correct models of scenes in the land of Burns. The models, which are shown to the public at Kilmarnock, are said to be the best and most correct that were ever made. It cost him many years' labour to finish them."

We also learn that he was skilled in the cultivation of flowers, excelled as a breeder of canaries, and was able to save up sufficient money to buy a small property for himself. It is sad to relate that he was killed by falling over a bridge without a parapet wall, when walking along the railway in the dark. The pointsmen called out to him not to proceed along the line, but of course in vain.

The writer once met an untaught deaf mute, earning a good livelihood as a carpenter, who had travelled all the way from Cape Colony to Liverpool for the purpose of visiting a deaf brother, who was settled in the latter city. After staying for some time, and seeing the sights of the neighbourhood, he went back to the Cape, where he arrived safely, and resumed his usual work. His only means of communication were natural signs, eked out perhaps by a few words which he had managed to pick up through his own natural sharpness. He had never been to school, nor had he had a day's tuition in his life.

On the other hand, it is but too true that, without education, the great majority of the deaf are in a pitiable

condition of ignorance. Except in the case of those who are exceptionally endowed, it is extremely difficult for them to pick up correct notions of the facts and the relations of the world around them. Signs may help somewhat, but signs uncorrected by language are liable to great misconstruction, even more than words, as witness the following story:

"The Spanish ambassador to the Court of James the First of England, conversing with the king, remarked on the advantage of doing business by signs instead of talking so much. The British Solomon, in his usual boastful style, said that he had a Professor of Signs. The ambassador thereupon became curious to see him, which rather disconcerted the monarch, who tried to put him off by saying that the professor was stationed in the far north of his dominions. The ambassador, however, was not to be put off so easily, and insisted on having an interview. A courier was accordingly despatched to Aberdeen, with instructions to the professors there to put the best face possible on the matter. On the arrival of the ambassador in the granite city, he was told the Professor of Signs was away among the hills practising his art. Nothing daunted, he said he would wait the gentleman's return. Puzzled for a time, those in charge at length hit upon a plan of escape from the dilemma, which was to employ a one-eyed butcher to impersonate the character of the Professor of Signs. A bargain struck and the day fixed, the ambassador was informed that the professor had returned, and would receive him at an appointed time and place. Prompt to time the ambassador was at the place assigned, and was introduced to the one-eyed butcher, now the Professor of Signs in gown and wig. The ambassador put up one finger, the professor put up two; the ambassador put up three fingers, the professor closed his hand; the ambassador took an orange out of his pocket, the professor replied with a piece of oatcake. The ambassador rose radiant, bowed, and retired. Those immediately concerned in the plot waited anxiously in a side-room the result. The ambassador expressed himself

as highly pleased, and said: 'I put up one finger, signifying there was one God; the professor put up two, signifying the Father and the Son; I put up three, signifying the Father, Son, and Holy Ghost; he closed his hand, signifying the Three in One; I took out an orange to say, this is the fruit of our land; he took out a piece of oatcake, as much as to say, this is the staff of life. I am thoroughly delighted.'

"Next turns out our professor, the one-eyed butcher, furious. 'Fancy,' says he, 'he put up one finger to say I had only one eye; I put up two to tell him my one was as good as his two; next he put up three, meaning there were just three between us; I closed my fist to let him have it; he then took out an orange, hinting you cannot grow these in your country; I took out a piece of oatcake, as much as to say, we can grow far better, for this is the staff of life. Only for my promise to you, I would have fixed him for his impudence.'"

This story is introduced because it aptly illustrates the danger of misconception which is apt to arise from the use of signs without words.

Previous to instruction, therefore, at a special school, the deaf have little chance of obtaining correct ideas of the relations of human beings to one another and to the Creator.

Even when parents take the trouble to try and instil some elementary notions into the minds of their deaf children, strange misconceptions are likely to be the result. Alexander Atkinson, a deaf mute who was educated in the Edinburgh Institution by Mr. Kinniburgh, in an autobiography which he published, says: "Unlike the Indian, who hears God in the wind, or the blind, who are so sensitive to the sublime medium of sound as to infer from it some rude intimation of some superior spirit, I don't recollect anything like it. Whenever my mother took me to church with her, she bade me join my hands, look up, pray, and kneel down. Making me do the same at home on Sundays, she generally pointed her hand towards the sky, and occasionally showing me some

large plates in her large family Bible figuring some child in a devout attitude, I may have imagined faintly that her prayers were *addressed to the sky*, I consequently addressed mine. This impression vanished and returned with the occasion, nor do I recollect any ultimate result from the repetition."

This story well shows the danger of depending entirely on gesture signs for the communication of ideas, and the necessity for some medium more definite in its purpose. That medium is spoken or written language, from the use of which the deaf mute is deprived as the direct result of his want of hearing. The special teacher's task is to give him this instrument; but to do so is not easy. Even with good abilities it is difficult to make four senses do the work of five. The theory of compensation holds to a certain extent, perhaps, and the energy which would be dissipated through the working of the ear may perhaps go forth as additional stimulus to the other organs, but as a rule facts do not bear out this theory. The teacher's task, therefore, is to get the pupil to understand what is to him a foreign language, and if signs be ignored or forbidden, he has to teach this language without any means of explaining except through the language to be learnt. The case is something similar to what would happen if an Englishman who knew no Gaelic undertook to teach to a Highlander the English language, of which he had previously never heard a sound. Nor is this the only drawback; the advantage would still be on the side of the Highlander and against the deaf man, for the one would have his five senses to help him, he would hear as well as see the words, and would remember the sound even when he could not recall the sight of them, while the poor deaf mute, on the contrary, would have to depend on his eyes alone, aided perhaps a little by the feeling of touch, but still forced by his affliction to *learn* and retain language by a channel which was never intended by Nature when she formed the ear to hear and the eye to see.

A little reflection will show how greatly the deaf mute

is handicapped in learning words, and how necessary it is to cry "Patience, patience, patience!" But if it is so difficult to get the deaf to attain to a knowledge of written or spoken language when they are only troubled with the one defect, how much more difficult must it be when, as is often the case, other defects are found co-existing along with the deafness. We do not agree with the extremists in placing the deaf, as a class, below others in physical development or intellectual ability; it has been shown in the first part of this work that they are quite equal to hearing persons in many respects, but it is impossible to deny that many deaf mutes suffer from impaired faculties other than deafness, and are often found physically and mentally below par. Graham Bell, in his evidence before the Royal Commission (21,449) states, "There are fourteen and a half times as many blind persons among the deaf and dumb in proportion to the population as there are in the community at large, and forty-six times as many idiotic." This statement seems strong, and requires confirmation, but an eye test which the writer once made of the pupils of the Liverpool School for the Deaf revealed the fact that 50% to 60% suffered from weak eyes. Certain it is that the causes which have produced the deafness have also in many cases affected the brain, and so rendered the teacher's task a much more difficult and hopeless one. This always requires to be kept in view when trying to estimate a teacher's work, and must be allowed for when an inquiry into the merits or demerits of particular systems is made. A boy now in the Glasgow school, whose deafness dates from the time when he had a brain trouble, cannot remember written words for any length of time, no matter how hard he strives to learn them. He understands the signs in use amongst the children, however, and by this means has acquired many elementary notions, and it is quite possible to instruct him as to necessary duties. Any attempt at written composition ends in utter failure. Now according to the statements of some extreme advocates of the German method, any child who can be educated

at all, can be educated on that method. Yet any person who understands signs at all would hesitate to pronounce this boy an idiot. And there are many similar cases to be found in our Deaf and Dumb schools.

In the early days of deaf-mute instruction, when large numbers were allowed to grow up without education, and those who did obtain any instruction were sent to school in adult life instead of in childhood, as is now happily the case, the question of whether it was common or possible to attain to the idea of God as our Creator, without definite instruction or revelation, was often discussed. Many adult deaf mutes, after being rendered capable by education of communicating their ideas in written language, were interrogated as to their notions previous to instruction. In general their replies were that they had formed no conception of a First Cause.

Speaking at the annual meeting of the Glasgow Institution in 1840, Mr. Kinniburgh said, "He had for twenty-nine years had his attention directed to this important subject of investigation (the knowledge of God held by the deaf and dumb previous to instruction) and his whole experience confirmed him in the conviction that without revelation or traditionary knowledge there was no power in the human mind which could ever guide it to the idea of God as a Creator, or of a future state of rewards and punishments."

M. Laurent Clerc, the celebrated pupil of the Abbé Sicard, wrote as follows to Mr. Lewis Weld, Principal of the Hartford Institution, U.S.A., April 27th, 1828: "You ask me if, previous to my instruction, I had any idea of God, and of the origin of the world, or the beings and things it contains. The same inquiry has been made of me perhaps one hundred times before, both in Europe and in this country, and my answer has always been that I had none at all, nor had I any of my own soul, for it never occurred to me to seek to know what was *that* within me which thought and willed. I have been a teacher of the deaf and dumb these thirty years, and, of course, have had frequent opportunity to make the same

inquiries of several of my unfortunate fellow-beings, and their replies, with a few exceptions quite insignificant, have been similar to mine." [1]

The majority of deaf mutes, who have been interrogated on this point after education, generally give the same answer. It has also been assumed that an uneducated deaf mute was incapable of forming abstract ideas. In an article entitled "A Deaf Mute's Recollections," in the *American Annals* of April, 1893, some particulars are given which tend to show that abstract thought of a decidedly subtle kind went on in a deaf mute's mind in advance of the means of expressing it to others.

A deaf mute named Estrella gives a long account of his recollections previous to his being sent to school. He says, "I thought in pictures and signs before I came to school. The pictures were not exact in details, but were general. They were momentary and fleeting in my mind's eye." Some of the signs he used were "beard for *man*, breast for *woman*, the hand down over the shoulder moving like a bell for *Sunday*, two hands open before the eyes for *book* or *paper*, etc."

This is how he accounted for the origin of the ocean. He says: "One day I went with some boys to the ocean. They went bathing. I first went into the ocean, not knowing how it tasted, and how strong the waves rolled. So I was knocked around with my eyes and mouth open. I came near being drowned. I could not swim. I went to the bottom and instinctively crawled up on the sand. I spit the salt water out of my mouth and wondered why the water was so salty. I thought that it was the urine of that mighty God."

He traces the origin of his knowledge of right or wrong to a fright which he got through stealing some money. Being often kept hungry when a boy, he got into the habit of stealing food. Then he began to take small sums of money, beginning with a dime, and gradually increasing the amount taken till he had the hardihood to take a quarter of a dollar. One day, however, he, by mistake,

[1] *Notions of the Deaf before Instruction*, by Dr. Peet.

took a piece of gold—a ten-dollar piece. He then says: "I made haste to the nearest grocery store, and asked for candy. I put the money on the counter. It was gold! ten dollars!! I felt as though I were a fish out of water, with my eyes shooting out. At once I took it back and ran out. I could see nothing but gold everywhere. My heart beat. Did I know that I was guilty? If so, how could I know? Simply by seeing that I had stolen *too much*." After describing the trouble he had to get rid of the money, the possession of which gave him no rest till one day on going to the place where he had hid what remained he found it gone, he proceeds: "I was momentarily disappointed, but in fact I felt happier than sorry for conscience's sake. Strange to say, anybody, even the butcher (from whom he stole the money) never gave me to understand that I had been suspected of the theft. Still more strange, I have never stolen money again. Besides I did not steal as many other things, particularly food, as I used to. My conscience must have become keen enough. It began developing more and more, mainly owing to the influence of the moon."

The above extract seems to prove that an uneducated deaf mute may arrive at some knowledge of right and wrong, independent of actual teaching by others. Granting, however, that the knowledge of right and wrong is developed to a certain extent in the mind of an uneducated deaf mute, it still remains questionable to what degree of absolute knowledge he can attain. Under the most favourable circumstances it cannot be so clear and precise as it would be after the educator had done his work, and in the lower types of intellect the development of the conscience must be almost *nil*.

One of the most difficult questions which lawyers have been required to solve is that of determining whether an uneducated deaf mute should be punished for breaking the laws of his country or not. This difficulty has always been felt to be very great. In the case of hearing people it is usually held that ignorance of the law does not

excuse the breaking of it. If such a person does not know the laws of his country, it is assumed that the fault is his own, since the means of learning what those laws are is open to every one, if he chooses to avail himself of them. The case of the deaf man is different. Till the educator steps in, it is impossible for a deaf mute to learn what the laws are which he has to obey. By observing what others do or refrain from doing, he may form some idea in his mind as to what is the law of life in the country to which he belongs; but there can be no certainty in his mind in regard to these ideas, unless it is assumed that the knowledge of good and evil is innate in the human mind, and that no instruction is required to enable any human being to discriminate between what is right and what is wrong. Concerning this the opinions of metaphysicians differ considerably, but amongst teachers of the deaf there is little doubt but that the uneducated deaf do attain to some perception of right and wrong, even without special instruction; though, on the other hand, allowance ought always to be made for their ignorance of any except the most elementary laws.

In an Appendix to the *Twenty-fifth Annual Report* of the Glasgow Institution some important information bearing on this question is given, which shows how the highest legal and scholastic authorities in Scotland viewed the matter at that time.

In January, 1846, in the Justiciary Court, Glasgow, a deaf and dumb youth was charged with housebreaking and theft. Great difficulty was experienced in ascertaining whether the accused understood the nature and consequences of a plea of guilty or not guilty, his interpreter stating that the only form in which, in these circumstances, he could put the question being to ask, by means of signs, whether the panel had stolen the property. The youth and his accomplices were eventually found guilty, and sentenced to seven years' transportation. This youth had obtained a certain amount of training by means of signs, though he was unable to understand writing. Mr. Anderson, who acted as interpreter in the case, informed the Sheriff that

the lad "seemed to understand distinctly that he was liable to punishment, and signified that he would go over the seas for seven years."

A more interesting case, both on account of the gravity of the charge and the consideration which was given to it in the highest quarters is that reported in *Hume on Crimes*, Vol. I., p. 45. The case is stated as follows:

"Whether a person born deaf and dumb is an object of trial and punishment came to be tried for the first time with us in the case of Jean Campbell *alias* Bruce, who was indicted at Glasgow, in April, 1817, for the murder of her own child, of three years old, by throwing it from the Old Bridge there into the Clyde, where it was drowned. The question being new, the Lords on the Circuit certified the case for the consideration of the High Court. A minute was entered for the prosecutor on record, bearing that he had no doubt of the panel being now, and having been from her birth, deaf and dumb, and that she had received no education; but that he would prove by the evidence of persons who had visited her in gaol that she knows right from wrong, and is aware that punishment is the consequence of guilt, and that she is able to conduct herself properly in all the affairs of life. The depositions were accordingly taken by a physician, and by the master of the Establishment for the Instruction of the Deaf and Dumb at Edinburgh, who had been thoroughly educated in the art of instructing deaf mutes. And on advising these, with informations on the case, the Court (17th July, 1817) being satisfied with respect to her power of communicating her thoughts, and her intelligence of right and wrong, found that she might be put on her trial, and remitted the case accordingly to the judges on the next Circuit at Glasgow. It appeared from the testimonies taken that she could write the initials of her name, that she had some notion of the nature of marriage, that she knew clearly the criminality of theft, that she understood that she was in custody on account of the death of her child, and that she was punishable if she killed it wilfully; and she repelled with marks of indignation the imputation of having done so. She had

also by signs and gestures very intelligibly told her story of the child having accidentally slipped, and being unfastened, from her shoulders while she put her hand to her own breast to search for money, and was resting the child on the parapet of the bridge. This dumb show she indeed repeated, and went through with equal significancy in the face of the Court.

"Her trial was, accordingly, insisted on at Glasgow on the 24th of September, 1817. She then pleaded not guilty, and this she did by communicating in the like dumb show, with a skilful interpreter (Mr. Kinniburgh), the above mentioned teacher of the deaf and dumb. The evidence was in her favour, and she had a verdict of not guilty."

The previous discussion took place on the 17th July, 1817, and the evidence given on that occasion by Mr. Kinniburgh is reported by the newspapers of the day. The woman communicated to him, by means of signs, that when the accident happened, she was intoxicated, "that the child was upon her back, covered with her petticoat and her duffle cloak, and, as he understood her, she had held them together upon her breast with her hands, while she rested the child upon the parapet of the bridge, over which the child fell, while she was in the act of putting her hand in her bosom, where she had money, and which she was afraid she had lost; and by so putting her hand in her bosom, he understood that she had lost hold of the child, at which time the child was asleep, and had then fallen over the bridge. So far as he could understand the prisoner, she appeared to be a woman of a powerful mind, and nothing seemed to have been awanting, humanly speaking, to have saved her from the pitch of depravity she had attained, but some hand to have opened to her the treasure of knowledge in proper time: that he conceives that the prisoner must be possessed of the power of conscience in a certain degree, and that she seems a woman of strong natural affection towards her children, as he was informed by different persons at Glasgow, and which she manifested by the indignant denial of the charge of having wilfully killed her child, and her

immediate assertion that it lost its life by accident." Being interrogated by the Court whether he is of opinion that the prisoner could be made to understand the question, *whether she is guilty or not guilty of the crime of which she is accused?* answers that, from the way he would put it, by asking her by signs whether she threw her child over the bridge or not, he thinks she could plead not guilty by signs, as she always communicated to him, and this is the only way in which he can so put the question to her; but he has no idea, abstractly speaking, that she knows what a trial is, though she knows she is brought into Court about her child; she has no idea of religion, although he has seen her point as if to a Supreme Being above, and communicates merely by natural signs, and not upon any system."

The difficulty attending the case was felt to be so great, that the opinion of the late eminent metaphysician, Dr. Thomas Brown, Professor of Moral Philosophy in the University of Edinburgh, was taken upon it by the Depute Advocate. It was given as follows:

"In the present case there seem to be *many* questions.

"In the first place—Is the panel capable of knowing the moral difference of actions, as right or wrong? On this point I have no doubt whatever, at least with regard to a crime like that which is the subject of the prosecution.

"If there *be* any *original* moral power of discrimination like that which has been improperly called the *moral sense*, it is quite clear that deafness does not preclude that which is as much a part of the constitution as the sense of sound itself; and if we suppose the moral feelings to be the *result* of various observations and sympathies and tender remembrances, there is surely no reason for asserting that an adult, strong-minded, *deaf* person is incapable of *forming the associations* which are supposed to give birth to the moral regard. The sense of *sound* is surely not more important *in itself* than the *sense of sight*; and though, as the *medium of language*, it cannot fail to

convey much instruction as to the *consequences* of actions, it still *presupposes* a tendency to feel approbation of actions that are beneficial to others, and disapprobation of actions of which the only object is injury; without which previous tendency to feel the emotion, the nice analysis of the consequences of the actions would be of no value. I am far from thinking that the panel has such refined feelings of this sort as those possess who have the advantage of letters. *Her* feelings must be rarely called forth, because they are called forth only by events that really take place, or have taken place, before her very eyes; while literature is continually surrounding us with real or imaginary *doers* and *sufferers*, whom we have never seen. But that *murder* is worthy of disapprobation, or, in other words, is *wrong*, she knows probably as well as the greater number of those human brutes who are condemned for the perpetration of it. Indeed, I have little doubt that *her* feelings of moral abhorrence of such a crime are *more* vivid than those of many young ruffians, the children of older ruffians, who have been fostered in vice, and who have had the sense of language only to hear curses and blasphemies, and the mockery of everything pure and kind. You do not allow this bad education to be pled at the bar of a criminal prosecution, and as little, on *this* ground, should deafness be admitted.

"All this reasoning is *a priori* as it were; but in Mr. Kinniburgh's evidence you have, I think, sufficient proof of an indignant repelling of the charge of murder, which might of itself be considered as implying her *capable of moral feeling*.

"In the next place—Is she capable of knowing that, when she did wrong, she exposed herself to punishment?

"That a deaf person is *capable* of knowing this, I think, cannot be doubted, if his observations have been wide, and if he be capable of knowing right from wrong. *He*, like other people, may see some one do what is wrong, and may afterwards see the same person caught in the act, seized by force, beaten by the individual whose

property or person he was injuring, or carried away to prison in spite of his struggles. What has *preceded*, what has followed, a deaf person is equally capable of combining in his mind as other people; but he knows *fewer* antecedents and consequents, because all which he knows must have been observed by himself. He does not know, therefore, with so much precision that *crimes* are followed by punishment, because he can know this only of the particular crimes which he has had personal opportunities of observing to be so followed; and if he never *saw* any punishment follow, he probably never would conceive it to be a physical consequence, more than he would have conceived *a priori* that a charged electric battery would give a shock. An adult, however, can scarcely fail to have made such observations, and accordingly it appears in evidence that the panel in this case has a notion that her detention in prison arises from the supposition of her having murdered her child.

"In the next place, it is necessary that, in order to render the panel a fit subject of trial, she should be supposed capable of knowing the *law* that has been violated.

"By a *fiction* in this country, everybody is *supposed* to know the existing laws, to which he has virtually consented. This fiction, which is evidently *untrue* in innumerable cases, where nobody conceives the criminal to have known the particular penalties to which he was exposing himself, is *physically impossible* in the present case; and this physical impossibility may perhaps be a technical bar. But of *that* I am not *lawyer* enough to judge. As a *moralist* I should be inclined to say that it is no bar. It is sufficient if the panel have known that she was doing that which was *morally wrong*, and if the punishment awarded be in proportion to the offence."

It would be difficult to add anything to this weighty utterance of one of Scotland's foremost thinkers and metaphysicians. With the advent of compulsory education the class of uneducated deaf mutes is gradually disappear-

ing, and, with it, the need for the consideration of such questions. With education also disappears the outward physical signs of the degradation of intellect which was common to many of these uneducated deaf mutes, and which led many observers to consider the deaf and dumb as of a lower type of intellect than their hearing fellows. It is a constant remark in the neighbourhood of the Glasgow Institution at the present time, that the pupils, who are now in attendance there, are of a different class to those which were in the Institution ten years ago. This change in the appearance is largely due, in the writer's opinion, to the fact that the pupils are now "caught young," and being treated rationally, having their mental, moral, and physical faculties cultivated to the full extent of which they are capable, they never acquire the heavy, dull expression which is common to many of those who did not get the benefit of education in early youth. There can be no doubt that the earlier the mental faculties are suitably exercised, the better it is for the child's development in after life. A case has lately come under the writer's notice, in which the converse of this is well shown. A boy was quite recently brought to school who had been allowed to grow up till the age of 13 in one of the remote western islands of Scotland without any attempt at education. On admission, he presented quite the appearance before spoken of as common to the uneducated deaf—dull, heavy-looking face, vacant, wandering eyes, and thick, hanging lip. In the short space of time during which he has been under instruction, he has begun to lose somewhat of this heavy expression, and his face will no doubt gradually assume a more intelligent aspect; but the years which have been thus allowed to run to waste can never be made up.

The mistaken notion, which is common amongst a large class of parents, that the hearing and speech of their deaf-mute children will be somehow restored at the end of a period of seven years, has had a great deal to do with the neglect of the means of education at the proper time. Rightly or wrongly, medical men are often blamed

by the parents for this state of affairs. It is quite a common thing, in the writer's experience, to be told that the doctor who has been consulted about the state of the child's ears has said that perhaps he will recover the use of speech by and by, at fourteen years of age, and so on. When the period arrives, and it is found that the hearing does not return, the parent begins to be alarmed and calls upon the educator, when, as a matter of fact, he should have been almost the first to be consulted. If those who encourage this absurd notion of the probability of recovery at certain periods could only realize the terrible wrong they inflict on a deaf child when they thus postpone the commencement of his education, we should meet with less trouble than at present exists in persuading people to commence the education of their deaf children at the earliest possible moment.

CHAPTER XI.

SYSTEMS OF EDUCATION.

One of the first difficulties which the inquirer meets with when he begins to investigate the problem of system in the education of deaf mutes, is the bewildering variety of method by which he is confronted. It is difficult to find two schools following the same system; every school or institution has its own distinctive method, and alas! in some schools every teacher is a law unto himself; so that instead of order and harmonious effort, we find nothing but chaos and confusion. An effort was made a few years ago, by the learned editor of the *American Annals of the Deaf*, to classify the schools in America under some arrangement, but the difficulty proved almost insurmountable. There is the Oral and the Pure Oral, the Sign and Manual, Manual only, the Silent system, and various others; while the varieties of the Combined system are as numerous as would be the combinations of all the aforesaid systems put together.

It follows, therefore, that it is difficult to attempt to describe all the systems which are in use, and we shall endeavour, as far as possible, to confine ourselves to a general description of the three great divisions into which the systems of teaching seem to us naturally to fall, warning the reader that he must constantly keep in mind the fact that there are these numerous minute differences in existence, and, moreover, that the terms used to describe a system by one writer are used by another in a sense which may be entirely different. As an illustration of what we

mean, we may cite the fact that at a conference recently held in America, at which representatives of all shades of opinion were present, a resolution was passed in favour of the "Combined method of instruction," and it has since been held that the war of systems in that country has practically ceased, that the lion has lain down with the lamb, and that from henceforth all is to be unity and concord.

And so it would be, if every one attached the same meaning to the word "Combined"; but such is not by any means the case. In this country the Combined system was generally understood to mean a combination of language teaching by means of writing, illustrated and explained by signs, and accompanied by as much speaking and lip-reading as could be taught to the pupil in a short lesson of say half an hour to an hour a day. In America the term is now used to designate all systems, from the Pure Oral to the Sign and Manual—some institutions attempting to teach all the systems under one roof, others separating the Oral pupils from the Sign pupils in different buildings, and so on *ad libitum*. It will be seen, therefore, that unless terms are carefully defined at the outset, and kept resolutely in mind, nothing but misconception can arise in discussing the merits or demerits of the various systems of instruction.

Assuming that the French or Sign system of De l'Epée is practically obsolete, for we certainly know of no school whose leading principle is to teach the pupils to express themselves in signs only, it seems to us that the most natural division of the different systems is (1) the Oral system; (2) the Sign and Manual system; and (3) the Combined system.

We shall endeavour briefly to describe the leading features and mode of procedure of the instruction employed in each of these methods, beginning with the first, the Oral or German method.

ORAL OR GERMAN METHOD.

As far as can be ascertained, the fundamental idea underlying this system is, "That the deaf mute can learn, and should be taught to speak; that language, as spoken, should be the instrument of instruction, and that by such means will the unhappy one be restored to society."[1] This principle, first clearly promulgated by Heinicke, who must be regarded as the father of the system, even though he may not have been the first to teach deaf mutes to speak, has been acted on with more or less success by the German teachers ever since his day, though in Germany itself there are, according to Kinsey, many varieties of the German system—some old-fashioned, some more advanced, and others in an intermediate stage.

Actuated by the idea that all mental development must be carried on by speech, and by speech alone, that spoken language is the first thing to be taught to the deaf pupil, and that he must be put as near as possible into the same relation to speech as the hearing man, it follows naturally that instruction in the production and recognition of the various sounds of which human speech is composed is the first care of the teacher on this method. Hence it is that the deaf child, on his entrance into an Oral school, after a few preparatory physical exercises,—designed to secure his attention, to stimulate his hitherto semi-dormant faculties, and arouse his latent powers,—is put through a course of exercises in articulation and lip-reading which shall enable him to pronounce, and to recognize when pronounced by others, not merely the simple individual sounds of the language he has to learn, but also any combination of the same which can be formed.

The question immediately arises, What order of teaching the various sounds shall be adopted? The opinion of teachers on this point is as various as it is on most other questions. Arnold in his *Teacher's Manual*, page 220, enumerates ten different methods employed by foreign writers who have treated the subject, while in our own

[1] Arnold, *Teacher's Manual*, p. 89.

country each book of lessons with which we are acquainted adopts not merely a different order of arranging the consonants, but also a different method of marking the long and short vowels.

Arnold lays down the conditions which should guide the teacher in selecting his order of teaching the sounds thus: (1) Facility of muscular action; (2) Visibility; (3) Tangibility. Acting on these principles he gives the following as the order in which he himself would teach the sounds:

1st Class—a p f o th u=oo m h ā ă ŏ ŭ v th b.

2nd Class (more difficult)—t ā ē ī ĕ n ĭ w l s sh z d.

3rd Class (still more difficult)—k ä g y è à ù ng j.

4th Class—ch j q x r.

For the purpose of comparison we give the order employed in a few of the leading schools of Britain. This table has been compiled from the lesson books published by the principals of these schools.

DONCASTER. (Mr. Howard.)

Vowels—

â = a (as in far), ă = a (as in hat), ā (as in fame), ô (as in nor), ŏ (as in not), ō (as in note), û = w and oo (as in cool), ŭ (as in but), ū (as in tune), ē (as in me).

Consonants—

f	s	sh	th	t	k	l	m	n	p	ng	î = âē.
v	z	zh	th	d	g	r			b		

MARGATE. (Dr. Elliott.)

h, f, p, th, ä (as in father), ŏ (as in not), aw (as in saw), ŏŏ (as in foot), oo (as in spoon), ŭ (as in but); er (as in fern); v, *th*, b, t, d, w, ă (as in cap), ĕ (as in pet), ĭ (as in pit), e (as in me), s, sh, ch, k, qu, o (as in so), ou, i (as in fine), u (as in tune), ā (as in face), oi, oy (as in boil, royal), m, n, ng, l, r (as in room), g, z, zh, j.

EALING, MIDDLESEX. (Mr. Kinsey.)

h, wh, f, sh, th, p, t, s, ä (as in fast), â (as in fall), ōō (as in food), ou, ō (as in foal); f–v, th–th, sh–zh, s–z, p–b, t–d, er (as in fern), oo (as in foot), u (as in fun), o (as in fox), i (as in fin), e (as in fen), ē (as in feet), a (as in fan), ī (as in fine), oi (as in foil), ā (as in fame), ū (as in fume), ch, k, j, g, x, *x*, l, r (as in ra), m, n, ng, nk, qu, r (terminal).

JEWS' DEAF AND DUMB HOME, LONDON (Mr. S. KUTNER).

ARTICULATION AND LIP-READING.

p	b	ar	farm	ap	op	ook	it	up	en
t	d	or	fork	map	top	book	sit	pup	pen
k									
f	v	oo	boot	ax	ox	oox	ix	ux	ex
				axe	box	books	kicks	ducks	vex
th	th	ee	feet						
		ea	pea	cat	cock	cup	cellar	city	
s	z								
sh		er	fern	per	ber	ore	gap		
		ur	turn	paper	number	core			
				ter	der	oor	gem		
ch	j			letter	ladder	core			
x		ow	cow	ker	ger	eer			
		ou	out	baker	dagger	deer	gill		
l		i-e	kite, tie	fer	ver	air			
				coffer	cover	fair	got		
m		a-e	face	ther	ther	are			
		ai	tail	thirsty	mother	mare			
n		ay	hay	ser	zer	ire			
r				saucer	razor	fire			
				sher	sure	our			
				fisherman	measure	scour			ang
h		oi	coin	ler		ure			
		oy	boy	miller		pure			ong
		oa	coal	mer					ing
		o-e	coke	farmer					
				ner					ung
		u-e	mule	dinner					

Mr. Kutner says: "I have been sometimes successful in beginning with consonants, and sometimes with vowels. I never make a point of going right through any class of sounds before taking another class. I use no arbitrary marks to indicate sounds, as I believe all differences are best shown by the vocal organs themselves. This practice also leads to improved lip-reading. My chart only embraces a few of the numerous initial and final, simple and compound sounds. They should be taught as occasion requires. I ought also to say that the preliminary lessons are taught without the chart—making lip-reading a necessity. The model words on the chart are taught as soon as their component sounds are mastered."

ORAL ASSOCIATION, FITZROY SQUARE.

(Mr. Van Praagh.)

Vowel Marks—

â (as in far), ô (as in lose), î (as in time), a (as in want), o (as in pot), ä (as in wall), ö (as in caught); ă, ĕ, ĭ, ŭ, o͝o (as in hat, pen, pin, put, cook); ŭ (as in hut), ŏĕ (as in does), i̊, e̊, ů (as in sir, her, fur); o=oa, c=k, ç=s; e̊, ẘ, k̊=mute.

h, â, oo, ea, p, t, k, oa a, f, s, w, m, n, l, r, oa b, d, g, v, z, y, th, sh, r (final), ew.

In the Glasgow Institution the lesson book used for this purpose is that compiled by the late Mr. Kinsey, Principal of the Training College for Teachers, Ealing, and which, though not perhaps faultless, is, in the hands of a qualified teacher, amply sufficient for all practical purposes. It will be found in practice that a deaf child in attempting one sound of a simple nature will often pronounce, by accident as it were, another of a more difficult character; and while in this, as in all other matters, a severely logical order satisfies the passion of some minds for order and arrangement, good practical results will not be confined to any one method, provided the teacher be patient and sympathetic, and ready to seize every chance which may occur in his work. While the teacher should aim at having a good arrangement, he should not be the slave of any system, but rather in this, as in all other things, its master, ready to make use of all expedients and happy accidents which may aid him in his task.

It is not our purpose to discuss all the minutiæ of the component parts of speech, but there is one letter, or one power of a letter, in the alphabet which seems to be ignored by some of the teachers whose works we have quoted, and respecting which we find, on personal inquiry, that not even so much as an attempt to teach is made in some of the schools. We refer to the terminal *r* in such words as *far*, *bar*, and so on. We were told, for instance, lately by some teachers of standing in the south of England, that there is really no difference between this *r* and the open Italian *a*. We venture, therefore, to quote the following remarks from Walker's Dictionary as being apropos to the

subject, and which, coming from a standard authority on pronunciation, are well worthy the attention of those who may be called upon to teach the deaf a good standard of pronunciation.

"*R*—This letter is never silent, but its sound is sometimes transposed. In a final unaccented syllable, terminating with *re*, the *r* is pronounced after the *e*.

"As this letter is but a jar of the tongue, sometimes against the roof of the mouth, and *sometimes at the orifice of the throat*, it is the most imperfect of all the consonants.

"There is a distinction in the sound of this letter scarcely ever noticed by any of our writers on the subject, which is in my opinion of no small importance, and that is the *rough* and *smooth r*. Ben Jonson in his *Grammar*, says it is sounded firm in the beginning of words and more liquid in the middle and ends, as in *rarer* and *riper*, and so in the Latin. The *rough r* is formed by jarring the tip of the tongue against the roof of the mouth near the fore teeth; the *smooth r* is a vibration of the lower part of the tongue near the root, against the inward region of the palate, near the entrance of the throat." . . .

In England, and *particularly in London*, the *r* in *lard, bard, card,* and *regard* is pronounced so much in the throat as to be little more than the middle or Italian *a* lengthened into *laad, baad, caad, regaad.* And again "it is often too feebly sounded in England, and particularly in London, where it is sometimes entirely sunk."

This power of the letter *R* is duly recognized by our great English authority, Arnold, who says there are three distinct forms of this sound, the labial as in *pray,* the trilling as in *roll,* and the guttural as in *work,* etc.

We venture to express the hope that in any future editions of lesson-books designed for the deaf this sound of the guttural *r* may be given its true place as a component part of standard English speech.

The learning of the sounds and their combinations is generally found to occupy a period varying considerably with the ability of the child. Some children learn in six

months what it takes others one year, or even two, to acquire. No general rule can be laid down; everything depends on the child's abilities, and each teacher must exercise his own discretion. In a large school, where from a dozen to twenty children enter at about the same time, a re-classification will be required every three or six months, if justice is to be done to all, and the bright children are not to be kept back for the sake of the duller ones. This is one of the great difficulties which all teachers of deaf mutes have to encounter; so much individual attention is required by each pupil, especially in the early stages, that the classes require to be exceedingly small, and the ideal system, for Pure Oral work especially, would undoubtedly be one teacher to every pupil.

Then, it is asked, should the child, during this preparatory period of instruction, be allowed to learn the meaning of any words which come under his notice? Opinion and practice amongst the teachers on the Pure Oral method vary considerably. Some allow the child to be taught the meanings of a few words as a reward, and as a means of lightening the task during the dreary round of articulation drill. Thus, supposing the child to have mastered the separate sounds of *t oo th*, which the intelligent child will do at a very early stage of his school life, there can surely be no harm in allowing him to know that this combination of sounds and the written characters represent the object *tooth*. Mr. Van Praagh, in the preface to his *Lessons for the Instruction of Deaf and Dumb Children*, says: "The combining of vowels and consonants so as to form words is taught as early as possible, such monosyllables as represent objects that can be actually shown to the child being preferred. Woodcuts of these objects are inserted in the primer opposite to their names. By these means the child is enabled to realize the use of the powers which he is acquiring. It is delightful to see the extreme pleasure with which the deaf, and hitherto dumb child, displays his new powers, and how anxious he is to make further progress."

Most teachers agree with this opinion, and allow the child to get an idea of what all the drill to which he is

being subjected is intended to prepare him for; thereby adding a stimulus in the shape of a strong motive, which shall help to bridge over a time necessarily somewhat dull and tedious. Others there are, however, who think that the preparatory period should be strictly confined to the merely mechanical drill in the speaking and lip reading of the various sounds and their combinations, till the child is fully perfected in the same, on the ground that in this way better speech and lip reading will be attained, because the child, having no adventitious aids to rely on, will be obliged to use his faculties of sight, touch, and imitation to the utmost, and will therefore correspondingly develop his powers of observation and attention. An analogous case may be found in the teaching of music, where the judicious teacher of a musical instrument keeps his pupils practising at the scales and exercises till they are fully mastered. These pupils, it is said, are generally found to surpass in execution those who are allowed to attempt tunes before they have mastered the *technique* of the instrument they are desirous of learning. To vary the monotony of the deaf child's life while undergoing this preparatory drill—and it cannot be expected that the unfortunate pupil should be kept at this exercise of *ba, bau, boo*-ing for several hours at a time—he should be taught to write and draw, and exercise his hands and eyes in sewing, kindergarten work, and other varied occupations which are now happily coming so much into fashion. These occupations, if kept in strict subordination to the main purpose of the child's education, will be found extremely beneficial, not merely in providing a change from the monotony of the articulation drill, but as a means of mental development, by exercising the functions of discrimination, etc.

Having passed through the preparatory exercises, and being able to pronounce the different combinations of sounds with more or less distinctness, and to lip-read the same when spoken by others, the child is now ready to commence the study of language as an instrument of thought and expression. This is the hardest task the deaf-mute

has to encounter, and it is one which few successfully accomplish, whatever the system which is adopted. Nor is the reason far to seek. When a deaf child enters school at seven years of age (the earliest period of compulsory attendance), the plastic period when. the brain is growing fastest, and most easily gathers up impressions, is past, and a certain amount of brain atrophy must have ensued, which no amount of after training can make up for.

The remarkable results which are brought out in the comparison of the head measurements of the hearing and the deaf on page 17, seem to lend themselves to this theory. Further measurements and comparisons would be desirable before accepting them as conclusive, but they seem to point decidedly in the direction indicated. It may be stated that the writer had formed the above conclusions, and had written the preceding paragraph before he was aware of the result of this comparison of heads.

Moreover, the whole of the vocabulary and of the variety of sentence forms which the hearing child has acquired during this period of active growth, is utterly lost to the deaf child, who has to begin his school life with his mind a *tabula rasa* so far as language is concerned. How great is this loss, only those whose business leads them to observe children, and contrast and weigh the difference between the accomplishments of the hearing and the deaf, can fully comprehend: the outside public who, possibly, have never given the matter a single thought, may be excused for their ignorance on this point, for even parents and friends of deaf children, who are by necessity brought into contact with the phenomena of deaf-dumbness, seem, as a rule, utterly unable to grasp the problem which the teacher has to solve, or to estimate fully the immense difficulties which beset his path in giving language in its spoken and written forms to the deaf and dumb. We are not referring here to the so-called language of pantomime and signs, which is held by many writers, and especially by educated deaf mutes, to be the natural language of the deaf; though, for the matter of that, this gesture language has been claimed as the

original language of the whole human race. Thus Bulwer writes :[1]

"What though you (the deaf and dumb) cannot expresse your mindes in those verball contrivances of man's invention: yet you want not speech who have your whole body for a tongue, having a language which is more naturall and significant, which is *common to you with us*, to wit, gesture, the general and universal language of Humane nature, which when we would have our speech to have life and efficiency wee joyne in commission with our words, and when wee would speak with more state and gravity, *wee* renounce words and use nods and other natural signs alone."

Our object at present, however, is not to discuss the question of what language is or is not, but to describe how the deaf pupil shall be put into as full use as he is capable of the spoken language of his country and its written representation.

In our inquiry into this part of the subject we have found some little difficulty in ascertaining the exact method of procedure of Oral teachers with regard to the teaching of advanced language. In this country there have been published some excellent lesson-books, dealing with the elementary part of the work; but in the higher branches, authorities give an uncertain sound. Apparently much discretion has to be left to the individual teacher who, having grasped the general principles of language teaching, and also the peculiar circumstances under which his work has to be done, must adapt himself to circumstances and make use of all the aids which chance may throw in his way. He must vary his lessons to suit the needs of the hour, steadfastly keeping in view the great ends which his teaching is to help his pupils to attain.

These ends are thus summarized by Arnold :

"1st. To provide the scholar with a copious vocabulary of words for the purposes of thought, so that its expression may be full and accurate.

"2nd. To familiarize him with the order in which the language has placed them in composition, so that he may

[1] Bulwer, *Philocophus*. London, 1648.

be able to think and speak in precisely the same order as others do.

"3rd. To make his method of acquiring language promote, as much as possible, the development of his understanding and the exercise of all his mental powers."

The first attempts at teaching language to the deaf were based on the old Grammatical method of teaching the dead languages which used to be prevalent in our old Grammar schools, a method which has been described by a well-known teacher and writer[1] as the Dryasdust method.

This method consisted in the pupil committing to memory the rules of the grammar of the language to be learnt, with all their exceptions;—the numbers, genders, and cases of the nouns and pronouns, the conjugations of the verbs, regular and irregular, and all the other minutiæ of the syntax and prosody,—before being allowed the pleasure of learning that sugar is sweet, or snow is white, except as illustrations of a grammatical rule. This method was followed not only by the early Oral teachers, but by De l'Epée and the sign teachers who followed him. A feeling against this method soon made itself felt in Germany, where it was considered to be "artificial and fragmentary; and while exercising the memory, did little or nothing for the understanding, and was therefore unfitted to the conditions and wants of deaf mutes."[2] We feel bound to add that, in our own experience, some of the most intelligent deaf mutes we have met,—persons who can use language fluently and correctly,—are amongst the products of this old-fashioned method, though it may possibly be said that their fluency was attained not by, but in spite of, the system on which they were taught.

The first step in the path of reform was the introduction of the Pictorial and Reading method of Moritz Hill. This eminent teacher designed a set of 384 pictures of the principal objects to be met with in daily life, with an accompanying series of lessons aiming at teaching not

[1] The late J. Scott Hutton, of Halifax, Nova Scotia.

[2] Arnold, *Teacher's Manual.*

only the names of the things represented but also exercising the pupils on the different forms of language while expressing the facts which each picture recalled to his mind. This Picture Teaching, as it is termed, found many imitators in this and other countries, and in the reaction against the excessive use of signs, was probably overdone, and is overdone at the present day. The objections to it are: that pictures can only present to the mind one special side of a scene or action; that it develops in the pupil a tendency to the too great use of the Present Actual Tense of the verb, to the exclusion of the others which are quite as important; that it does not stimulate, but rather militates against, the exercise of the imagination of the pupil, and, moreover, that it is impossible to produce a set of pictures which shall provide exercises on all the forms and varieties of sentences which it is desirable for the pupil to know. At the same time pictures serve a very good purpose if rightly used: they serve to recall objects and scenes which the pupils may have witnessed at home, but cannot describe for want of language, and they also help them to realize, partially at least, verbal descriptions of scenes with which they are not familiar. We cannot agree with Arnold when he says that they ought not to fill a larger space in the teaching of deaf mutes than they do in the education of hearing children.

Take, for instance, the case of a deaf child from the country who may be quite familiar with all the details of a farm yard. For lack of words he will be unable, except by natural signs, to explain something relating to it which he may wish to tell during the course of a reading lesson referring to the subject, and on his side the teacher will be in much the same predicament.

The hearing child, from having heard the words on the spot in connection with the incidents, would be able at once to call up an image of what was meant by the words; a picture to the deaf child would serve the same purpose, and the teacher would not be under the necessity of using signs to illustrate his meaning. After the deaf child has

learnt language, of course the procedure would be the same as for the hearing child; but in how many cases can these aids be dispensed with? Certainly not till long after the hearing child has passed the same stage.

The method now most generally used for the teaching of language is what is known as the Natural, Intuitional, and Logical method, by which is meant a systematized course of lessons based on observation of the way in which the ordinary hearing child learns his mother tongue, hence called by some the Mother's method. Instead of allowing pantomimic signs, or even pictures, to come between the spoken or written word, and the action, thought, or feeling which is to be expressed, the immediate association of word and idea is aimed at. A good illustration of what is meant is given by Bain in his *Education as a Science:*

"It is in associating names *at once with their objects,* or meanings, that the acquisition of language proceeds most rapidly.

"When learning a foreign language in the country where it is spoken we are made aware of the difference between adding word to word, and connecting each name at once with the realities. In a French town we see the word 'rue' put up at every street corner; in the shop windows we see the articles laid out with their several names attached. Riding on a rough road, after some great jolt, we hear a fellow-passenger exclaim, 'secousse,' and one utterance is enough to attach the name to the situation for ever; whereas several repetitions of 'secousse' and 'shock' would be requisite to establish a durable bond between the two words."

The same principle was strongly advocated by the late Professor Blackie. "In the acquisition of any language, whether living or dead, the commencement must be made with a living appeal from the tongue of the teacher to the ear of the learner, and this with direct reference to objects in which the learner feels a natural and familiar interest."[1]

All teachers of the deaf who follow the Mother's method

[1] Blackie, *Colloquia Graeca.*

endeavour to carry out this principle of direct association of the name with whatever it represents. If the word *ball* is to be taught, the plan is to show the pupil a ball, and by giving the spoken or written word at the same time, the association of the representative symbols and the actual thing becomes complete in the mind. The meaning of verbs, adjectives, and all the other parts of speech, can be taught in the same way, the rule being observed that we must proceed gradually from the simple to the complex, and from the concrete to the abstract. There will still remain much diversity of opinion as to the application of this principle in the arrangement of sentences. Some teachers consider it best to begin with the teaching of the verb *to be;* others, with the verb *to have.* Some prefer beginning with the imperative mood of the verb, using such sentences as "Throw the ball," "Spin the top," etc., requiring the pupil first to perform the action at the word of command, and, at a later stage, after he has become somewhat familiarized with this form, requiring him to say what he has done, thus introducing another tense of the verb, on which he must be constantly practised till he becomes quite master of the form. By gradually introducing the different sentence forms in this way, illustrating them with practical examples drawn from the pupil's everyday experience, little or no difficulty will be found in getting the intelligent pupil to acquire a mastery of the various forms of simple sentence which go to make up the language. And in making use of any lesson-book, whatever may be its method of arrangement and however severely logical may be its order, no intelligent teacher who knows his business will bind himself down to follow absolutely any hard and fast line.

As in the teaching of the sounds, so in the teaching of language. A happy chance, seized on at the right moment, will often enable an observant teacher to put his pupil in possession of words and phrases which, in the ordinary course, would probably be postponed till a very late period of the child's education. It is this faculty of turning all things to account as they happen in the daily round of life

which makes the great difference between a first-class teacher and an indifferent one. There is a tendency in some quarters to make too much of method and too little of the individuality of the teacher. We repeat, Have a right method by all means, if such a method is attainable, but be not the slave of any method, but rather its master, capable of using it and bending it to the immediate purpose in hand. Hearing children do not learn the mother tongue by a purely formal method. The mother or nurse, in her talks with the child, does not set herself to consider whether verbs transitive or verbs intransitive should be used first. She talks to the child incessantly in her own language, in the words which rise naturally as suggested by the circumstances of the moment, and the child soon learns to discriminate between the different meanings of the words. In thus pleading for freedom for the teacher, we are careful to recognize that the case of the deaf child is not strictly on a par with that of the hearing, nor do we think the teacher should cast aside an orderly arrangement of lessons. All we plead for is that, circumstances being favourable, a certain phrase or idiom should not be left unused because it is not in the book, or because the child has not arrived at the stage at which, following the programme, the phrase in question should be taught. We have known experienced teachers of the deaf express surprise at the idioms and colloquialisms used by some pupils taught by the system advocated, when as a matter of fact the thing was quite simple. If the thought is present in the mind, the opportunity should be seized to give expression to it, and it will be found that sentences taught in this way will be learned, retained, and reproduced by intelligent pupils in a manner which will surprise those who, bound tightly down to a severely logical or grammatical order, have never tried this freer and more elastic method. The only danger is that the teacher may be led off the main track too often, and he will not make sufficient progress if he is not careful to see that his liberty does not degenerate into anarchy.

With regard, then, to the teaching of language respecting

the material side of life, the method seems quite plain and simple, and not at all difficult to understand. Beginning with the teaching of simple names of objects and actions, the pupil is gradually led through a course of lessons designed to put him in possession of all the simple forms of language, such as a hearing child possesses when he first goes to school, say at the age of seven. This "mother's language" generally consists of some hundreds of words which the child can understand and use in all the forms of the simple sentence, and possibly of a few compound and complex sentences of a not too difficult nature; for it must not be forgotten that while the hearing child of seven has words sufficient to express his simple wants and wishes, and the simple experiences of his everyday child-life, he is still far from being able to understand the highly complex language of literature—a language which it will take him years of steady labour to acquire. Too much is often expected of the deaf child even by those who ought to know better. The writer has seen questions propounded to deaf children of five or six years' school standing, which no hearing child of a *like period of schooling would be expected to answer.* These erroneous notions arise partly from inability to grasp the peculiar relation of the deaf mute to language, partly, no doubt, from the mistaken notion of the almost supernatural powers ascribed by others to the deaf, and which have been no doubt fostered by the public exhibitions that from time to time have been held for the purpose of dazzling the credulous and unloosing the purse strings of the wealthy.

As an instance of what is meant, we may quote the celebrated answer which De l'Epée's show pupils gave to the question, Does God reason? "Man doubts, therefore he reasons; God never doubts, therefore he never reasons." We do not for one moment wish to assert that it is impossible, or even improbable, for a brilliant and well-educated mute to give as good answers to similar questions, far from it; but we wish to guard against the assumption, founded on the publication of such illustrations, that deaf

mutes as a class are specially gifted in this respect, and capable at a moment's notice of turning off such-like answers to all and sundry inquirers.

Hartmann, referring to a case of this description, says:

"I attended the examination of one institution on the movements of the celestial bodies; after the pupils had personally been coached on this subject in a great number of lessons, some of them were, indeed, fairly able to describe the subject, but it could be inferred from their answers that they had not completely understood it. But when they were examined in purely practical matters—for instance, if they were asked to write a letter on a given subject, it was found that the formation of sentences and the thoughts which they expressed left much to be desired."

It is greatly to be feared that such cases are not unknown even yet, and we have heard of examinations where the pupils were ready with the answer before the question had been formed, and in one case, where the questions got a little mixed, No. 3 answer was given to No. 2 question, and *vice versa*.

Although it was considered by some that deaf mutes were specially gifted in defining abstract words or phrases, yet, on the other hand, many people experience difficulty in understanding how a deaf mute can be taught to comprehend the meaning of an abstract term at all, especially without the intervention of signs.

This difficulty arises from the assumption of the theory that the mind of the deaf mute is differently constituted to that of the hearing, and works in a different way, when as a matter of fact, except that one of the avenues to the seat of knowledge is blocked, it is moulded on the same lines, and works in exactly the same manner. The uneducated deaf, destitute of language as they are, are not unable to reason, as has been falsely assumed in certain quarters. For want of language they may not be able to carry on long trains of connected arguments, but they can observe the facts which pass under their eyes and draw inferences as well as any speaking and hearing

person. An experienced teacher, therefore, who has a clear idea of what he means by an abstract notion and an abstract term, can have little difficulty in imparting the meaning of such terms to a deaf mute, provided the pupil is intelligent, and the teacher takes care to lead the mind of his pupil gradually up to the point at which he aims. Thus the idea of the quality "roundness," for example, is not difficult to deduce. By a skilful use of questions eliciting the names of various articles which are round, and therefore possess this quality of "roundness," the abstract idea will begin to form in the mind of the deaf mute in the same way as it does in that of the hearing person, and he only needs to be told that the word *roundness* is the visible symbol for this idea which now exists in his mind, and he will comprehend and use the term possibly as readily and well as a hearing person would do.

One of the great obstacles to the teaching of language to the deaf will be found in the readiness with which the pupil forgets the words he has learnt. "Experience has attested," says Arnold, "that the memories of deaf mutes are unusually bad. They have not been exercised, and therefore they have not the tenacity that arises from the culture enjoyed by hearing children. Suppose that they heard, then these verbal forms would have been repeated thousands of times in their hearing and used till it was hardly possible to forget them." This assertion, we think, requires some qualification. We are inclined to question the bald statement that the memories of deaf mutes are unusually bad. We have seen a class of deaf mutes commit to memory whole pages of geographical names, and reproduce them readily and accurately in a way which it would puzzle many hearing people to do. We have seen deaf mutes learn by heart pages of exercises and reproduce them word for word without comprehending the meaning in the least—a task which the ordinary schoolboy would make a very poor show at. It would seem, therefore, that the memory itself is *there* and can be used, and that it is not to its weakness *per se* that this seeming

inability to retain words is due. On this point our opinion is supported by Hartmann, who remarks: "The good memory of deaf mutes becomes specially apparent during instruction. Without it such very favourable results as we have opportunity of seeing in deaf and dumb schools could not be effected by tuition. This also explains the frequently amazing knowledge which deaf mutes manifest when examined in public. The most difficult subjects may be taught, and they will be learned and reproduced, but frequently without the deaf and dumb pupil having an understanding of them, as he has committed the lesson to memory without having fully comprehended it. . . .

"Whoever has been present at the public examinations of the Berlin Deaf and Dumb School will have seen how cleverly and surely the deaf-mute scholars are able to calculate, which, at anyrate, is a proof of a good memory for figures."[1]

One reason for the apparent superiority of the memory of the hearing person is that he has heard repeated thousands of times a form of words which the deaf mute is expected to retain after very few repetitions. To be convinced of this, one only needs to listen for half an hour to a mother talking to her child. The number of times which the same word or phrase will be repeated is simply astounding. The deaf child never has anything corresponding to this.

Another reason will be found in the fact that all language for the deaf has to reach the brain through the sense of sight, aided, to some extent, by the sense of touch. A little consideration will show that nature, having designed the ear to be the recipient of spoken language, it follows that when the hearing is wanting, as in deaf persons, a double share of work is thrown on the eye. To learn language entirely through the eye must be extremely difficult. As a test, let the reader try to commit to memory a page of printed matter by simply looking at the book, refraining, if possible, from articulating the words even in a whisper. The difficulty

[1] Hartmann, *Deaf Mutism*, p. 16.

of the task will be appalling, even if the reader is familiar with the full meaning of the words which he is trying to memorize. How much more difficult it would be if the words were in an unknown tongue! Yet this is what the deaf child has to do.

In support of this opinion as to the difficulty of learning a language through the medium of the eye, the following extract from Gouin's *Art of Teaching and Studying Languages* is given:

"The organ of language is not the eye, it is the ear. The eye is made for colours, and not for sounds and words. Now, all that I had hitherto learnt, I had learnt by the eye. The word was in my eye and not in my ear." And again, "The doctor condemned me to remain blind for a month. This was quite time enough for me to forget my vocabulary, which resided, as I have said, essentially in my eye; and for words, *this organ is without true memory*, not having the wherewithal to 'retain' them."

In an article on the "Gouin Method" in the *American Annals of the Deaf* for April, 1893, by James L. Smith, M.A., we find the same opinion expressed.

"The ear is the organ of language; the eye, at best, is but a sorry substitute. A method that may teach a language to little Jack Stead in six months, by means of the ear, will not avail to teach it by the eye in twice nor thrice six months. Whatever the method, whoever the teacher, however capable, however earnest, teaching the English language to those from whom nature has withheld the sense of hearing will always be a work of slow achievement, requiring infinite patience and the placing of the work more than 'twenty times upon the anvil.'"

As we cannot hope to restore the lost sense, the remedy is, as Arnold says, frequent repetition, taking care "never to ask of memory to repeat mere sounds or unknown propositions, but only what is well understood." In addition, we may well take a hint from Dalgarno's notion, and surround our pupils with the written form of language suitable to all occasions, so that, wherever he may turn,

at play or in school, his eye shall rest on words and expressions which he has to learn, and so to some extent make up for the great loss he has sustained through his want of hearing.

In Oral teaching, if great success is desired, these facts must be kept in mind. It is idle to expect the voice of a deaf man to be even tolerably flexible and smooth and his pronunciation distinct and agreeable, unless he gets sufficient practice to enable him to keep the machinery, as it were, in proper working order.

Neither need we look for good lip-reading if the pupils are only allowed to watch the lips of one person for a short time per day. Such is not the way hearing persons acquire language. Constantly hearing, constantly speaking, that is the method by which we arrive at the easy and natural use of our mother tongue. Constant practice must be the method employed if the deaf are to attain to anything like fluency in the use of speech, or ability in the practice of lip-reading.

THE SIGN AND MANUAL SYSTEM.

The Sign and Manual system owes its origin, as we have already stated, to De l'Epée. Finding it impossible, as his school began to increase, to teach his pupils the written and spoken language of their country, he conceived the idea of taking the signs of which he observed them making use, and forming them into a language, by means of which they might be instructed in the subjects which are usually taught to hearing children by speech. He succeeded so well in this task that he seems to have given up all attempt at teaching not only speech but also the written language of the country. On this supposition alone can the arguments brought against his system by the German school be maintained, namely, that the French-taught deaf mute "can only hold intercourse with those who have learned the sign language." Be this as it may, De l'Epée's successors soon abandoned the idea of teaching by signs alone, in favour of a method which made signs the stepping-stones to written language. In learning language on this

method now-a-days, gestures are used for the purpose of explaining written language, and for recalling and imparting ideas, but no attempt would be made to associate grammatical signs and symbols with these gestures. Much greater attention is paid to the instruction of the pupils in the written language of the country; and, in fact, it is clearly recognized that, unless a pupil can be taught to express himself in the language of the country, he is practically shut off from intercourse with all who are not as expert as himself in the language of signs. While thus recognizing the value of a knowledge of language, it has been contended, and is still maintained by those who follow this method, that the deaf as a class,—apart from a few brilliant individual exceptions,—cannot attain to a command of spoken or written language sufficient to enable them to hold ready converse with the hearing world. In his evidence before the Royal Commission, Dr. E. M. Gallandet, of Washington, says:

"It is a fact that in many schools for the deaf the pupils, even after a number of years' teaching, are lacking in the ability to use language idiomatically; the number of such pupils is not found to be greater in Manual schools than in Oral schools. Under the best teaching, in the Oral method as well as in the Manual method, there will be found a certain number of deaf mutes who seem to lack the ability to attain to an absolutely idiomatic use of language. That I think is a fact that cannot be disputed, that under the best auspices and the best teaching, with the full period of instruction, there will be found pupils whose mental capacity seems to be lacking in some respects, and who will never be able to attain to an idiomatic use of their vernacular."

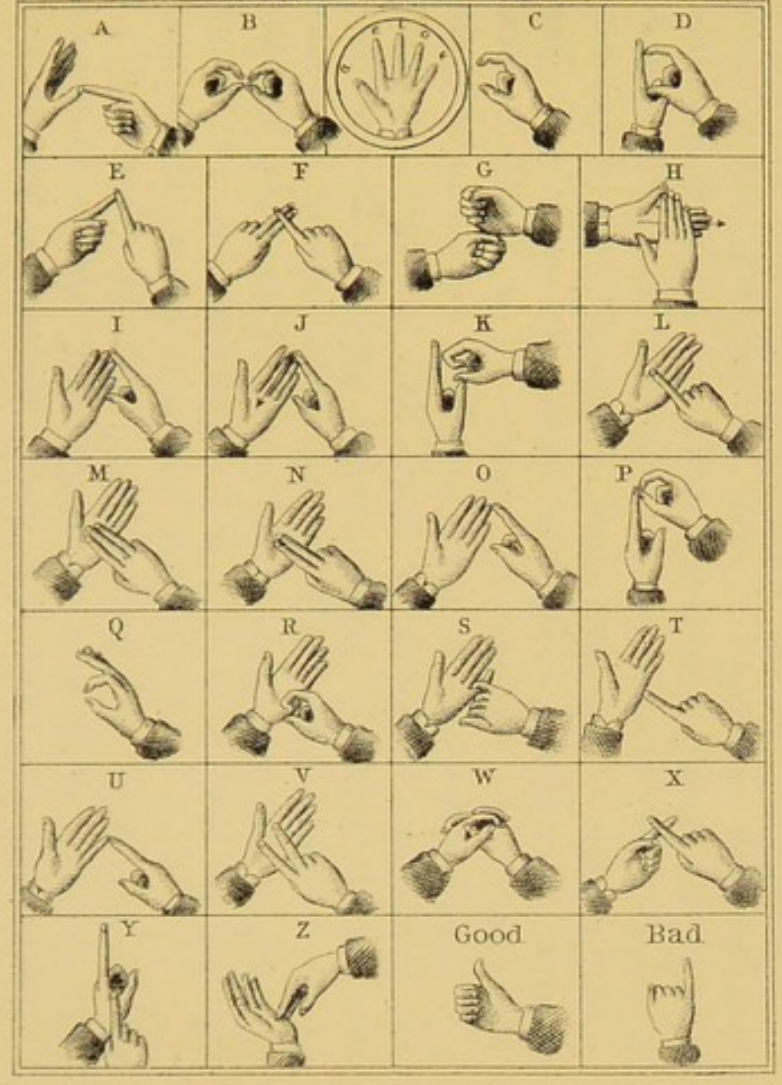
If this be admitted, and the author of it is one of the highest authorities on deaf mutism in the world, then it follows that there will be a greater or less number of deaf mutes who can never hope to attain to such a knowledge of language as will enable them to get by its means the information necessary to their physical and mental progress and well-being. It is in these cases that the use of signs

or gestures is necessary. It is quite possible, by means of signs, to give to a deaf child information on all manner of subjects far in advance of what could be given to him by speech or writing, that is, supposing him to be incapable of acquiring his mother tongue sufficiently to use it as the medium of ready communication. A single instance will go far to prove this position. In the Glasgow Institution lately, a young lad of ten years of age, whose knowledge of language was equivalent to that of a second year's pupil, recently put a question to the writer respecting the Crimean War. Surprised to find that the pupil knew anything of the subject, which was not taught him in the school, the boy was questioned by means of signs, and it was found that he had a pretty extensive knowledge of the course of the war, and that this knowledge had been acquired by watching some of the bigger boys talking in signs about it amongst themselves. There is no doubt that deaf mutes acquire a large fund of information in this way, and this knowledge extends not merely to the material facts of life, but also to the abstract and spiritual. It has been wrongly assumed by writers of the German school that signs are incapable of conveying abstract notions. Thus Hartmann says, p. 113, "For abstract ideas, which are at all complicated, no gesture can be invented; and exchange of ideas in the language of signs can, therefore, take place only in reference to sensible perceptions." This is decidedly wrong, as all who are familiar with the work which goes on in our special churches for the deaf will recognize at once. The meaning of a sign develops in the same way as does that of a word. Jevons, in his chapter on the Growth of Language (*Elementary Logic*, VI.), says: "Almost all the terms employed in mental philosophy or metaphysics, to denote actions or phenomena of the mind, are ultimately derived from metaphors. Apprehension is the putting forward of the hand to take anything; Comprehension is the taking of things together in a handful; and so on.

"The very word *spirit*, now the most refined and immaterial of ideas, is but the Latin *spiritus*, a gentle

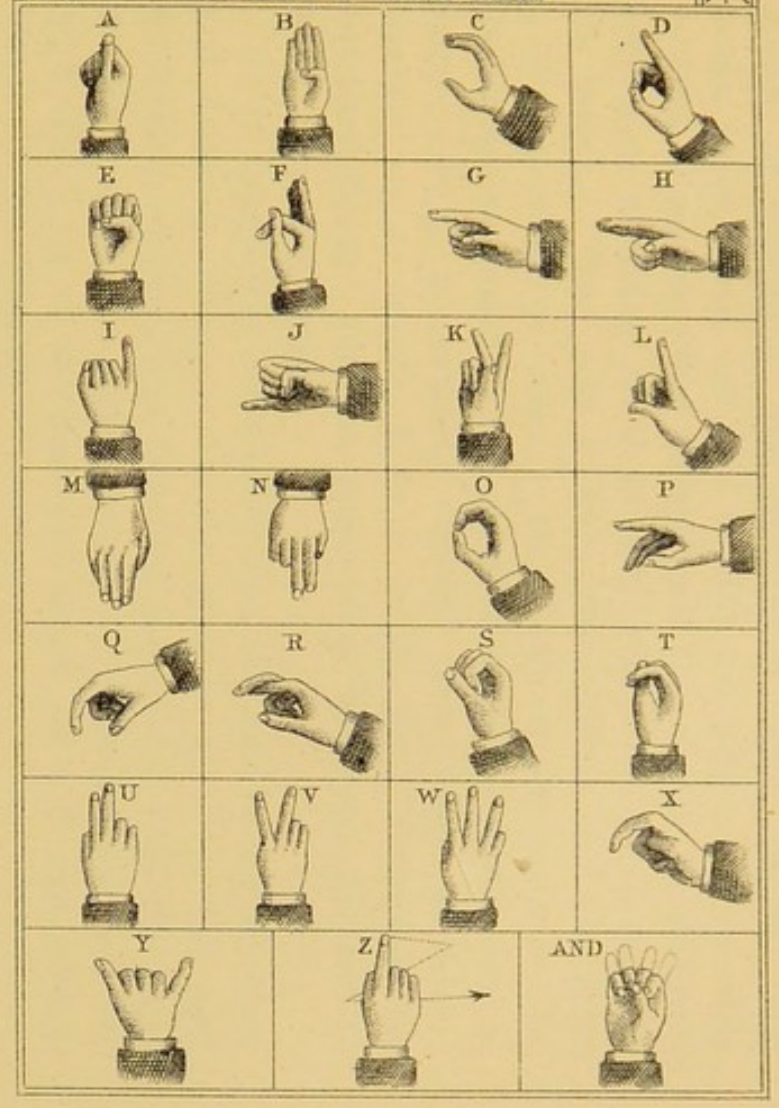
THE MANUAL ALPHABET.

(English or Double Hand.)



THE MANUAL ALPHABET.

(French or Single Hand.)



breeze or breathing; and Inspiration, *esprit*, or wit, and many other words are due to this metaphor. It is truly curious, however, that almost all the words in different languages denoting mind or soul imply the same analogy to breath. Thus, *soul* is from the Gothic root denoting a strong wind or storm; the Latin words *animus* and *anima* are supposed to be connected with the Greek ἄνεμος, wind; ψυχὴ is certainly derived from ψύχω, to blow; πνεῦμα, air, or breath, is used in the New Testament for Spiritual Being; and our word *ghost* has been asserted to have a similar origin."

It is interesting to observe that the sign which the deaf and dumb in Glasgow use for soul or spirit is the sign for breath, which shows how the same laws hold for signs as for words: the same process of growth goes on alike with the signs of the deaf and dumb as with the spoken words of the hearing.

Arnold, than whom no stronger advocate of the Oral method exists, recognizes this in his comment on this principle of the German school, for he writes:

"It is much to be regretted that teachers should indulge in unqualified assertions of the impossibility of deaf mutes attaining to clear conceptions and abstract thinking by signs or mimic gestures. Facts are against them. There is nothing in the nature of a sign to prevent it from becoming, from long use, a mere symbol, and thus serve the same end as a spoken or written word. There is no magic in speech; it is only the simplest and least cumbrous form of expressing thought."

Again, Graham Bell, who is generally considered an opponent of the Sign system, says: "I think that if we have the mental condition of the child alone in view without reference to language, no language will reach the mind like the language of signs; it is the method of reaching the mind of a deaf child."

In support of this position we may also quote the testimony of Mr. Henderson, an ex-teacher who, for the last twelve or fourteen years, has been superintendent of the Glasgow Mission to the Deaf and Dumb: "In my

experience I have found in Glasgow that those who have been taught by the Sign and Finger system have a greater amount of information and general knowledge than those who have been taught on the Oral system."

Mr. Henderson goes even further than this, for he says, "Those taught on the Combined system have a greater knowledge of *written language*."

The position taken up by the advocates of the Sign and Manual system will now be clear to the general reader, and as a knowledge of the *modus operandi* pursued in schools of this description may not be uninteresting, we here give a brief sketch of the method pursued in the Glasgow school by the late Mr. Duncan Anderson, who, by common consent, is considered one of the very best exponents of this method which the century has produced. Mr. Anderson taught articulation in his early days, but gave it up after some years' trial, as he did not consider the results obtained at all commensurate with the amount of effort expended by the teacher.

The following account is taken from an appendix to the *Forty-second Annual Report* of the Glasgow Institution, 1863, and though there is no name attached to show the authorship, there can be little doubt but that it was penned by Mr. Anderson himself, and, as such, is an authoritative though brief exposition of his method.

He says: "It is through the medium of the five senses that the mind receives impressions or ideas, and we have often been asked how the deaf and dumb can be taught, since the sense of hearing, the chief avenue by which ideas are conveyed to the mind, is awanting. It is through the sense of sight, next to hearing the most important channel of communication to the mind, that the deaf and dumb are taught. A child, who has been deaf from birth, comes to school with a very limited stock of ideas, which he has no other means of conveying to others than by signs. He may know a great number of objects by sight, their qualities and uses, but he is quite unable to *name* a single one of these objects. The first step, therefore, on his entering the institution is to teach him the names of common things,

articles of clothing, food, furniture, parts of the body; in short, the names of everything. As soon as he has acquired a large vocabulary of mere names, the next class of words with which he is made familiar is that of *adjectives*, words used to qualify nouns or names of objects. Adjectives expressive of form, colour, and physical properties; as *round, black, hard, soft*, being more easily apprehended, are taught before those which express abstract qualities, as *honest, truthful, pious*.

"We wish to teach the adjective *black*, for example. The word is written on the blackboard before the class, and several objects, the names of which the children already know, are pointed out; a hat, for instance, is put before them, and the name written down. It is then shown to possess a certain colour, which the word *black* expresses. It is now 'a *black* hat.' In the same manner a number of other examples are given: 'a black coat,' 'black hair,' 'a black dog.' They have now grasped the idea of *black*, and proceed to write down on their slates from memory the names of objects already learned, prefixing the adjective *black* to each. The same process is gone through with the other adjectives; such as *long, short, tall, fat, little, pretty*, etc. Such adjectives as *dishonest, sly, careless*, are more difficult of explanation, and it is only by means of signs, examples, and practical illustrations, frequently repeated, that their meaning can be conveyed to the minds of the children.

"Having now acquired a large vocabulary of nouns and adjectives, and having learned the singular and plural of nouns; the articles definite and indefinite, *a* or *an* and *the*; the pronominal adjectives, *my, your, his, her, its, this, that, each, every*, etc., the next step is to teach them verbs, beginning with the verb *to be*, denoting existence.

"A piece of coal being shown, the pupils are asked by signs what properties it possesses. The reply is given immediately: *black, hard, heavy*. The teacher then writes down the sentences, 'coal *is* black,' 'coal *is* heavy,' and so on with many other substances—'sugar is sweet,' 'snow is white, cold.' Examples are also given of personal

properties, as 'John is fat,' 'he is clever,' 'I am tall,' 'you are lazy,' etc.

"The next verb that is taught is *to have*, denoting possession; as 'I *have* a watch,' 'he *has* a sore finger,' 'a bird *has* two wings,' and a host of like examples. The children are now capable of writing simple sentences, embodying the verbs *to have* and *to be*; and the next step in advance is the teaching of the large and important class of words comprised in transitive and intransitive verbs, with their different moods and tenses. At first the most simple form is taught, with a nominative, a verb, and objective; as 'John carries a slate,' 'a horse draws a cart,' 'a cat catches a mouse.' The meaning of the verbs is taught by signs, or by a practical illustration: one of the boys may be brought out and told to carry two slates; this he does before the class, and the example is then written down, 'John carries two slates.' The action having been performed, the past tense is brought into use to express the idea, 'John *carried* two slates'; and the future, 'John *will carry* two slates,' is taught at the same time. In teaching the intransitive verbs, another class of words—the prepositions—are required, *e.g.* 'the boy stands *on* the chair,' 'the dog sleeps *in* the kennel.'

"Such are the gradual steps by which the deaf and dumb child is brought as far on the road to knowledge as to be able to write the most simple sentences. By far the most difficult class of words for the deaf and dumb to use correctly are relative pronouns and conjunctions. These can only be taught by means of examples, which must be repeated until the pupils are able to apply them correctly.

"The children having acquired a tolerable amount of language, information is communicated through this means on the various subjects of their education, but this is the result of a degree of patient care and perseverance which occupies, on an average, from six to eight years."

Mr. Robert Armour of Liverpool, an old pupil of Mr. Anderson's, has kindly contributed the following account of his recollections of the method by which he was

taught. This will enable the reader not only to compare the master's own account of his method with that of the pupil, but will at the same time show to what degree of perfection in the use of written language Mr. Anderson was able to bring his best pupils.

Concerning this pupil it is recorded that at the annual meeting of the Institution in 1857, the chairman (Dr. Norman M'Leod) asked that one of the old pupils present should be called on for a speech, whereupon Mr. Armour, who was selected for the task, immediately wrote down on the slate the following:

"It is with the highest degree of pleasure I rise to move a vote of thanks to the directors and teachers for the creditable manner in which they have discharged their respective duties for these many years past. To appreciate the value of an establishment such as this properly it is both necessary and desirable that a person should take the trouble of observing the operation of the various means employed for the instruction of persons deprived of two of the most important channels through which knowledge is conveyed to the soul. Having done this I conclude they will be forced to admire that scheme which is of so much benefit to the deaf and dumb. I conclude by expressing the hope that the rich merchants of Glasgow will come forward and keep the Institution in a state of efficiency by pouring a part of their substance into its funds."

This speech was read to the meeting by the then secretary. Mr. Armour assured the writer quite recently that when he entered the room he had no idea that he would be called upon to make a speech. Dr. Norman M'Leod, the chairman of the meeting, remarked, "I am bound to say that no man in Glasgow could have made a speech of that sort more to the purpose."

The following is

MR. ARMOUR'S ACCOUNT OF HOW HE WAS TAUGHT.

"The minds of his (Mr. Anderson's) pupils, whose admission into the Institution dated from the eighth year of age—

never earlier—being as a rule totally destitute of the very rudiments of verbal language, insomuch as they had been accustomed to think and speak in signs only, the first step he found necessary to take was to enable them to acquire the alphabet, both manual and written. Then he transferred them to the second class, introducing them to the knowledge of a large number of simple nouns, all pictured on boards, then of their numbers and genders, and then of the articles definite and indefinite. In the third class he explained the simple verbs, the personal pronouns, and the cases, nominative and objective, thus preparing the pupils for the first course of lessons on parsing given to the fourth class. By parsing I mean the art of conjugating the verbs according to the tenses. His special faculty as a sentence-maker now came into full play for the first time, and it continued to assert its beneficial sway through all the subsequent stages of education. By adducing appropriate examples in abundance, he soon succeeded in showing his pupils the difference between the transitive and the intransitive verbs. In this connection he of course made them masters of the prepositions—a really important part of grammar. He would never rest satisfied with thus simply storing their memory, but he would take special care to stimulate their understandings also. How? By causing them to originate sentences similar to those just taught. In the fifth class he put them through more elaborate processes of parsing, showing them how to employ the compound tenses as well as the simple, and also the moods properly. These courses of lessons he would continue until he felt satisfied that they mastered thoroughly the more delicate shades of meaning and expression.

"In order to facilitate this desirable object the more, he elaborated a system of arbitrary signs denoting each one of the tenses and the moods. These he called the Manual symbols of grammar, which he intended to serve as so many aids to the memory and the understanding of his pupils alike. At this long time of distance (thirty years since I parted from him as my teacher), it would indeed

be vain to ransack my memory for a complete reproduction of them. I can only recollect the first four of these :

1st. I love you.



2nd. I do love you.



3rd. I am loving you.



4th. You are loved by me.



Suffice it however to say that all the rest were only different combinations of the same nature formed by the hand. For the sake of greater easiness of reference in the course of his own teaching, he had them all pictured on boards hung up on the wall. To elucidate this remark, I should say that he, when dictating a lesson, used to recite each sentence in the sign language, and then, pointing to this or that symbol of grammar, direct his pupils to translate the same into written or finger-spelled language accordingly. This was an intellectual exercise that proved quite exhilarating indeed. Now let me remark that though confessedly highly artificial, and therefore quite meaningless to the uninitiated, these symbols of grammar yet glowed with the sunshine of intellectualism to his pupils. In other words they were indeed so many lamps set on high, shedding a steady light along the whole path which leads up to the temple of grammar. Many of his old pupils have never tired of alluding to these wonderful diagrams as constituting the beauty of his system of teaching ; but when revisiting the Glasgow Institution later on I noticed with inexpressible regret that they were conspicuous only by absence. I then realized that Oralism had already gained a firm footing therein, though only in the mild disguise of *dualism,* but I now comfort myself with the reflection that the day is drawing nigh when its doom will be sealed in the court of experience. In that case it is to be fervently hoped that instead of sharing the fate of the lost arts of the ancient Egyptians, this masterpiece of Mr. Anderson's educational ingenuity may be resurrected, expanded, and glorified by the energy of some future disciple of his.

"As to the relative pronouns and the conjunctions, it is true that he did not illustrate them in the same way as he did the tenses and the moods, not however from any lack of ingenuity or zeal, but really because he deemed it highly undesirable to needlessly expand his system of grammatical signs at this advanced stage of education. He preferred to rely wholly on the illustrative power of examples, classic as well as familiar, and it can be added with perfect truth that he used it with very great effect. A very few specimens of this peculiar style of teaching must suffice. He would write forward on the blackboard two simple sentences first, and then connect them by means of one or another of the relative pronouns. '1. The boy stole his father's purse.' '2. The boy went away to sea.'—'*The boy* WHO STOLE HIS FATHER'S PURSE, *went away to sea.*' '1. The Edgehill tunnel is a masterpiece of George Stephenson.' 2. Many trains pass through it daily.'—'*The Edgehill tunnel,* THROUGH WHICH MANY TRAINS PASS DAILY, *is a masterpiece of George Stephenson.*' '1. The Schoolmistress was a beautiful young woman.' '2. Mr. B. married her.'—'*The Schoolmistress* WHOM MR. B. MARRIED *was* a beautiful young woman.' Again he would illustrate the place and use of the relative pronoun *what* in this way:

'Let us thank God for { that which / what / anything which } he gives us.'

{ 'Anything that / What / That which } we eat and drink nourishes our bodies.'

According to his own custom he would multiply such examples almost *ad infinitum*, that is to say until he quite familiarized the pupils' minds with this important part of grammar.

"Again he taught them to combine any two sentences by means of one or another of the conjunctions—another very highly useful mental exercise. Most of the conjunctions he found little or no difficulty in explaining to them; however there were two or three which almost baffled his illustrative power for a time, but so resourceful

and so diligent was he that they were at last mastered alike to his own relief and to his pupils' benefit. I refer to these conjunctions: 'unless' or 'except,' 'lest,' and 'therefore.' By simply substituting '*if not*' for 'unless' or 'except,' and '*for fear that*' for 'lest,' he had the inexpressible satisfaction of seeing the pupils glow with the joy of conscious intelligence. For example: '*Unless* you study your lesson thoroughly, you will not win a prize'—'*If* you do *not* study your lesson thoroughly, you will not win a prize'—'This old man took his spectacles off *lest* the lightning should strike the wires thereof'—'This old man took his spectacles off *for fear that* the lightning should strike the wires thereof.' With regard to the conjunction 'therefore,' he succeeded in making its meaning clear enough by simply reversing the order of any compound sentence in which the conjunction 'because' acted as the connecting link, thus: 'Lord Smith sentenced J. C. to death *because* he murdered his wife'—'J. C. murdered his wife, *therefore* Lord Smith sentenced him to death.' And as to the compound conjunction 'though yet' after satisfying himself that his pupils understood its precise signification perfectly, he was of course particular enough to impress on them that the original sense of any compound sentence in which it was employed, remained not at all weakened or modified by the omission of either of these words, thus: '*Though* Mr. J. was very rich *yet* he would give nothing to the poor'—'*Though* Mr. J. was very rich, he would give nothing to the poor'—'Mr. J. was very rich, *yet* he would give nothing to the poor.'

"One more specimen of his excellent style of teaching—When describing two actions happening at the same time, he taught his pupils to write thus: 'The brave soldiers *fell, fighting,*' that is to say, 'The brave soldiers *fell when fighting,*' or 'The brave soldiers *fell when they were fighting*'; or '*Fighting, the brave soldiers fell,*' *etc.* Again when describing two actions happening at different times, —*I mean one immediately after the other*; he taught them to write thus: '1st, I have written a letter; 2nd, I will

go out and post it'—'Having written a letter, I will go out to post it,' or, reversing the order of this sentence, 'I will go out to post a letter, having written it.'

"And now let me call your attention to another admirable series of lessons which Mr. Anderson delighted in imparting to his pupils. After having led them through all the ramifications of the noun, from the common noun to the relative pronoun, he invited them to acquire in a similar manner those of the verb, namely the *verb* itself, the *adjective*, the *adverb*, and the *abstract noun*. He used to write each day a list of these forward in so many columns on the blackboard, illustrating them by appropriate examples of his own making, and then prompting the pupils to originate similar ones. Thus:

Verb.	Adjective.	Adverb.	Abstract Noun.
			grace
To grace	graceful.	gracefully.	gracefulness.
	gracious.	graciously.	graciousness.
	graceless.	gracelessly.	gracelessness.

EXAMPLES.

1. Flowers grace (adorn) this garden. The Queen graces (dignifies) the Lord Mayor's banquet.

1. The Queen's manners are *graceful* (beautiful or elegant with dignity).

The swan is a *graceful* swimmer.

2. The old man received his prodigal son in a *gracious* (kind) manner.

3. The prodigal son led a *graceless* (abandoned or profligate) life.

1. The swan swims gracefully (in an elegant manner). The Queen rides gracefully.

2. The Queen received the poor Scotch crofters graciously (in a gracious or kind manner).

3. The prodigal son lived gracelessly (in a graceless manner).

1. God hears the prayers of penitent sinners with grace (favour), (or in a favourable manner).

2. The Queen rides with grace (ease of manner, or elegance), (or in an easy or elegant manner).

3. The swan swims with gracefulness (or in a graceful manner).

4. The English revere Queen Victoria for her graciousness (or being generous or kind.) The Queen received the poor Scotch crofters with graciousness (or kindness), (or in a gracious manner).

5. The prodigal son sincerely repented of his gracelessness (or being graceless), (or wanting in grace).

"In cases where the verb is wanting he told them to fill up the gap by simply adding the verb 'to make' or 'render' to the adjective, such as 'to *make* or *render* good.' Again he always took care to remind them that with a very few exceptions, the adverbs, though professing to add to the verbs, were really formed by adding 'ly' to the termination of the adjectives, and furthermore that there were a few adjectives which looked like adverbs, but were really not so, such as 'miserly,' 'dastardly,' 'niggardly,' 'cowardly,' etc., for example: 'The Russian Emperor's treatment of the Jews is *cowardly*' (adj.). But in order to convey the sense of an adverb, it would be necessary to say thus: (*in a cowardly way*) or (*with cowardice*). Then he would explain in an equally painstaking manner the difference that existed between such two adjectives as 'contemptible' and 'contemptuous'—or as 'graceful' and 'gracious.' 'Judas' conduct towards his Divine Master was *contemptible*' (*worthy of contempt* or *mean*). 'Judas' remarks about Mary Magdalene were *contemptuous*' (expressing contempt). The synonyms indeed formed a peculiarly valuable supplement to the above series of lessons, inasmuch as they helped to extend and enrich the pupils' vocabulary. For instance 'impertinent' and 'impudent' are said to be synonymous or nearly so, yet there is a shade of difference existing between their significations. Mr. Anderson would of course be careful enough to point it out to the pupils, and also to illustrate it by examples. Such were the principal ways in which he trained the deaf, committed to his fostering care, to acquire the elegant art of English Composition thoroughly.

"As to the idiomatic verbs, I have to admit, however,

that he did not teach them systematically for fear that he should force the intellects of the majority of his pupils prematurely or unduly. But on the other hand, he interspersed his other series of lessons with them and also metaphors rather profusely, so that his pupils might become familiarized with them gradually, or by slow degrees. In this respect he differed greatly from his professional contemporaries, who used to declare that the deaf were totally incapable of comprehending, much less using, the idioms and metaphors. Reason was certainly on his side, not on theirs, as I shall presently explain. It was his happy custom to encourage the more advanced of his pupils to consult diligently in their leisure hours Webster's Dictionary (unabridged edition), which literally teemed with idiomatic verbs and metaphors illustrated by examples, literary as well as colloquial. Then pantomimic signs are essentially a pictorial language—indeed metaphors without words. Even an uneducated deaf mute is only too apt to say in signs, '*This man is an ass*,' meaning thereby that he is stupid like an ass. It is therefore perfectly obvious that he only requires to be endowed with a copious command of verbal language in order to be able to translate his own sign-thoughts as well as the pantomimic signs of his fellows into correct English. To illustrate this point, let me now introduce a parallel familiar to all:—that of a native of China who, after having graduated in an English college or school, can translate into English, with perfect fidelity, his own language, which is nothing if not a language of pictorial devices or signs."

With reference to the signs referred to by Mr. Armour, Mr. Anderson, at the annual meeting in 1856, explained that, in teaching the deaf and dumb, symbolical signs are made use of to show the arrangements of the parts of speech in the various constructions of sentences. A few of these symbols were written on the board, and the pupils constructed different sentences corresponding to the arrangement of the symbolical signs. Thus, signs representing the indefinite article, an adjective, a noun, a verb in the past tense, a preposition, the indefinite article again,

and a noun in the objective case; and the scholars produced immediately such sentences as the following:

"A little boy fell into a deep well."

"A bold traveller ventured into a dark cave."

All this is very ingenious, and shows an active mind full of devices, but we think that Dr. Harvey Peet, of New York, who visited the Institution in 1851, when Mr. Anderson was at his best, hit upon a better explanation of Anderson's success in language teaching than can be found in the use of symbolical signs. Dr. Peet says: "Our kind friend, Mr. Anderson, conducted us to the Deaf and Dumb Institution of Glasgow, where we saw a few pupils under instruction. Their language in thought and expression would have been creditable to persons in possession of all their senses. From all we saw and learned, I regard Mr. Anderson as one of the best practical instructors of deaf mutes whom we had the opportunity of meeting abroad. One cause of his success undoubtedly is his zeal and earnestness in his work; *he spends eight hours of each day and sometimes more, in the direct work of instruction.*"

Small wonder that his pupils made great progress in their studies—system or no system; such labour and zeal could not fail of success.

So much has been said about signs that it may not be out of place here to say a few words on the various kinds of signs used in teaching deaf mutes. Bell[1] classifies them as follows:

1. Signs of the emotions, facial expression and so forth.

2. Dramatic signs, signs used by orators and others to emphasize the meanings of words.

3. Imitative signs, natural pantomime by which people imitate, etc.

4. Symbolic signs or conventional signs; these are generally imitative in their nature, but are symbolical of something else.

Regarding the use of these signs, Bell says: "There is no teacher who does not use signs of the nature of Classes

[1] Evidence before the Royal Commission.

1 and 2; they all use expressions of face and dramatic gesture. There is no teacher who objects to Class 3 in moderation being used as pictures are used; there is no teacher who would not allow his children to illustrate the meaning of a sentence or story by acting it out. The proper use of signs is to illustrate language, not to take its place."

If this classification be correct, and it seems to us that it cannot easily be improved upon, it will be seen that the controversy between the opposing schools regarding the use of signs is reduced to a very narrow platform, namely to those under the head of Class 4, at anyrate so far as British teachers are concerned. We find that as far back as 1851-52, at a Conference in London of heads of British institutions, the opinion was unanimous that signs should be reduced to a minimum in school work. This opinion is held, with few exceptions, by British teachers of the present day. As it is conceded that natural signs, that is to say, Classes 1, 2, and 3, are used in schools on the German method, and in theory, at anyrate, British teachers are nearly agreed on the point, it should not be difficult to arrive at a definite and unanimous expression of opinion on this much debated question.

This refers solely to the work of teaching, where the object is to instil a knowledge of language, and has no reference to the use which the adult deaf and dumb make of signs for the purpose of communicating with one another. If deaf mutes are thrown much into each others' company, there will always be developed among them a set of conventional signs which will take the place of words spelled on the fingers. This comes naturally, for the use of conventional signs makes conversation more rapid, and is not so tiring to the eyes as is constant spelling on the fingers. To watch the rapid finger-spelling of accomplished deaf mutes for an hour or two is a great strain on the best eyes, and so to give relief they resort from time to time to the easy gesture language which comes so natural to them.

THE COMBINED SYSTEM.

In attempting to describe the Combined method of instruction, the difficulty before mentioned, of knowing exactly what is meant by the term, at once presents itself. The method being comprehensive and its principle selection, it follows that all known methods are laid under contribution, but in varying proportions, according to the idiosyncrasy of the teacher using it. The idea is to select what is best in all the other methods, and so to combine them that the pupil taught on this system shall be able to speak and lip-read with the orally-taught pupil and the hearing, write with the pen or pencil, spell on his fingers with the silently taught, and sign with those who are unable to communicate by any other method. This is the Combined method of the old masters, such as Bonet, Wallis, Braidwood, and we have it on good authority that some at least of their pupils exhibited results which have not since been surpassed.

The difference between the theory of this method and that of the Pure Oral lies in the fact that while professors of the latter make all instruction dependent on speech, those who prefer the former begin by developing the power of using written language before teaching speech and lip-reading. In theory, at least, the difference between the two schools is fundamental. In practice, this difference is very much minimized. We find that professed teachers on the Pure Oral method do not scruple to write down on the black board, for the pupil to read, a difficult word which he has not been able to catch from the lips; and, on the other hand, we have seen pupils whose education has been conducted on the theory of writing first and speech afterwards, who have read the lips as well, and spoken as naturally, as any child we have seen in the so-called Pure Oral schools. The truth seems to be that Nature is really above theories, and that, theorize as we may, she will still find means to deceive us and upset all our reasoning. Moreover, what is there to prevent the process which must go on in the mind

when speech is given first and writing second, from being reversed? If a hearing person can become so accustomed to written language as to think in it better than in the spoken word, what is there to prevent the deaf man, who has been taught written language first, from acquiring the faculty of thinking in articulate speech, provided he gives sufficient time and attention to the subject? That such a thing has been achieved, we know from personal observation, the only question to the mind of a practical teacher is as to which method will lead to the better results. Graham Bell, the inventor of the telephone, who is to-day one of the strongest advocates of the Combined system (though he is generally reckoned a Pure Oralist) says: "I have no hesitation in saying that the attempt to carry on the general education of young children who are deaf from infancy by means of articulation and speech reading alone without the habitual use of English in a more clearly visible form would tend to retard their mental development. I do not mean to say that this is ever actually done, but I know that there is a tendency among teachers of articulation to rely too much upon the general intelligibility of their speech. Let them realize that the intelligibility is entirely due to context, and they will rely more upon writing and less upon the mouth in their instructions to young congenitally deaf children.

"The exceptional cases of congenitally deaf persons who have become expert in this art assures us that, with all who are deaf from infancy, we can certainly achieve the same results, if only we can give them a sufficient knowledge of our language, at least in its written form. In the early stages of the education of the deaf it appears to me that written English should be made the vernacular of the schoolroom, and that all words or sentences written should also be spoken by the teacher and read by the pupils from the mouth."

Mr. Bell also recommends the use of an alphabet similar to the one figured by Dalgarno in his book, *Didascalacophus*,[1] and indeed the system he recommends seems to us very similar to the one advocated by that early writer.

[1] See page 237.

The method of teaching language by this system is the one common to that employed in the Oral and Silent systems. The objections taken to the Combined system are that (1) "As yet no attempt has been made to reduce this system to logical consistency or completeness, or even to specify the precise parts of the systems from which the selection is made" (Arnold's *Manual*, p. 138; (2) "That it is useless to think of merely teaching articulation; to be successful it must be, as in the German system, the basis of instruction, so that the pupil may always think and express ideas in the order of the language of his country. This is next to impossible for him to do, when taught upon any system of inverted order like that of signs. Signs are also much easier than articulation to the deaf. The two have nothing in common. The easier will always supersede the harder in the affection and practice of the pupil."[1]

And again, "By teaching articulation as a mere accomplishment, the pupils do not get sufficient practice, hence their voices are harsh and disagreeable, owing to the fact that during the greater part of the day their vocal organs are lying idle. Continued and persistent exercise is necessary to restore vitality; if they get this, their voices will soon become, if not quite natural, at least, not disagreeable. A Combined system, then, in depriving the pupil of this required practice, injures the tone of the voice, and, as the deaf are only too ready to think themselves the objects of detractive remarks, persons so taught will soon find out that their speech is peculiar, and be driven to use their voices less, to depend on silent methods more, and so prefer the society of the deaf."[2]

These objections are weighty, but they do not entirely do justice to the results obtained by the Combined method.

As an instance of successful lip-reading by pupils taught on this system, the class at Donaldson's Hospital, mentioned on page 23, may be referred to. These pupils were trained entirely on the Combined method, that is to

[1] St. John Ackers, *Report of Conference*, 1877.

[2] Miss Hull, *Report of Conference of Headmasters, etc.*

say, they were taught written language, aided by spelling and signs, and, *pari passu*, were instructed in articulation. The writer, who has visited nearly every important school in Britain, and many of the best abroad, can truthfully say that he has never seen better results in lip-reading than those obtained by this class. It must be admitted that the pupils were picked pupils, chosen specially for their ability in this direction, but this does not alter the fact that here we have an instance of what is often denied by those who advocate the purely Oral method only, namely, genuine success in the teaching of lip-reading, attained on the Combined system as practised by our early British teachers.

Admitting the force of the objections against this old Combined system, another plan has been tried in some places, namely, that of having under the same management two schools separate from each other, one on the Oral, and the other on the Silent system. To distinguish it from the old combined method this has been termed the Dual system. This is the plan adopted at Manchester, and also at Philadelphia, U. S. A. The pupils, on admission to the institution, are tried orally for a year or two, and, if promising pupils, are retained, and finish their education entirely on the Oral system. If, on the contrary, it is found that their mental capacity is not sufficiently good to make them apt pupils on the Oral method, they are relegated to the Silent school, where they are taught as much of the written language of their country as possible, while their minds are fed and their intellects developed with information given and received by the aid of signs.

This is practically what was recommended by the late Royal Commission, and, where funds will allow, it is as good a solution of the problem as it is possible to attain. To carry it out fully, it would be necessary to divide the country into districts, each district under the management of a body who would have full power to decide what should be done with all the deaf mutes of school age residing in that district. It would, moreover, be necessary that the area of each district should be sufficiently large

to furnish such a number of pupils as would render it possible to make the classification of the scholars complete. Till something like this is done, nothing but chaos can exist, so far as the proper classification of the deaf-mute pupils is concerned. As matters stand at present, School Boards are left to their own ways; and, while many public-spirited Boards will no doubt do much towards the solution of the problem of educating the deaf, there are others whose first care will be to save the rates, and their last to look after the interests of the deaf and dumb who may be resident in their district. It is to be hoped that the Education Department will gradually acquire sufficient knowledge and experience to enable them to grapple with the vexed question of systems, and arrive at a solution which will conserve the best interests of the deaf and dumb. The task is a hard, but surely not an impossible one.

CHAPTER XII.

RESULTS OF EDUCATION.

In considering the value of the results achieved by the different methods, and their suitability for the education of the deaf as a class, it is difficult to steer clear of partizanship. The advocates of the varying systems all seem to consider the one which they themselves favour as the sole system which possesses any value, and in many cases they place an exaggerated estimate on results which, remarkable in themselves, if the disability of the pupil is considered, yet do not sustain in every case the theory which has been founded upon them.

Many false hopes have been raised by the publication of exaggerated accounts of success attained in lip-reading and speaking, and when it is found that these hopes cannot be realized, except in very brilliant and exceptional cases, a feeling of disgust is apt to be created, which causes those who experience it to rush to the other extreme, and condemn as useless, attainments which, though not ideally perfect, are yet of considerable value to the possessor when properly used.

In a letter in the *Glasgow Herald* of February 18th, 1884, occurs this statement: "Children taught by means of this system (German), when they leave school make use exclusively of speech"; and, again, it was asserted by another writer in the same newspaper, "After training for a period of about three years under a competent teacher, the deaf children would be enabled to take their places among the speaking and hearing children in the school."

To the letters from which these extracts were taken, the following reply was sent by the parent of a deaf mute: "My son was educated under Mr. Van Asch, one of the first gentlemen who introduced the German system into this country. After four years' tuition, he returned home, speaking sufficiently well to enable him to attend an ordinary school, and, I may say, was looked upon as one of the brightest examples of the Oral system; but notwithstanding all this, I soon realized that he was to a great extent isolated, and that something more was required to complete his education. More especially was this felt on Sunday, when his attendance at church was found to be literally an empty form, he having no means of deriving either pleasure or profit from his inability to follow the service. This led to his being induced to join the Deaf and Dumb Mission, where the services are conducted by signs purely. After a short time, my son acquired this language, and thereupon commenced a brighter and happier life, for he could now attend the means of grace, and hold fuller and readier intercourse with his fellows."

This letter effectually disposes of the statements made by the two writers first quoted, and experience of deaf mutes in Glasgow, who have been trained exclusively by the Oral method, abundantly confirms the opinion to which the writer of the last letter gives expression. It is found that the adult deaf, unless they are very jealously guarded and secluded by their relatives, do mingle with each other, do not make use exclusively of speech, and, except in very rare cases, are not able to take their place alongside hearing children in school. The Bible Class of the Glasgow Mission to the Deaf and Dumb recently had a walking expedition in the neighbourhood of Langside, and on the return journey they called at the institution and were shown over the place. The writer was surprised to find amongst the number several who had been educated at Pure Oral schools, and it was found that, while they were quite able to hold a conversation *viva voce* with persons who would take a little trouble with them, yet it was

evident that the strain of the endeavour to take their place amongst the hearing on anything like a footing of equality was too great for them, and that they found both pleasure and relief in turning to the finger language and signs, and the freer and easier intercourse which that medium of communication afforded them. It appears clear to the writer, therefore, that the deaf and dumb will always prefer the Finger and Sign language as a means of communication when left to themselves, and also with those hearing persons who can spell rapidly on their fingers. Even the semi-mute, who has learned speech through the ear before he became deaf, will often prefer to use writing rather than make use of a voice which he can see clearly enough has become altered and intelligible with difficulty by those not accustomed to hear it. A deaf friend, on whom the writer was urging the importance of trying to make use of his voice as much as possible, put the case in this way. He said: "Suppose I go to a railway station and ask the booking clerk for a ticket, the chances are that at first he does not understand me, and I have to repeat the word over, probably a good many times before I can make him understand. In the meantime everybody's attention is drawn to me, and I become the cynosure of all eyes. If, on the other hand, I simply write on a slip of paper the name of the place I want to go to, the clerk at once recognizes what I want, and there is no more trouble.

"This," my friend said, "is my constant experience, and I prefer to acknowledge at once that I am not as other men, and resort always to writing, which is, for me, quicker, safer, and surer."

This, it may be said, is only an isolated case of a supersensitive mind, but there is no doubt whatever that it is truly representative of the attitude of a great number of educated deaf mutes in this country.

On the other hand instances of great success in the use both of speech and lip-reading by the deaf are multiplying. Mention may be made of Arnold's famous pupil, A. Farrar, who passed the Cambridge Local Examination with honours

in Classics and Mathematics, and afterwards matriculated at London University.

A more recent case is that of a gentleman, a pupil at Miss Hull's Private School at Bexley, Kent, who graduated at Dublin University, B.A., in 1887, and M.A., in 1891. This gentleman, the writer is informed, was educated entirely through speech and lip-reading. In reading for his degree, he received lessons in the degree subjects from an ordinary tutor and took the *viva voce* examination along with the other students. His mother says that he now looks after all his own estate accounts, and never finds any difficulty in the shops, and travels abroad all alone.

A similar case reported from France is that of Maurice Koechlin of Lyons, who passed the examination for the Degree of Bachelor of Letters at Lyons. These, it will be contended, are exceptional cases, and they do not dispose of the question as to what is the best system to be adopted in schools and institutions where a larger number of pupils of varying capacities, drawn from the lower ranks of society, are to be educated.

Many and various opinions have been expressed on this point. Statistics extending over a large area are wanting. Hartmann gives a number of facts which were collected in the dukedom of Nassau in 1864; but of 177 deaf-mutes who had been instructed, "33 employed articulate speech only, and spoke well; 23 employed only articulate speech, and spoke tolerably well; 86 employed both articulate speech and sign language; 18 mostly employed the sign language; and 17 the sign language only. The only statistics available at present in the United Kingdom are those collected by Mr. Howard of Doncaster. In the Report of the Yorkshire Institution for 1888, it is stated:

"As a test of the permanency of speech and lip-reading, and the value placed upon it by the friends of pupils who have passed through the Institution, as also for the information of the Royal Commission, a circular containing a series of questions was sent out to the friends of eighty pupils who had left school during the last ten years, taught upon the Pure Oral system. Replies were received in

65 cases; ten circulars failed to reach their destination from change of address, and to five there was no response. The following is a summary of the replies received:

1. "Is your son (or daughter) employed?"

1. "Yes," in 58 cases. "No," in 7 cases. Of these latter 4 are girls helping at home.

2. "How?"

2. *Boys.* 5 in Agriculture, 1 Blacksmith, 2 Boot and Shoe Makers, 1 Boxmaker, 1 Brushmaker, 3 Cabinetmakers, 1 Card Maker for Weaving, 1 Clogger, 1 Corf Repairer at a Colliery, 1 Compositor, 1 Engraver in Electro Plate Works, 1 Fettler, 1 Finisher of Cloth, 2 French Polishers, 2 Joiners, 2 Lithographic Artists, 1 Painter, 1 Printer, 1 Printer and Compositor, 1 Spring Knife Cutler, 1 Stone Carver, 4 Tailors, 1 Ticket Writer, etc., 1 Wood Carver. Total 37.

Girls. 1 Burler, 1 Carpet Designer, 1 Cloth Inker, 5 in Domestic Work, Cooking, etc., 6 Dressmakers, 1 Milliner, 1 Reeler in a Mill, 4 Weavers, 1 Worsted Yarn Finisher. Total, 21.

3. "Does he (or she) give satisfaction?"

3. "Yes." "I think so." "Thorough." "Perfect." "He gives great satisfaction." "He is considered the best apprentice in the lot," etc., 62.[1] "No," 1. No reply, 2.

4. "Does he (or she) continue to use his (or her) speech?"

4. "Yes." "Yes, and talks to everybody." "Yes, and has improved greatly." "Yes, seldom uses signs." "Yes, constantly," etc., 57. "No." "Not much," "No, very little," etc., 8.

5. "Can he (or she) make himself (or herself) generally understood by speech?"

5. "Yes." "Yes, generally to most." "Yes, she can make the master she works for know all she says." "Yes, to a great extent." "Yes, to her mother." "We understand all she says, and she has improved." "Yes, very well." "She always makes herself understood when we send her anywhere," etc., 52. "No." "No, very little." "Not much." "No, more by writing," etc., 13.

6. "Does he (or she) read the lips of others speaking to him (or her)?"

6. "Yes." "Yes, easily." "Yes, and improves in that also." "She understands all that is said to her by the lips." "Yes, very well." "Yes, at home and about home," etc., 45.

[1] The replies given above are quotations and examples, and the figures "62," etc. indicate the number of similar answers.

"Not much." "No, very little." "Not everybody." "Not very often," etc., 14. "No," 6.

7. "Do you value the amount of speech and lip-reading which he (or she) possesses?"

7. "Of course we value it very much." "Yes, I like to hear what he can say." "We value it very much, indeed, I assure you." "Yes, certainly." "I certainly do, very much." "Yes, very much." "Yes, I consider it a great blessing to him and to all connected with him, and I heartily thank the Institution for what they did," etc., 60. "No," etc., 5.

8. "Does he (or she) associate with the Adult Deaf and Dumb?"

8. "Yes," 30. "Occasionally," 20. "No," 15.

A second circular has been lately (July 1, 1895) sent out by Mr. Howard, which has produced the following results: 60 circulars sent out—45 replies. 1 boy dead, 14 to be accounted for.

1. "Is your son (or daughter) employed?"—

1. "Yes," 41. "No," 2. "Unsettled," 1.

2. "How?"

2. "Shoemakers, Tailors, Cabinetmakers, Compositor, Lithographers, Stonemason, Builder, and Farmers."

Girls. "Dressmakers, Laundresses, Under Servants, at home 2."

3. "Does he (or she) give satisfaction?"

3. "Yes," 43. "Fairly," 1.

4. "Does he (or she) use his (or her) speech?"

4. "Yes, very well," 36. "Fairly," 3. "Moderate," 2. "To some extent," 1. "No," 2.

5. "Can he (or she) make himself (or herself) generally understood?"

5. "Yes, very well," and "Yes," 41. "To a certain extent," 1. "Fairly well," 1. "Only middling," 1.

6. "Does he (or she) read the lips of others speaking to him (or her)?"

6. "Yes," 37. "Yes, we speak to him only by the lips," 1. "Yes, he very rarely uses his fingers," 1. "Partly, but she hears much better," 1. "Fairly well," 2. "No," 2.

7. Do you value the amount of speech and lip-reading which he (or she) possesses?"

7. "Yes," "Very much," "Certainly," "Of course," and "Yes," 44.

8. "Does he (or she) associate with the Adult Deaf and Dumb?"

8. "Yes," 16. "Yes, sometimes," "On Sunday," "With the few she meets," "With the few who are here," 11. "No," 17.

Mr. Large, Donaldson's Hospital, Edinburgh, reports that "34 per cent. of the ex-pupils of that school use speech and lip-reading, 42 per cent. articulation only, and 24 per cent. make use of neither." These pupils were taught on the Combined system. About one-half of the ex-pupils of the Institution at Exeter are reported as making use of speech and lip-reading in their daily life.

These figures seem to prove that a large number of the deaf can be taught to use their voices in a manner which is satisfactory, at least to their parents. How far they would satisfy an educational expert, or even a casual visitor or acquaintance, is a different question, the answer to which would depend largely on the standard expected. The reports which have been published by visitors to Oral schools vary so much that it is exceedingly difficult to account for them. The Royal Commissioners, who examined a great many schools at home and abroad, were far from unanimous in their opinions as to the success achieved.

A sub-committee of the Cross Institution at Preston, who, previous to the opening of that school, were deputed to examine the question of method, reported on what they saw and heard as follows: "We saw one deaf gentleman, and one deaf lady, who can engage agreeably in what might reasonably be called ordinary conversation. We saw three other ex-pupils of Mr. Van Praagh's, whose articulation may fairly be called speech, and whose lip-reading in conversation on simple subjects was very fair. At the Jews' Home we saw an ex-pupil of Mr. Schöntheil's who could speak and lip-read on simple subjects with facility. In the first two cases we consider the results excellent; in three out of the other four, very satisfactory.

"In the first class of Mr. Schöntheil's school, consisting of three bright girls and two boys, we saw most intelligent

lip-reading, and evidence of patient teaching of the highest excellence. The senior pupils at Fitzroy Square were able to receive religious instruction on simple and familiar subjects from the lips of Miss Ferrier, who is a very excellent teacher. In a reading lesson for the most advanced of these pupils, conducted by another teacher, we were seriously disappointed, and we were also disappointed with the ability of the pupils to engage in conversation with us, even on the simplest subjects. These results were the best we saw at the Pure Oral schools, and they were only attained by the brightest of the pupils. Some of the results we saw were indifferent, others bad. We saw no good results in the Board School, where the conditions are inferior to those of Fitzroy Square and the Jews' Home.

"The lip-reading and speech we saw at Margate were almost, if not quite, equal to the best we saw at the Pure Oral schools, and we were convinced that there is no disadvantage to the oral pupils in allowing them to associate with the sign-taught pupils after school hours."[1]

The following opinion may be of interest in this connection. The writer of it, Mr. Stewart, has for a number of years officially inspected the schools for the deaf in the State of New York. He has thus had ample opportunity of seeing what could be done on the different systems by schools working in other respects under similar conditions. He says:

"The State of New York furnishes an interesting field for experts in the different methods of the education of the deaf. The schools at 162nd Street (New York), Buffalo, Rome, and Malone, are classed as 'Combined' schools, but in all of them, more or less, Oral instruction is given. The school on Lexington Avenue, New York, and that at Albany are taught by the Pure Oral method; and the pupils at St. Joseph's Schools, at Fordham, Westchester, and Brooklyn are also nearly all taught by that method; a few of the older pupils in them are survivals of their 'Combined' period. The Rochester school is classed by its principal as

[1] *Report on the Pure Oral System*, by Sub-Committee of the Cross Deaf and Dumb School at Preston, Lancashire.

a 'Manual Oral' school; speech is taught in part by the aid of the manual alphabet. In former reports I have devoted some time and space to the consideration of the merits of the different methods for the education of the deaf, at the same time disclaiming special expert knowledge. I do not deem it necessary at this time to make further comment or suggestion on the subject, as several annual visits to the schools have satisfied me that time is satisfactorily determining the matter. Considered from both the points of educational results achieved, and the *per capita* cost for maintenance and education, my judgment is that the Rochester school is '*facile princeps.*'"[1]

One explanation of the varying reports given by different persons who have visited schools for the purpose of ascertaining how far lip-reading is possible by the deaf, will be found in the manner in which these persons themselves articulate. No two persons speak their words in exactly the same way, "some mouth their words as the players do, others pronounce them trippingly on the tongue," while some, alas! speak in so slovenly a manner that it becomes a matter of great difficulty even for a hearing person to catch what is said. Hence one need not be surprised to read in the Report of the Royal Commissioners that "Vatter's highest class had great difficulty in reading the lips of the interpreter, but could lip-read one of the Commissioners' better."

The writer has often observed the same thing when showing visitors round his own school. In speaking to the children, some visitors are easily understood, while others quite fail to make themselves understood. It is of course out of the question to suggest on these occasions that the fault may not be entirely with the pupil.

The degree in which the speech of the deaf is understood is also subject to the same law. It is matter of common knowledge that some persons are much quicker than others at catching the strange sounds of a foreign language, and so people, unaccustomed to the peculiar speech

[1] *Report for the Standing Committee on the Deaf*, by William R. Stewart, Commissioner, New York State.

of the deaf, find greater or less difficulty in understanding them according as their own endowment is more or less perfect. Thus the interpreter above referred to "could only understand the one who was not born deaf. However, the children talked to and understood each other."

The facts quoted in Chapter II., on the limits of hearing, seem to confirm this theory, and will probably explain what to many seems incomprehensible, namely, the different impressions made on two such earnest and sincere men as the late Andrew Paterson and Arthur Hopper in their historic visit to Mr. Schöntheil's school in 1877. As a result of that visit, Mr. Paterson altered the views of a lifetime on the subject of Oral teaching, while Mr. Hopper remained unmoved.

Many years ago the writer, who was trained as a teacher in a Sign and Manual school, determined to investigate for himself the question of Results, and during the last ten or fifteen years he has visited the most important schools, not only in this country, but also in Germany and neighbouring countries. The conclusions he has drawn from these visits can only be stated briefly and in dogmatic form, and are of course liable to error in the same way as are those of other observers, but they are given for what they are worth. It must be stated, first of all, that great difficulty was experienced in finding out what schools were to be considered as Pure Oral schools. Thus in "Parliamentary Paper, No. I., 86," it is stated that "at Antwerp, which is only for males, the so-called German, or phonetic, system is solely employed," yet at the Conference of 1885 (*Proceedings*, page 102) Mr. Schöntheil is reported to have said that "it is not a Pure Oral school at Antwerp."

Mr. Black, secretary to the late Royal Commission, in an article in the *National Review* (1885) refers to the school of M. Magnat, at Paris, as a Pure Oral school, yet a Mr. Bishop, writing in the *American Annals*, said the pupils there "sign like mad."

Again, Miss Hull, in her evidence before the Commission, said that "the Brühl (Germany) school was a very poor one, that it was not very Pure," yet the

Commissioners say that the results there were amongst the best seen on the Continent, a statement which the writer, after a week's attendance at this same school, can heartily endorse.

The truth seems to be that, however much the teachers may try to put down signs among the deaf pupils, nature proves too strong for art, and that, wherever deaf people are congregated, signs will, in the absence of words, yea, and in spite of the knowledge of words, continue to flourish. Fighting signs among the deaf is, as one writer puts it, like fighting original sin; yet some wonderful results are achieved in these Oral schools. During a week's residence at the Brühl school, the writer saw no sign whatever used in the class-rooms, the whole instruction was given by word of mouth, and the pupils seemed perfectly to comprehend what was said by the teacher. The questions were given almost exactly as they would be in a hearing school, and each member of the class in turn was required to furnish an answer, which was generally done correctly. The subjects of instruction covered much the same ground as would be gone over in a good Sign and Manual school. Out of school the tendency of deaf children to make signs, when left to themselves, was noticeable, though it was evidently held in restraint when the teachers were present. In taking a walk in the forest during the mid-week half-holiday, the children often came to the teachers to ask the names of the flowers and plants they met with, but the conversation was not so free as it would have been with children who could use finger spelling and signs. The articulation was generally plain and easily understood, even to the writer, who was not accustomed to hearing much of the German tongue.

At one school visited the pupils were given, as a test in dictation, a paragraph from a newspaper which was selected by the writer. The teacher dictated orally, and the paragraph was written down with tolerable correctness by the class.

At another school the pupils of one of the advanced classes, after a similar test to the above had been per-

formed, were asked to write examples on one or two words which had been met with in the lesson; but they seemed unacquainted with this kind of exercise, and were unable to perform it, nor was the teacher able to make them comprehend what was required of them while the writer remained in the room. There would, of course, have been little or no difficulty had signs been allowed.

In estimating results, it is always needful to keep in mind that in a school for the deaf are usually to be found several classes of children whose cases really require, to some extent at least, separate treatment. These classes are:

1. The deaf who, from birth or early childhood, hear nothing.

2. The semi-deaf, who can hear loud sounds and, occasionally, vowels.

3. The semi-mute, or those who have lost hearing after speech has been acquired.

Concerning the last class, it is doubtful whether they should ever be placed in a school for the deaf at all.

Hartman says that "Sägert, director of the Educational Institution for the Deaf and Dumb in Prussia, believed that such children as had lost their hearing after they had already learned to read and write should also be sent to deaf and dumb schools in order to learn lip-reading."[1]

Many teachers hold, on the contrary, that such children are better taught alongside hearing children, inasmuch as they will thus stand less chance of losing the speech they have already acquired. This view is supported to some extent by the following interesting case, kindly supplied by Miss Robertson, one of the teachers in the Glasgow Institution, who was employed to give special lessons in lip-reading to the child in the evenings:

"J. K., aged nine years, became deaf when six years of age through congestion of the head. When she commenced her education she was physically of a delicate constitution, but looked bright and intelligent. She could not distinguish sounds by hearing, and her voice was rough and unnatural. She was taught the articulation of all the

[1] Hartman, *Deaf Mutism.*

sounds from the beginning exactly as if she had been always deaf. At first she had great difficulty in understanding why she was required to look at the lips, but gradually became interested in her lessons, and began to take pleasure in the exercises. When all the sounds and combinations had been mastered, words and sentences were introduced and reading lessons given out of the *Little Reader* (Nelson's). These lessons were first carefully articulated by the pupil under the guidance of the teacher, and were afterwards taken as a lip-reading lesson. Then questioning was resorted to, and the pupil was encouraged herself to ask questions of the teacher just as a hearing child would do. These questions were always given by word of mouth, but when great difficulty was experienced by the pupil in reading the lips, the slate and pencil were brought into requisition. These were only resorted to on rare occasions. Arithmetic was taught from real objects, and at the end of a year the pupil could quickly and accurately work simple rules in addition and subtraction.

"In the autumn of 1893, the child was sent to a public elementary school, where she did the regular school work, and was found quite capable of keeping pace with the hearing pupils, the headmaster remarking that she was exceptionally bright.

"During the second year's course more difficult exercises in articulation and lip-reading were assiduously practised, and the child read with intelligence the *Royal Readers* Nos. I. and II., and could answer any questions put to her on the subject-matter of the text. She took great pleasure in old Scottish stories, Chambers' *Graduated Readers* No. II., and many other books, the gist of which she would enthusiastically relate to her teacher. In arithmetic—addition, subtraction, and multiplication were thoroughly mastered.

"She is now (September, 1895) in Standard II. at the public school, and is treated exactly as a hearing child. Her composition compares favourably with that of her hearing comrade, a year older than herself."

While it would be unwise to generalize rashly from this interesting case, and, on the strength of it, maintain that all

children who become deaf after learning to speak could be, and should be, educated in the ordinary schools, yet it will be instructive to watch this child's development, especially with the view of testing whether the power of lip-reading can be acquired sufficiently to enable her to keep pace with the other children when the higher branches of education are entered upon. Even if some specially-gifted children can acquire the power of lip-reading, so as to hold their own in a hearing school, the writer doubts whether it is possible for all to do so.

The power of lip-reading is partly a natural aptitude, depending on a variety of causes over which the teacher has no control. It is quite a common thing to hear of persons, who have become deaf in middle life, learning to lip-read without any special instruction; while, on the other hand, many who take lessons in the art never attain any proficiency in it. This seems to prove that skill in lip-reading depends on endowments which are not granted to every person alike.

Class II.—The semi-deaf can, as a rule, be trained to speak well enough to carry on an ordinary conversation with friends and others who will take a little trouble with them, and ought to have at least the chance of being educated on the Oral system. In some of these cases, too, it is possible to train the hearing to a certain extent, so that it can be used for the purpose of modulating the voice, and getting rid of the harshness and monotony which is characteristic of the speech of most of the Orally-trained deaf mutes.

It has, however, been found that many who belong to this class (the semi-deaf) are more difficult to teach, and make more disappointing pupils than some who are absolutely deaf. The brain seems to be injured in some way, as well as the ear; and while it may be quite possible to train them to speak and read in a more natural way than those who are stone deaf, and though their voices are clearer and more intelligible, yet their memory for words is so poor, that it is next to impossible to get them to remember the vocabulary and construction of

the language, and consequently they make very poor pupils. That this is not a solitary experience, the following remarks will prove. The author of them, Mr. Greenberger, is a well-known Oral teacher in New York. Most teachers of the deaf could furnish a similar experience.

After dividing deaf mutes into four classes, according to his idea of the supposed cause of deafness, Mr. Greenberger says: "I have often found it difficult to decide in cases of semi-deaf applicants of this class (those whose deafness is due to, or accompanied by disorganization of the whole nervous system), whether they are suitable subjects for admission or not. There is little difficulty in teaching them to articulate, but it is not easy to determine by a mere preliminary examination whether the degree of intellect which they possess gives promise of future development. My experience with this class of pupils has been that they make rapid progress in the beginning, but come to a sudden standstill when they reach an advanced class."[1]

Class I.—The totally congenitally deaf, and those who lose their hearing before acquiring speech, are more difficult to deal with. The writer believes that a percentage of them can be taught to speak and lip-read, and that in every case a trial ought to be made. He is of opinion, however, that it is not possible to train *all* to speak well enough to be understood without great difficulty, and that in many cases the result obtained is not worth the labour expended on it. Their time might be more profitably occupied if trained on the Manual or Silent system exclusively. The Orally-trained deaf mute Farrar, in his Historical Introduction to Bonet's book, says: "There are some who need reminding by this old teacher that their efforts in this direction (lip-reading) are of little avail unless seconded by aptitude on the learner's part, even when his acquirements in speech are all that can be desired." How often this aptitude is lacking, only those who have struggled with the task can tell, but it is unfortunately not seldom, and there will always, we fear, remain a residuum who will have to eke out their limited knowledge and scanty

[1] *American Annals of the Deaf*, October, 1883.

vocabulary with signs. Bell says: "The exceptional cases of congenitally deaf persons who have become expert in this art assures us that, with all who are deaf from infancy, we can certainly achieve the same results, if only we can give them a sufficient knowledge of our language, at least in its written form." The system, however, which can give to *all* the congenitally deaf this knowledge of written language has yet to be invented.

The question is often asked: Then what percentage of cases do you consider suitable for Oral training? The answer is not easy to give. The percentage varies with each batch of pupils. Experience in the Glasgow Institution shows that while in one year a majority of the new pupils are capable of profiting by Oral training, the next year's admissions prove just the reverse. With the object of getting the opinion of the teachers actually engaged in the work at the Glasgow Institution at the time of writing, the following questions were handed round to them:

(1) State the number of pupils in your class that you consider would make good Oral pupils.

(2) State the number that you think would never be good Oral pupils.

(3) State the number you think suitable for Acoustic training, (*i.e.* those with a little hearing).

The following is a tabulation of the answers:

Class.	Acoustic.	Oral.	Silent.	Total.
I.	—	10	8	18
II.	—	4	10	14
III.	—	8	6	14
IV.	3	6	4	13
V.	2	7	3	12
VI.	—	1	9	10
VII.	—	10	—	10
VIII.	—	—	10	10
IX.	—	4	9	13
X.	1	5	6	12
XI.	1	5	6	12
XII.	2	6	4	12
XIII.	—	8	2	10
Total,	9	74	77	160

Hence it appears that in a school of 160 pupils, taken without selection from all classes of the population of Glasgow and district, the teachers actually engaged in the work of instruction think that a little over 50 per cent. of the pupils can be trained on the Oral and Acoustic system. The remainder, they think, should be relegated to the Silent system. The writer's own opinion, based on his periodical examinations of these same children, is that the percentage of successful cases of instruction on the Oral system would not be so large as the teachers think; but this is a question which only an actual test, under proper conditions, can answer. Till such a test is made for each school this question of system will always continue to agitate the minds of those who are interested in the education of the deaf.

At present in Glasgow all these pupils are being educated side by side in the same school-room on the Combined system; and though speech and lip-reading are not by any means neglected, and one or two of the classes are being carried on almost entirely by means of written and spoken language, yet the writer holds that, if the *best* results are to be obtained in Oral work, the necessary conditions can only be obtained in a double school on the plan so successfully carried out at Manchester and at Philadelphia, U.S.A. In other words, the Dual system must be adopted.

All the writers of the German school agree that if speech is to be made the vernacular of the child, then the conditions necessary must be observed. These conditions are laid down by Walther thus:

"(*a*) An eight years' course of instruction: three years for the lower, three for the middle, and two for the higher stage;

"(*b*) The number of pupils in one class must not exceed ten;

"(*c*) Every class must have its own teacher, familiar with the method, and experienced in the practice of deaf-mute instruction;

"(*d*) All necessary material must be provided, to enable the word to be associated directly with the object;

"(*e*) Deaf-mute children must enter the Institution on the completion of their seventh year;

"(*f*) All the teachers of an Institution must work on a uniform plan."[1]

When these conditions are fully complied with in this country, then, and not till then, will it be possible to form a just estimate of the comparative merits and demerits of the conflicting systems about which so much has been written and said by their partizans.

We should like to express the hope that Glasgow may, at some not too distant date, be permitted to take its proper share in the solution of this vexed question.

[1] *History of Deaf-Mute Education*, 1882; Reviewed in *American Annals of the Deaf*, October, 1883.

CHAPTER XIII.

PRESENT STATE OF EDUCATION.

One good result of the controversy which has been waged between the advocates of Oral and Silent methods during the last twenty-five years is the increased interest which has been taken in the education of the deaf and dumb. Prior to 1891 it was a reproach to our country that the state of the education of deaf mutes was left to charity. In other countries it was not so. America long ago made ample provision for the education of all her deaf mutes. Most of the States could boast a Government Institution at which every deaf mute in the State could claim not only education, but maintenance as well. On the continent several kingdoms had made full provision for the education of the deaf long before our own had moved in the matter. It was not till 1891 that a law making attendance at a school compulsory came into force in Scotland, and not till 1894 was this provision extended to England. Unfortunate Ireland still waits expectant, though the friends of the deaf in that country are hoping that her turn will come soon.

The principal provisions of the Act now in force in Scotland and England are as follows:

Education is compulsory from the age of seven to sixteen, and the duty of seeing that this is carried out is laid on the School Boards or school authorities of the parish where the parents of deaf children reside.

The authorities in carrying out the Act are at liberty to provide a school of their own, or they may send the

children to a certified school or institution outside their bounds, the parents being allowed a reasonable liberty in the choice of a school.

Where the parents from poverty are unable to pay the fees, the school authority is required to pay not only for the education but also for the maintenance of the child.

Power is conferred on the Education Department to make grants to schools, on the results of the examinations held by inspectors appointed by the Department.

In carrying out the provisions of the Act, great diversity of action has been manifested. Some Boards, especially in the larger towns, have gone into the matter with great spirit, and with the evident intention to work for the benefit of those for whom the Act is intended. The Glasgow Board, for instance, as soon as the Scotch Act came into force, appointed an officer specially to look after the blind, and the deaf children in the city. An agreement was come to with the Glasgow Institution, to which all Glasgow children except Roman Catholics are sent, and it would be difficult at the present moment to find a deaf child of the proper age who is not at school. On the other hand some Boards, particularly in poor country districts, seem to set themselves to work to find means of evading the Act. A notorious instance is the following: A ploughman in the south of Scotland has five deaf and dumb children. Though frequently appealed to, the School Board of the parish steadily refused to give any help towards maintaining these children at an institution. After much pressure, they eventually agreed to pay for one child, but only on condition that the one they offered to pay for should be sent to a different institution from the one the other children were attending. The terms on which children are received in the two institutions are the same, and naturally the father was desirous of keeping all the children at the one school. The reader must judge for himself as to the motive which produced such a strange policy.

Shortly after the passing of the Act the Education Department both of England and Scotland issued a Minute

stating that grants would be given for every child who showed satisfactory attainments at the annual examinations as follows :

Three guineas for Class subjects (reading, writing, arithmetic, etc.).

Two guineas for Manual or Technical training.

No Code or Syllabus of Instruction has, up to the time of writing, been definitely laid down. The choice of method is left entirely to the local authority, and at present each school follows its own plan, though in England there seems to be a disposition to favour the Oral in preference to the Manual method. How long this state of things will last it is impossible to say. In some quarters there is a longing for an authoritative code, and at a meeting of teachers held in London (July, 1895) a resolution was passed empowering the Executive of the Association of Teachers of the Deaf to prepare a scheme or code.

The Education Department, meanwhile, seems to be in no hurry to formulate a cast-iron method, and is probably wise in thus holding its hand, till such times as it understands the complicated problem with which it has to deal a great deal better than it can possibly do at present.

The method of inspection, always an important factor in educational matters, varies in the two countries. In Scotland the work is entrusted to the local inspectors of the district in which the school is situated. These gentlemen, as a rule, possess no special knowledge of the work upon which they are called to pronounce judgment. If they stay in the district long enough, they acquire a knowledge of the method pursued at the school they examine, sufficient to enable them to compare the work of one year with that of another. They can certify whether the standard of the school falls below or rises above its own average, but that is all. They are unable to compare one school with another, or one method with another, and consequently no opinion of the inferiority or superiority of the different competing methods and schools can be arrived at by them. The question of system must therefore remain unsolved by the Department and its

officers, and the solution of it is left to chance, public opinion, or natural selection.

In England a somewhat different course has been taken. To begin with, the Senior Inspector of the kingdom, Rev. Mr. Sharpe, C.B., was sent round on a visit of inspection to all the schools desiring to be certified. He made a cursory examination of the buildings, and a superficial examination of the children's attainments. After a time two assistants were appointed to help him in the conduct of the examinations. The one, Mrs. Thurstan Holland, a lady who had previously been a member of the governing body of the Training College for Teachers of the Deaf at Ealing, was deputed to examine the Oral work of the schools; the other, the Rev. Mr. Gilby, the chaplain of the Royal Association, was to examine the children taught on the Sign and Manual method. As these inspectors have but recently begun their work, it is too soon to speak with any confidence of the results which are likely to follow. The elementary education of the deaf as a class will probably be considerably improved. The knowledge that the work of the school is to be regularly tested will result in a general improvement. Greater uniformity in method will no doubt prevail in time, but at present it appears as if the Education Department, in England as in Scotland, is not anxious to have the honour of solving the problem which has divided teachers of the deaf into two hostile camps for so many years.

Another question which calls for speedy settlement, and is in fact at the present time much more vital than the settlement of system, is the obtaining and training of teachers. Hitherto this has been conducted in a haphazard fashion. Frequently no training whatever was available for those who entered on the work in Institutions, except such hints as could be picked up by watching older and more experienced teachers at work in the same school-room. There were few or no books to guide the young aspirant in his search for the best method. He was generally left to grope his own way in the dark as best he could.

If he succeeded in becoming a qualified teacher, it was in spite of obstacles, and only after long and tedious experiments and research.

The establishment of a Training College for Teachers at Ealing, Middlesex, and a similar college in Fitzroy Square, London, has to some extent remedied this defect, at least for Oral teachers. At the Ealing college, the students go through a complete course of study in such subjects as "The Mental, Physical, and Social Condition of the Deaf," "History of the Education of the Deaf," "Comparison of Systems," "Mechanism of Speech," "Development of Language," "Sound," "Anatomy and Physiology of the Organs of Circulation, Respiration, and Vocalization," etc. This course lasts one year, but students are recommended to take a second year's course whenever practicable. They are also required to attend the practising school connected with the college, so as to gain practical experience as well as theoretical knowledge. Evidence of a good education is required before students are admitted to the college. A goodly number of ladies have been thus trained for the work, but, unfortunately, hitherto this college has failed to attract men. These training colleges also have not been in touch with the Institutions of the country, and their graduates are chiefly to be found conducting day classes in board schools, or engaged as governesses in private families.

To raise the standard of attainment of the Institution teachers, a number of head-masters associated themselves together to form an examining body, with power to grant certificates, under the title of "The College of Teachers of the Deaf and Dumb." The examinations conducted by this body have been largely taken advantage of by the teachers for whom they were designed, and some progress has been made towards the formation of a professional feeling amongst teachers. At present, however, one great defect of the examination scheme is that it is purely on professional subjects. No preliminary examination of the general knowledge of the candidates is held. This we think is a mistake. On the other hand we think the time given by the two

other colleges to practical work, before certifying their teachers as efficient, is too short. An amalgamation of these different schemes is necessary if the profession of teacher of the deaf is to be placed on a sound basis, and it is to be hoped that the government will tackle the subject in earnest before long.

The idea which seems at present to obtain at Whitehall is that of taking elementary school teachers who have passed two years at a Normal college, and giving them a year's extra training at a school for the deaf and dumb. This idea is imported from Germany, where a similar practice is in vogue. The writer considers that this system will not produce altogether good results. The rate of pay which can be offered by the Institutions will not be such as to attract the best teachers from the hearing schools. The worst are not wanted. It is an advantage no doubt to have teachers in a school for the deaf and dumb who are thoroughly conversant with the work of teaching as carried on in hearing schools, and a judicious mixture is advisable ; but the majority of the most successful teachers of the deaf in Britain are men who were apprenticed to the work in early life, and have grown up in daily and hourly contact with the children they have had to teach. This is especially true in schools where the Manual system is adopted, but the rule holds equally in Oral work. If proper instruction be afforded, and sufficient time allowed for study, there is no reason why the scholastic attainments of apprentices in schools for the deaf should not equal those of apprentices in hearing schools, while the constant association with the children at an impressionable period of the teacher's life will give an insight into the character of the deaf, which one who comes to the work later in life will find difficult to obtain.

Hartmann considers that "the principal qualities of which a teacher of the deaf-mute must be possessed are a love for his profession and an entire devotion to it." Something more is required: patience and skill combined are equally necessary, and a thorough knowledge of many

subjects is essential if the teaching is to be of first-class quality. A good education, a knowledge of physiology and of psychology are absolutely necessary to those who aspire to train youth. The ability to draw well enough to freely illustrate lessons is especially desirable for teachers of the deaf; and if the fullest development of oral work is desired, it is also necessary that the teacher should make as thorough a study of voice production, modulation, etc., as is now required of a professor of singing. Nor should the art of gesture-making be entirely neglected, even by the most enthusiastic oralist. Any one who has carefully watched an Irving or a Terry recite will understand how much help appropriate gesture can give in making clear the meaning of a passage, even to hearing persons. Why should such aid be denied to the teacher of the deaf and dumb?

One of the results of the recent legislation is the establishment by School Boards, in many of the larger towns, of small day classes for deaf children in connection with the public elementary schools. Most of these classes, as will be seen from the return, profess the Oral system of teaching. This system of small day classes is that recommended by Graham Bell as a precaution against the intermarriage of the deaf and the propagation of a deaf-mute variety of the human race. Whether it will have the desired effect of preventing the deaf from marrying the deaf is doubtful. There will be more likelihood of boys and girls coming together when allowed to wend their way home from school without any control, than there will be in a well-managed Institution, where they live in separate wings, are always under the eye of a teacher, and are kept continually employed from morning to night.

The writer is of opinion that the children who attend these day classes will get an inferior education, except in the few cases where they have good homes, and their parents and friends devote a large measure of their time to the amelioration of the solitary condition of the deaf member of the family. How few members of the working classes in our large towns can afford to give much time to

their deaf children! A case illustrating this occurred at the Glasgow Institution very recently. A mother brought back her child to the Institution, after the holidays, minus a good deal of clothing which had been supplied. She confessed that they had been put in the pawn-shop; and moreover, she volunteered the information that, when the boy was at home, he was turned out of the house early in the morning, and left on the streets all day, to fend for himself as best he could.

Even in the families of the well-to-do, the deaf child is often treated in a manner which is anything but conducive to his future welfare and educational advancement. Because the child is deaf, he is allowed to have his own way, is petted, spoiled, and subjected to no discipline, till with expanding frame and growing strength, he becomes a nuisance and sometimes a terror to everybody, and then when too late, is shipped off to an Institution, where the teachers are expected to work miracles, subdue the young bear, and turn him into a civilized being. This is no supposititious case, but one with which teachers of the deaf are constantly meeting.

The day school for the deaf in this country has not hitherto been a great success. Where one has been started, it has after a few years either collapsed or grown into a boarding school or Institution. The London School Board, who in 1874 began day classes at many centres in the vast metropolis, have found from experience that the results obtained are not altogether satisfactory, and they are now building an Institution at Annerley to hold 150 pupils. The Leeds School Board, which have had one of the most successful day classes in the kingdom, have also undertaken the providing of accommodation for boarders in the new school which they are erecting for the deaf and dumb. The Sheffield School Board have just decided to abandon their day class, which has been in existence for some years, and to send the children to Institutions. We hear also of others who are not quite satisfied with the results obtained, and there can be very little doubt that only considerations of economy prevent the turning of many of these

classes into properly fitted Institutions. The evidence from America points in the same direction. We read that in Chicago it is proposed to establish boarding houses where the children attending the day schools can stay during the school week, going home only at the week-end. In Germany, where the system of boarding out largely prevails, the social conditions are quite different from what they are in Britain. Discipline is much stricter, and children boarded out are really much more under the control of the schoolmaster than can be the case here. Moreover, it is on record that the German teachers, speaking from the point of view of the Oral system only, were entirely in favour of internats, *i.e.* the Institution system, for at least the first four years of the child's school life.

Theoretically it seems no doubt a fitting thing that the deaf child should see as much as possible of its home, and mix with friends in society, but practically it is found that more often that not, the lot of a deaf child brought up amongst hearing persons is one of terrible isolation, while the educational results of the day school are much below those of the boarding institutions.

The following statistics, of which those referring to the present year have been compiled from returns kindly furnished by the head teachers of the schools, will show how the compulsory clauses of the Act are working. As far as the writer knows, no *public* school in the United Kingdom has been omitted from the list. There are, however, a few private schools in existence, concerning which no information has been obtained. The number of pupils at these latter schools is small, probably not amounting to 50 at the outside. The return may therefore be looked upon as showing fairly accurately the number of deaf children at school at the time of writing (End of September, 1895). The statistics for 1885 are taken from a return appended to the *Report of the Proceedings* of the Conference of Head Masters, etc., held in London in 1885. Those for 1855 are copied from the *Report* of the Glasgow Institution for the year 1855-56.

SCHOOL.	Date of Foundation.	Number of Pupils in 1885.			Number of Pupils in 1895.			System in 1895.			
		M.	F.	Total.	M.	F.	Total.	Oral.	Manual	Combined	Aural
Asylum for the Deaf and Dumb, London & Margate,	1792	176	151	327	222	160	382	308	74	...	...
Birmingham Institution, - - - - -	1812	74	59	133	78	60	138	74	44	20	...
Manchester, - - - - - - - -	1823	95	75	170	142	88	230	189	41	...	...
Liverpool, - - - - - - - - -	1825	73	47	120	94	42	136	85	51	...	...
West of England, Exeter, - - - - -	1826	30	15	45	35	20	55	55	...	...	...
Yorkshire Institution, Doncaster, - - -	1829	84	50	134	73	56	129	113	16	...	...
Northern Counties, Newcastle-on-Tyne, - -	1838	57	48	105	94	53	147	...	116	31	...
Brighton and Sussex, - - - - - -	1842	44	44	88	33	28	61	...	30	31	...
Bristol District Institution, - - - -	1841	26	18	44	28	23	51	...	51	...	...
Bath, - - - - - - - - - -	1844	5	9	14	8	7	15	...	15	...	...
Cambrian, Swansea, - - - - - -	1847	20	24	44	29	22	51	...	...	51	...
British Asylum, London, - - - - -	1851	...	31	31	...	...	...	...	...	...	...
Llandaff, S. Wales, - - - - - -	1862	13	10	23	12	13	25	...	...	...	25
Jews' Deaf and Dumb Home, London, - -	1864	19	12	31	18	15	33	33	...	...	...
St. John of Beverley, Boston Spa, Yorks, - -	1870	52	57	109	89	81	170	140	30	...	...
Hull and East Yorkshire, Hull, - - - -	1870	9	13	22	21	22	43	43	...	...	...
Oral Association, London, - - - - -	1871	40	24	64	26	20	46	46	...	...	...
London School Board, - - - - -	1874	164	149	313	294	219	513	462	51	...	...
Ealing, Middlesex, - - - - - -	1878	11	11	22	4	10	14	14	...	...	...
Sheffield School Board, - - - - -	1879	18	10	28	21	21	42	22	20	...	...
Leeds School Board, - - - - - -	1881	16	14	30	32	29	61	48	13	...	...
Nottingham School Board, - - - - -	1883	13	6	19	26	10	36	...	...	36	...
Leicester School Board, - - - - -	1884	9	3	12	18	13	31	31	...	...	...
Bradford School Board, - - - - -	1885	10	3	13	12	18	30	30	...	...	...
Bristol Board School, - - - - -	1885	...	...	...	17	20	37	37	...	...	...
Cardiff Board School, - - - - -	1895	...	...	...	4	2	6	6	...	...	...
Middlesborough Board School, - - - -	1894	...	...	...	2	6	8	8	...	...	...
Oldham Board School, - - - - -	1890	...	...	...	20	10	30	30	...	...	...
Birmingham Board School, Stamford Street, -	1894	...	...	...	16	8	24	24	...	...	...
Cross Deaf and Dumb School, Preston, - -	1894	...	...	...	30	36	66	53	13	...	...
Birmingham Deaf and Dumb School, Moseley Rd.,	1894	...	...	...	12	8	20	20	...	...	...
Totals, - - - - - -	...	1058	883	1941	1510	1120	2630	1871	565	169	25

Increase, - - - 34 per cent.

SCOTLAND.

SCHOOL.	Date of Foundation.	Number of Pupils in 1885.			Number of Pupils in 1895.			System.		
		M.	F.	Total.	M.	F.	Total.	Oral.	Manual.	Combined.
Edinburgh,	1810	32	22	54	43	26	69	...	...	69
Glasgow,	1819	80	65	145	92	63	155	...	...	155
Aberdeen,	1826	14	8	22	14	11	25	...	...	25
Dundee Institution,	1846	13	4	17	8	12	20	...	20	...
Donaldson's Hospital, Edinburgh,	1850	57	63	120	64	51	115	12	16	87
Smyllum Orphanage, Lanark,	1871	14	14	28	28	34	62	...	62	...
Greenock,	1878	6	11	17	13	13	26	26	...	...
Dundee School Board,	1885	5	4	9	7	19	26	26	...	...
Paisley School Board,	1894	...	...	...	6	6	12	11	...	...
Govan School Board,	...	...	...	...	10	4	14	14	...	...
Totals,	...	221	191	412	285	239	524	89	99	336

Increase, - - - 27 per cent.

IRELAND.

SCHOOL.	Date of Foundation.	Number of Pupils in 1885.			Number of Pupils in 1895.			System.		
		M.	F.	Total.	M.	F.	Total.	Oral.	Manual.	Combined.
National Association, Claremont, Dublin,	1816	21	19	40	18	12	30	30	...	...
Ulster, Belfast,	1831	62	40	102	49	39	88	8	72	8
St. Joseph's, Cabra, Dublin,	1846	208	...	208	216	...	216	...	216	...
St. Mary's, Cabra, Dublin,	...	...	205	205	...	213	213	...	213	...
Totals,	...	291	264	555	283	264	547	38	501	8

Decrease, - - - 2 per cent.

EXTRACT FROM AN APPENDIX TO THE 1855-56 REPORT OF THE GLASGOW INSTITUTION.

NUMBER OF CHILDREN UNDER INSTRUCTION IN DEC., 1853.

England.		Scotland.	
London,	300	Glasgow,	81
Doncaster,	110	Edinburgh,	62
Manchester,	80	Donaldson's Hospital,	46
Liverpool,	65	Dundee,	40
Birmingham,	64	Aberdeen,	30
Brighton,	50		259
Newcastle,	46	**Ireland.**	
Exeter,	45	Cabra,	122
Bath,	44	Claremont,	77
Bristol,	26	Belfast,	62
Swansea,	24	Derry,	27
	854		288

According to the census returns, the total deaf-mute population of the kingdom was as follows:

	1851.	1881.	1891.
England,	10,314	13,295	14,192
Ireland,	4,747	3,993	3,365
Scotland,	2,155	2,142	2,135

The number actually at school at the nearest period to these dates for which any figures have been obtainable are:

	Dec., 1853.	1885.	1895.
England,	854	1,941	2,630
Ireland,	288	555	524
Scotland,	259	412	547

Dividing the number of deaf mutes in the country by those actually at school, we get the following as the proportions which the children at school bear to the general deaf population:

	1851-53.	1881-85.	1891-95.
England,	1 in 12	1 in 6	1 in 5
Ireland,	1 in 16	1 in 7	1 in 6
Scotland,	1 in 8	1 in 5	1 in 4

The last return shows that the number of deaf children attending school compares very favourably with the proportion of hearing children who attend school. According to the rules of the Education Department, school accommodation has to be provided for about one in every six of the hearing population. If this were assumed as the basis of calculation for deaf children, it would follow that there are really more deaf children at school than ought to exist. This difference may be easily accounted for. First we have the fact, as shown in the chapter on the Census Returns, that we cannot absolutely rely on the accuracy of these figures. Children under five are rarely returned as deaf and dumb, for the parents are anxious to keep them out of that category as long as possible. Then there is the tendency of the deaf to die out sooner than hearing people, which materially reduces the number of the adult deaf, as compared with the children; and lastly there is the fact that deaf mutes are now kept longer at school (seven to sixteen) than hearing children.

One fact which is well brought out by these figures is the high position which Scotland (as might be expected) has taken in the matter of educating the deaf. In the middle of the century she was a long way in advance of the other two countries, just as she was in the education of the hearing. England however has made up the leeway in great measure, and now only stands one point behind the northern kingdom; and when the compulsory law, which came into operation last year, has had full time to be put into effect, we may expect to find her taking an equal place with Scotland in this as she is doing in elementary education. It is not a little surprising to find that Ireland, which as yet has no compulsory law in force, should compare so favourably with the other two countries, and we are unable to suggest any cause for such a phenomenon. If the figures are at all correct, they would seem to suggest that there is absolutely no necessity for altering the state of the law in that country, seeing that practically every deaf child of school age must be receiving education.

CHAPTER XIV.

MISCELLANEOUS QUESTIONS RELATING TO DEAF MUTISM.

THE BLIND AND DEAF.

FORTUNATELY for mankind, this combination of afflictions is rare. Some of the cases where the double loss has taken place have already been referred to.

From the point of view of a teacher of the deaf, they are interesting, as showing how the intelligence may be developed through the remaining senses of smell, touch, and taste. In the case of a deaf mute who is also blind from birth, a special teacher would be requisite, not only conversant with the methods of educating the deaf, but also familiar with the special means used to instruct the blind. Individual teaching would be an absolute necessity.

In this country we have not met with many instances of the education of this class. Mitchell's case (see p. 24) can hardly be considered as one of successful instruction; he made little or no progress in the acquisition of language. In the record of his case which was published by Dugald Stewart in the transactions of the Royal Society of Edinburgh, we read:

"When a stranger arrives, his smell immediately and invariably informs him of the circumstance, and directs him to the place where the stranger is, whom he proceeds to survey by the sense of touch. He never attempts to express his feelings by utterance except when angry, when he bellows in a very uncouth manner. When he

wishes to communicate his ideas to any one near him, he uses *natural signs*; and it is curious to observe that most of these signs are addressed to the *sight* of those with whom he converses."

It would be interesting to learn how he obtained the notion that those around him could see, but unfortunately that is not recorded. A few examples of the signs he used are given:

"When he would express that he had been on horseback he raises his foot, and brings the fingers of each hand together under the sole, in imitation of a stirrup. He places his hand on his mouth to signify his wish for food; and when he would go to bed, he inclines his head sideways, as if to lay it on a pillow. Wanting to go to the shoemaker's, as he moved towards the door, he made use of a sign from which no one could fail to discover whither he was going; it was an exact imitation with his arms of a shoemaker's motion when he pulls his thread."

One would suppose from this, that he must, at some period of his life, have *seen* a shoemaker at work.

Two well-known cases of the instruction of deaf, dumb, and blind children in Britain are those of Mary Bradley and Joseph Hague, who were taught by the late Mr. Paterson, of Manchester. Later still, a youth named Edwin Brooks was taught at the Manchester Institution.

An interesting case is furnished by Mr. Stoddart, the superintendent of the Asylum for the Blind in Glasgow: that of Isabella Birrell, aged 12 years, who was admitted to that Institution in March, 1895.

Mr. Stoddart says: "She lost her sight and hearing two years before her admission (cause, influenza). She was said to have been in the fourth standard previous to her illness, but apparently a lapse of memory had accompanied her illness, for she had to be taught even the multiplication table, and appears to have forgotten entirely all about Grammar, Geography, History, etc.

"When admitted she could use the manual alphabet, and knew the Braille alphabet, although she could not write it; but has since learned to read and write all the

Braille contractions accurately. She receives all her instruction by manual signs, but her voice is still audible; although she is rapidly forgetting the pronunciation of even common words. One of the greatest difficulties to encounter with her is teaching the proper pronunciation of a new word. She has now mastered the fourth simple rule of arithmetic, and is learning the geography of Scotland from a raised map."

When the writer saw her, she was reading aloud to some blind women from a story-book printed in the Braille characters. She read slowly, but quite distinctly. By means of the manual alphabet (figured at p. 296) the writer asked her the name of the book, and if she liked reading, and she replied *viva voce* quite distinctly, with a strong Scotch accent.

It is to America that we must turn for instances of the most wonderful achievements in this particular branch of tuition. Laura Bridgman's case has been made so widely known by the genius of Dickens that the barest outline will suffice us here. Born December 21st, 1829, she lost both hearing and sight by fever at the age of twelve months. At seven years of age her parents took her to Boston. Here her affliction came under the notice of Dr. S. G. Howe, of the Perkins Institution. She was placed under his care on the 4th October, 1837. Working solely through the sense of touch, he led her onward step by step, till she was able to work, to read, to write, and to talk with ease and fluency by means of the finger alphabet. As time went on she studied Arithmetic, Algebra, Geography, History, Astronomy, Philosophy, and Geometry, and, as she herself wrote on her fifty-eighth birthday, "besides doing duties for the matron and friends, she was happy to be the assistant of the teacher in the work of the school, for many long terms."

Dr. Howe's achievement is, however, being put completely into the shade by the wonderful success which is attending the tuition of the blind and deaf young lady, Helen Keller. Born in Alabama, U.S.A., in the year 1880, this young

person lost her hearing and sight after a severe illness at the age of eighteen months. In 1887 she was placed under the instruction of Miss Sullivan, of the Perkins Institution for the Blind in Boston. She has learned not only to write and spell on the fingers, but also to articulate, and to read the lips of others by placing her hand on the mouth of the speaker. It is said that she learned all the elements of speech and combined them easily and naturally in a short course of ten lessons! Her command of language is no less wonderful; and if the facts concerning her were not so well substantiated by trustworthy witnesses as they are, one might well be dubious of the veracity of the accounts which are given of her progress. A volume might be taken up in discussing the bearings of the case. Suffice it here to say that only on the supposition that Helen Keller is a most remarkable genius, can the extraordinary results obtained with her be explained.

Even when this is admitted, her teacher and those who have had charge of her are to be congratulated on the signal illustration which they have afforded of the triumph of human ingenuity over difficulties.

EMPLOYMENTS OF THE DEAF.

Much curiosity is often exhibited by the general public to know what becomes of the deaf and dumb after they leave school. The following tables of occupations followed by them in the two principal cities of Scotland will furnish some answer to this question.

TRADES AND OCCUPATIONS OF 581 DEAF MUTES WHO HAD PASSED THROUGH THE GLASGOW INSTITUTION BEFORE 1865.

Males.

Tailors,	21	Sawyer,	1
Shoemakers,	18	Iron Dresser,	1
Bookbinders,	10	Diesinkers,	2
Engravers,	6	Patternmaker,	1
Carpenters,	2	Hammermen,	3
Marble Cutters,	3	Calico Printers,	3
Marble Polishers,	2	Colliers,	2
Labourers,	14	Blacksmiths,	3
Farmers,	9	Caulkers,	3
Weavers,	7	Rivetters,	4
Farm Servants,	6	Assistant Teachers,	2
Carter,	1	Clerks,	5
Stoker,	1	Boilermakers,	6
Lithographers,	2	Ship Carpenters,	2
Currier,	1	Boat Builder,	1
Cabinetmakers,	3	Mason,	1
Potters,	2	Quarryman,	1
Gilders,	4	Marine Draughtsman,	1
Engineers,	2	Hostler,	1
Lawyer,	1	Gardener,	1
Carvers,	3	Inker,	1
Glass Stainer,	1	Painter,	1
Coopers,	2	Block Cutters,	2
Brassfounders,	3	Letterpress Printer,	1
Compositors,	7	Cotton Spinners,	2
Stocking Weaver,	1	Wood Engravers,	4
Carpet Weaver,	1	Silk Weaver,	1
Bakers,	2	Glass Cutters,	2
Pattern Designers,	3	Sculptor,	1
Silver Chasers,	2		

Females.

Dressmakers,	9	Paper Maker,	1
Sewed Muslin Workers,	26	Bonnet Maker,	1
Staymakers,	4	Bleacher,	1
Pirn Winders,	2	House Servants,	7
Hat Trimmer,	1	Cook,	1
Powerloom Weavers,	9	Furniture Polishers,	2
Fringe Maker,	1	Darners,	2
Farm Servants,	5	Straw-hat Maker,	1
Laundrymaids,	2	Colourists,	2
Washerwomen,	4	Book Folders,	2
Shawl Trimmers,	2		

A LIST OF TRADES, Etc., IN WHICH THE DEAF AND DUMB OF GLASGOW ARE EMPLOYED.[1]

Artist,	1	Glass Decorators,	3
Art Metal Workers,	2	Glass Stainers,	2
Bakers,	4	House Joiners,	3
Beltmaker,	1	Iron Workers,	3
Blacksmiths,	2	Jewel-case Makers,	2
Boilermakers,	6	Jeweller,	1
Bookbinders,	20	Labourers,	15
Bookfolders,	4	Lamplighters,	2
Boxmakers,	5	Lithographic Artists,	15
Brass Engravers,	7	Marble Cutters,	2
Brassfinisher,	1	Mill Workers,	4
Bricklayers,	2	Moulders,	3
Brickmakers,	2	Needlewomen,	8
Brushmakers,	4	Painters,	2
Butcher,	1	Patternmakers,	4
Cabinetmakers,	2	Purse Makers,	2
Calenderer,	1	Rivetters,	2
Capmaker,	1	Saddler,	1
Carpet Designers,	5	Sculptor,	1
Caulkers,	3	Ship Joiners,	5
Chairmaker,	1	Shoemakers,	6
Clerk,	1	Silver Engraver,	1
Compositors,	5	Tailors,	16
Confectionery Worker,	1	Ticket Writers,	2
Cooper,	1	Tinsmiths,	6
Diesinkers,	2	Umbrella Makers,	5
Domestic Servants,	3	Upholsterers,	3
Draughtsmen,	6	Washerwomen,	3
Dressmakers,	10	Weavers,	5
Dyer,	1	Wood Carvers,	4
Engine Fitters,	6	Wood Engraver,	1
Fancy-box Makers,	6	Wood Turner,	1
Fishing-tackle Makers,	2		254
Gardeners,	2		

[1] Taken from the Report of the Glasgow Mission to the Deaf and Dumb, 1894-95.

LIST OF TRADES, ETC., IN WHICH THE ADULT DEAF AND DUMB OF EDINBURGH ARE EMPLOYED.[1]

MALES.		FEMALES.	
Bookbinders,	2	Housekeepers,	7
Tailors,	23	Charwomen,	2
Labourers in Factories, Docks, etc.,	15	Servants (Domestic, and Laundresses),	12
Lithographic Printers,	2	Dressmakers, etc.,	14
Engravers,	6	Teacher,	1
Brushmakers,	2	Envelope Makers,	2
Bootmakers,	5	Type Writer,	1
Litho. Artists,	5	Staymaker,	1
Tanner,	1	Artists,	2
Compositors,	6		
Cabinetmakers,	4	Total,	42
Carvers,	2		
Dyer,	1		
Engineers,	3		
Coach Painter,	1		
Jewel-case and Purse Makers,	2		
Sculptor,	1		
House Painter,	1		
	82		

The following extract from the Census of Victoria, Australia, enables us to compare the condition of the deaf here, with that of their fellows in that far-off country.

"At the Victoria Deaf and Dumb Institution the inmates are habitually instructed in such occupations as appear to be most suitable to the deaf and dumb, the chief being bootmaking, tailoring, and gardening for males; and household duties and plain and fancy needlework for females. Some acquire other trades outside the Institution, and many in various parts of the colony are able to earn their livelihood, and even to marry and support a family. Subjoined is a statement of the various callings followed by the deaf and dumb at the date of the Census:[2]

[1] Furnished by the Rev. W. J. Hansell.

[2] Census of Victoria, 1891, p. 160.

OCCUPATIONS OF THE DEAF AND DUMB, 1891.

	Males.	Females.
Engravers,	4	—
Charitable Institutions, Engaged at,	—	1
Ministering to Amusements,	1	—
Pawnbroker,	1	—
Land, House,—Proprietors, Agents,	2	—
Book Hawker,	1	—
Furniture Dealer,	1	—
Commercial Clerks,	1	1
Commission Agents,	2	—
Printers,	3	—
Bookbinder,	1	—
Lithographer,	1	—
Basketmaker,	1	—
Mechanical Engineer,	1	—
Cart Manufacturer,	1	—
Painters, Plumbers,	2	—
Tailors, Tailoresses, Dressmakers,	6	13
Shoemakers,	16	1
Matmaker,	—	1
Bakers,	2	—
Fellmongers, Tanners,	3	—
Coopers, etc.,	3	—
Tin, Zinc Workers,	4	—
Carpenters, Joiners,	5	—
Labourers,	8	—
Farmers, Market Gardeners, Farm Servants,	31	4
Grazing Farm Labourers, Shepherds,	4	4
Woodcutter,	1	—
Domestic Servants,	—	8
Annuitant,	1	—
Children (not Scholars), Wives, Relatives, etc.,	43	93
Students and Scholars,	38	10
Dependent on Charity,	—	24
Occupation not stated,	16	—
	204	160

Some doubt exists as to whether the deaf and dumb are able to hold their own in competition with hearing workmen. Mr. Henderson, the superintendent of the Glasgow Mission, who has had a very large experience in

this matter, is of opinion that the deaf and dumb do make workmen as good as, and in some cases better than, hearing persons. One reason which he suggests for this opinion is that owing to their infirmity they are less liable than those who hear to have their attention distracted from their work by idle chatter. On the other hand, the writer has heard the opinion expressed by men who have worked alongside the deaf and dumb in workshops, that they are not, as a rule, quite the equals of the hearing workman. There is some truth probably in both views. The deaf workman's ability at his trade will (like his school work) be largely influenced by the disease which caused his deafness; if this disease has not injured his brain, the probability is that he will, by increased attention to his work, be able to make up for his disability. If on the other hand, his brain and nervous organization are affected, it can hardly be expected that he will make a good workman, any more than he can be expected to become a good scholar.

Few of the deaf, in Scotland at least, are found carrying on business for themselves. Considering the stress of modern competition, this is not to be wondered at. The want of speech when seeking for orders is a bar to success, for which no amount of ability can make up. The time of business men is too precious now-a-days for them to think of spending much of it in communication, by means of writing, with a deaf man in search of orders. The uncertainty of oral communication between hearing and deaf is so great that it cannot be depended on; hence the deaf man finds that he cannot compete on anything like equal terms with the hearing man, and generally has to be content with taking a subordinate place in any firm with which he may be connected. There are, however, a few brilliant exceptions.

Should trades be taught to the deaf and dumb while they remain at school? In America, where the pupils remain at the institutions till they are 20 or 25 years of age, the answer generally given is "Yes," and the teaching of a trade forms part of the curriculum of nearly every

institution in that country. In Britain, on the contrary, the teaching of trades at school is not favoured. In the early days of many of the British institutions this was attempted, but according to Scott it always failed. Trades were at one time carried on in the Exeter Institution, but were abandoned because "they could not well be taught in the time allowed for such training." The writer remembers the time when tailoring, shoemaking, and printing were taught to the boys of the Edinburgh Institution; but all except the first were given up, as it was found that many of the boys did not follow the trade which they began at school, but rather acquired a distaste for it, and also because on their entry into a regular apprenticeship they had often to unlearn a great deal of what they had been taught, and were thus in a worse position than if they had entered the workshops complete novices. The majority of the heads of institutions who took part in the conferences of 1851-52, were of opinion that trade-teaching at school was undesirable, and that it was better for the pupil to devote his early years to mental training, and then serve an apprenticeship in the ordinary way. With this opinion the present writer entirely concurs, and he regrets to learn that the Senior Inspector of the Deaf and Dumb Schools in England seems to favour the idea of a revival of this ancient and obsolete experiment. It is true that industrial conditions are changing, and the conditions of apprenticeship in this country are not what they were 40 or 50 years ago, but it is absurd to expect that boys and girls who leave school not later than sixteen years of age, can have the muscular strength and dexterity to perform the operations which are required of a skilled mechanic.

It does not necessarily follow from what has just been said that the writer thinks that boys and girls should not learn to use their hands. On the contrary he is strongly of opinion that the education of the bodily powers is absolutely essential to the full development of the mental faculties, and also of the moral nature. Any training of an industrial kind which is given to children at

school should be based on educational methods, and should be given by a skilled teacher rather than by a mechanic. This principle is being recognized more and more in the Deaf and Dumb Institutions of the British Isles. The principles and practice of educational Sloyd are permeating all classes. The pioneer of this work in Britain amongst the deaf and dumb is the School for the Deaf at Old Trafford, Manchester. This school was, we believe, the first to commence the teaching of carpentry to boys on the Näas principle. There are few institutions now in which some form of manual work is not taught. Indeed the danger is that this department will grow so large as to overshadow the mental side, and overburden the curricula of the schools. Paper plaiting, paper weaving, wire work, embroidery, clay modelling, carpentry, bent iron work, brass repoussé work, working in metals, etc., etc., not to mention drawing, painting, and drill, furnish a catalogue of occupations which it must surely tax the ingenuity of head masters and teachers to dovetail into the daily routine, while giving sufficient attention to the purely scholastic work of the school. If they are kept in strict subordination to the main object of school life, and if they are properly taught, these manual occupations and exercises can be made to yield valuable instruction not merely in manual dexterity, but also in language, always provided that the instructor of the class understands what deaf mutes most require, and that he is not handicapped by having to work for trade rather than for educational results. That the former danger exists the writer is well aware, and he is of opinion that the great value of the Näas propaganda lies in its insistence on the value of educational method over mere technical skill in the handling of tools.

The recognized course of Manual Training in vogue at the Glasgow Institution is as follows:

The younger children are first of all taught paper plaiting, weaving, folding, cutting, and designing, and also the use of the needle in simple embroidery, hemming, and seaming. Thereafter a division of the sexes is made; the

boys are grouped into two divisions of three classes each. The junior division alternately takes clay modelling, drawing and colouring, and drill, while the senior division alternate between clay modelling, Sloyd carpentry, and drill.

The girls, in addition to the ordinary lessons in needlework, according to the Elementary Education Code, are instructed in the use of the sewing machine, and are taught cookery, laundry work, and ordinary household duties, according to a *rota* so arranged that too much is not expected at once. The language proper to all these operations is persistently taught;—in the junior classes, by means of vocabulary and simple sentences; in the senior, more advanced expressions are used. How necessary this language teaching is may be judged from the statements made to the writer, of deaf and dumb mechanics who have gone through life without being able to name the parts of the machines they worked at, or to describe in words the simplest operations performed. As an illustration may be mentioned the case of a deaf sewing maid who was an expert machinist, and yet, when the class for the girls was started at the Institution, was glad to learn along with them the names of the operations which for several years she had been in the habit of performing skilfully.

LEGAL STATUS OF THE DEAF AND DUMB.

A brief summary of the legal status of the deaf and dumb is appended. The following notice of the state of the law in Scotland is furnished by Mr. William Gibson, Writer, Bath Street, Glasgow.

"One of the old institutional writers on the laws of Scotland (Lord Stair) apparently took it for granted that all who are deaf and dumb from birth are, without exception, incapable of management of their affairs, or of taking part in the conduct of the affairs of the country. No doubt this opinion was founded on the Roman law, under which such persons were held to be incapable of consent, and consequently unfit to enter

into a legal obligation or contract. This was undoubtedly the common law of Scotland for a considerable period, down to at least the seventeenth century; the result being that all deaf mutes required the appointment of curators to act for them in all matters requiring their consent.

"But with the advance of civilization, and the progress of education, the position gradually became altered, so that we may find it stated by Erskine, Professor of Scots Law in the University of Edinburgh from 1737 to 1765, and whose *Institutes* is still the standard authority on the law of Scotland, that there are instances of those who have been deaf and dumb from the birth, who are not only endued with strong natural parts, but can apply them to all the affairs of life, and who even act in the character of free-holders, etc., in the more public concerns of the kingdom or country. Now, deaf mutes may contract or make a will if they have the use of reason, and if they understand the nature of the engagement which they are undertaking, and have expressed their consent by the usual signs. In a case in 1853, involving the capacity of a deaf mute to manage her own affairs, the then Lord President of the Court of Session (Lord Colonsay) stated: 'The want of the power of speech does not disable a party from taking the management of his affairs, especially when not combined with the want of power of hearing, and even when it is so accompanied, there are many instances in which persons so afflicted are not merely perfectly capable of managing their own affairs, but who exhibit proof of the highest intellect. The intellect may be reached by education, and such persons are capable of receiving education. The want of hearing and speech combined is no proof of the want of intellect. The intellect is there; though access to it through the ear is not open, it may be reached through the eye; the organs may be defective, but the expression of sentiment may be effected by other means than speech.'

"In the case of deaf and dumb persons who are incapable of managing or understanding their own affairs, the law provides tutors who act for them.

"As regards their liability for criminal acts, reference may be made to the case cited on p. 266, where a woman born deaf and dumb was tried for murder. Proof was offered that she knew right from wrong, and that punishment is the consequence of guilt, and that she was able to conduct herself properly in all the ordinary affairs of life. She pleaded not guilty by signs; and the evidence on the trial being favourable for her, she was acquitted. In the case of a deaf mute accused of crime, an interpreter is usually appointed by the court, just as in the case of one who does not understand English. Deaf and dumb witnesses are admissible though they have had no education, and can only converse by gestures, provided they know right from wrong, and are aware of the existence of a Supreme Being.

"It is almost unnecessary to state that any one either deaf or dumb cannot act as a juryman."

Through Mr. Allen, Secretary of the West of England Institution at Exeter, Mr. H. R. Burch, Solicitor, of Exeter, has kindly furnished the following information regarding the legal status of the deaf and dumb in England. Mr. Burch writes:

"The deaf and dumb do not appear at present to be under any disability in the eye of the law, except that they are disqualified from serving on juries, or entering the army or navy. Of course the fact of a person being deaf and dumb may be a ground for presuming that they are not so competent as their fellow creatures; but the law does not recognize any such presumption, except as I have stated above. I enclose an extract from *Taylor on Evidence* which may be of interest.

"'The judges formerly held that persons *deaf and dumb* from their birth were, in contemplation of law, idiots. But this presumption has recently been disputed; and if it be now recognized at all, it certainly has not the same force which it used to have, as persons afflicted with these calamities have been found, by the light of modern science, to be much more intelligent in general, and to be susceptible of far higher culture than was once supposed.

Still when a deaf mute is adduced as a witness, the court, in the exercise of due caution, will take care to ascertain before he is examined that he possesses the requisite amount of intelligence and that he understands the nature of an oath. When the judge is satisfied on these heads, the witness may be sworn and give evidence by means of an interpreter. If he is able to communicate his ideas perfectly by writing, he will be required to adopt that as the more satisfactory method; but if his knowledge of that method is imperfect, he will be permitted to testify by means of signs.'"[1]

A further case which occurred in this country is worthy of note on account of its peculiarity. At 60 years of age a lady born deaf and dumb, and educated in that condition, became blind also. She was entitled by will to considerable wealth. At 70 years of age she executed her own will, with the aid of good advisers, and an interpreter of known experience (Dr. Buxton). At her death, 10 years afterwards, the will was disputed by her relations on account of her many infirmities, which were represented as disqualifications; but, after ample trial and the fullest evidence, her competency to make the will was established, and the will was proved. The particulars of this case were given in evidence before the Royal Commission by Dr. Buxton.[2]

[1] *Taylor on Evidence*, 2nd edition, 1855, Vol. II., p. 1075.

[2] See *Minutes of Evidence*, Royal Commission on Condition of the Blind, etc. (9, 269).

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