ON THE
PHYSIOLOGY OF THE EAR,

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OF LINCOLN.

COMMUNICATED BY

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SOME time ago the Medical and Chirurgical Society did me the honour to publish in their Transactions a paper of mine, in some points relating to the physiology and pathology of the ear. I at that time endeavoured to prove, that when the meatus auditorius externus is stopped, and a sounding body is applied to the face, &c., sound is not mechanically conveyed to the portio mollis of the seventh pair of nerves; and, likewise, that it was probable, that in fishes the sense of hearing was produced from the nerves spread on the external parts of the head receiving the impressions of sound, and conveying them to the auditory nerves; and that man might hear well in this way, when the mechanism by which sound is usually conveyed to the auditory nerves was imperfect. I supposed,

in consequence, that people born deaf and dumb, and who had no defect in the auditory nerves, might be made to hear through the medium of the facial nerves, and thus have their unfortunate condition in some measure ameliorated. I judged that this might be done, from having observed that dumb people could hear a watch when in contact with the face ; and likewise from a case, then related, of a musician, who was enabled to play by having part of the instrument between his teeth. With respect to making the dumb understand various sounds, and thereby enabling them to speak, I could then urge nothing more than probability ; but I now, in the following case, have the power of proving how sensible the facial nerves are of the impressions of sound, and that what I thought probable is really practicable.

Elizabeth Nobles, aged thirty-six years, was born with the meatus auditorius externus of each ear imperforate. In the right auricle there is a very slight trace of the meatus auditorius externus, and there appears to be no other part of the auricle, but part of the helix and the lobus. In the left, there is a slight trace of the meatus, but it is only about one-sixteenth part of an inch deep ; and in the right it is quite superficial. There is the form of the auricle, but the different eminencies are not distinct, and the communication between the external air and the membranæ tympani, if they exist, is as completely obstructed as it is possible for it to

be. She did not begin to talk at all intelligibly till she was seven years old, and she did not talk tolerably well before she was about twelve. She can now talk so as to be perfectly understood. She can hear perfectly when a person addresses her at the distance of six or seven yards. She cannot hear nearly so well when the person speaking is behind her. She cannot hear a watch unless it be in contact with her face, and not if it be in her mouth, unless it be in contact with some part of it. She herself, and others who have known her, suppose that she hears through the mouth and nose, and collects the meaning of what is said from observing the motion of the speaker's lips. To prove that this is not the case, the circumstance I have related with respect to the watch might suffice; but I made her shut her eyes, and she heard distinctly what I said; as likewise, when both her mouth and nose were quite closed. Putting a cloth over her mouth, and nipping her nose, have made a slight difference now and then; but nothing more than I could suppose would happen from the extent of the face from which the sound was thus kept. I have pressed my fingers on the parts where the meatus auditorius externus should have been; but she heard just as well as before. I have put a thick cloth over them, and at the same time pressed it as close as I could, but it made no difference. I stood four feet from her, after having put a linen cloth over her face; and when I addressed her, she heard me distinctly. I

then put over the linen a piece of flannel, and she still heard me. I then put over the flannel a large woollen cloth coat, and asked her several questions, but she could not hear any of them. I removed all the coverings, and used the same words in the same tone, and she told them to me immediately. I made the same experiment another day; but she heard all the questions I asked the more faintly according to the extent of the coverings put on her face. I made the first experiments at her own house, when no one else was present; and the second at my house, after she had walked fast, and before company: and some variation will always exist in these experiments, for it is impossible always to remember the exact tone of voice made use of in them; and some little difference may likewise exist in the coverings. She could hear distinctly tunes played on the piano-forte at the distance of seven or eight feet. I covered her face as in the other experiments, and the sounds were fainter. I pressed on her ears with a cloth, but she heard the tunes just as well. I placed her in a chair near the piano, and covered her face so as to hinder her from hearing so well; I then placed her hand on the piano, and she heard much better. I then tied a silk handkerchief tight round her arm, and she did not hear so well: she heard better again when I loosened it. When her face or teeth are in contact with the piano when any one is playing, the sound is very loud to her. She cannot hear the sounds of bells at a distance,

nor the cathedral clock strike, unless she is very near, although the hammer strikes upon a bell, which is one of the largest in the kingdom, and can be heard at different times at the distance of several miles.

In the case I have related, no means were employed beyond those that are made use of for the instruction of children in general; and no pains were taken to make her understand, as is very generally done in the education of dumb children. It therefore may not be uninteresting to inquire, why this faculty of hearing in dumb people is not even occasionally perfected in those who have had much trouble bestowed on them for their instruction. May not the reason be, (I speak only of those whose auditory nerves are perfect, and who have the *portio dura* capable of recovering impressions of sounds,) because their whole attention has been taken up with signs, &c., and no methods have been used to increase the power of the provision usually made by nature for supplying the defects occasioned by imperfections of the tympanum. I think this may be the case; because we find that the sensibility of the nerves, as far as the performance of their particular functions is concerned in the production of the senses, is increased by proper use. This I apprehend is the case with all the senses; but I will adduce, as an instance, only that of hearing. Many young people, it is said, have no ear for music, and perhaps, if no attention were paid to it, they would never have it as long as they lived;

but I believe that in almost every instance of this kind, by proper instruction from a master, and proper attention from the pupil, music may be taught, so that the learner may have as correct a judgment respecting every part of it, and be made to play and sing as well as many people who have the best ear for it naturally. Do we not find this argument supported by anatomical facts? Many of the nerves, like the muscles, enlarge by constant use. When much irritation has existed in a limb, the nerves of that limb may be found much enlarged, far beyond the place where the disease existed, and the nerves will have a healthy appearance; exactly as muscles have that are enlarged from use, compared with those that have been more inactive. Do we not find in subjects, where the features of the face are the most marked, that the facial nerves are much larger, and apparently more numerous, than in those where the expression has been less? And is it not the case in very old people, where sensation is almost lost, and the nerves have been but little exercised, that the facial nerves are so small and fine as to be with difficulty dissected? If this be true, may we not suppose that in dumb people the facial nerves would have much more power of receiving the impressions of sounds if they were properly exercised, than where no exertion of this sort is made? I doubt not but that many people have the power of hearing sounds with the face, where the mechanism of the ear is perfect; for I have frequently stopped up the ex-

ternal ear as close as possible, and yet the human voice has been heard. I have in one instance seen the ears so stuffed with wax, as to produce all the noises attending that complaint, without the patient being at all deaf. These noises had existed a year; and I conceive, in this case, the facial nerves must have been of essential service to the patient.

Presuming that what I have said is well founded, it is not reasonable to expect, that the powers of the facial nerves should ever be fully developed in dumb children, if their instructors do not direct the whole, or by far the greater part of their attention to the proper exercise of these nerves. And if this is to be done effectually, it must probably first be by the assistance of instruments, to increase the effect of sound; and when these have been properly used, and have answered the intended purpose, then by gradually lessening their power until common sounds can be heard.

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