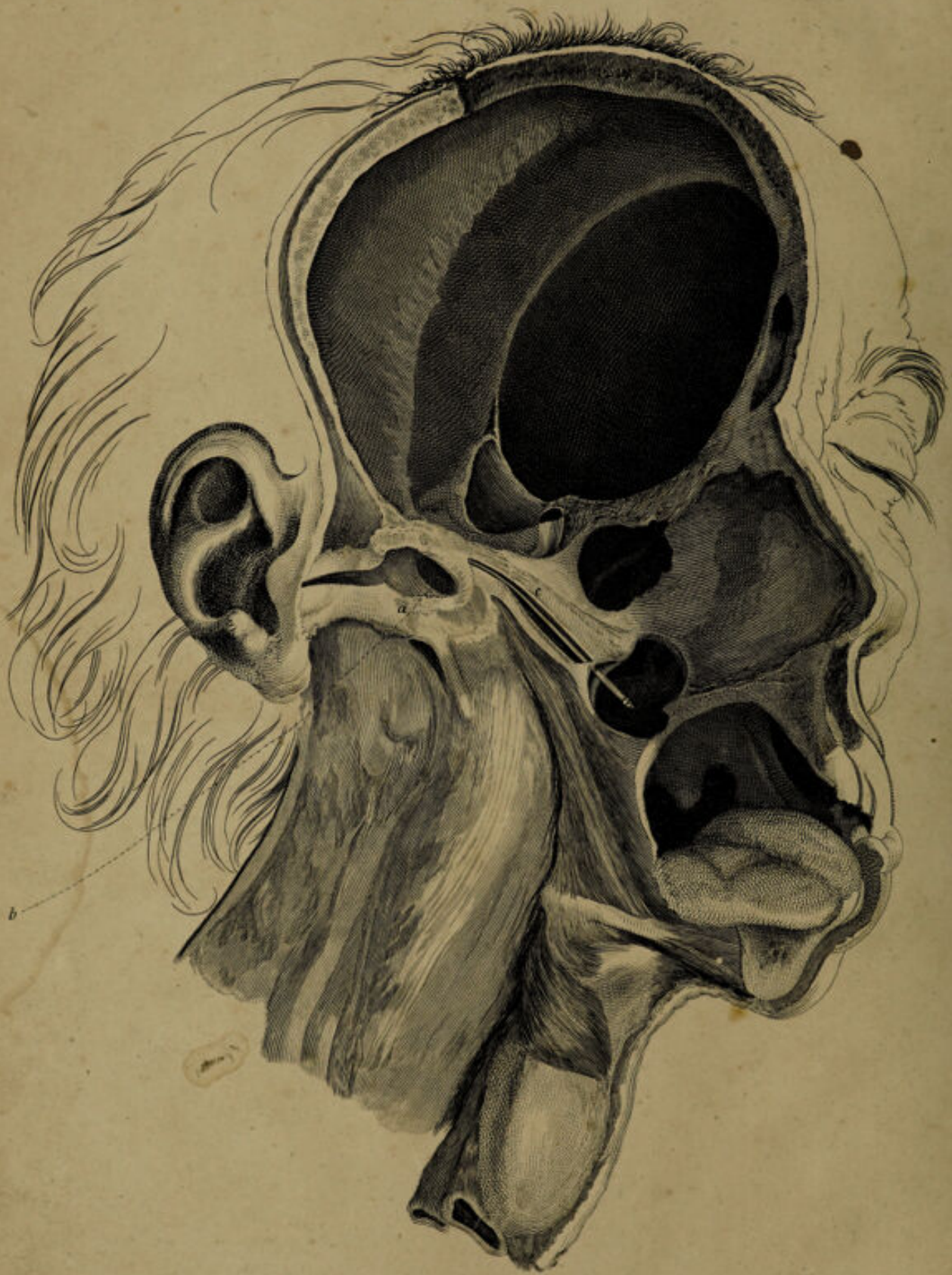
The anatomy of the human ear, illustrated by a series of engravings, of the natural size with a treatise on the diseases of that organ. The causes of deafness, and their proper treatment / [John Cunningham Saunders].



View of the Meatus Externus, Membrana Tympani & Eustachian Tube.

Printed March 1.1816 for Richard Phillips 6 New Bridge St Blackfriars.

THE

ANATOMY

OF

THE HUMAN EAR,

ILLUSTRATED

BY A SERIES OF ENGRAVINGS,

OF THE NATURAL SIZE;

WITH

A TREATISE ON THE DISEASES OF THAT ORGAN,

THE CAUSES OF DEAFNESS,

AND

THEIR PROPER TREATMENT.

BY J. C. SAUNDERS,

DEMONSTRATOR OF PRACTICAL ANATOMY AT ST. THOMAS'S HOSPITAL, AND SURGEON OF THE LONDON DISPENSARY FOR DISEASES OF THE EYE AND THE EAR.

LONDON:

PRINTED FOR RICHARD PHILLIPS, NO. 6, BRIDGE STREET,

BY J. M'CREERY, BLACKHORSE-COURT, FLEET-STREET.

1806.

To ASTLEY COOPER, Esq. F.R.S.

Sir,

THE dedication of this book to you indulges at once my gratitude and my ambition. I avail myself of this opportunity to acknowledge the many obligations which your kindness and uniform attention have conferred on me. With pleasure I render this tribute to your friendship.

In seeking the authority of your name I have consulted the means of enhancing my own reputation. Who can more properly patronize a work on the Ear than one who has signalized himself by the elucidation of its diseases? Who so well appreciate the merits which it may possess, or shield its defects against the severity of criticism? The world is acquainted with your professional abilities, and respects your opinion. Your enthusiasm and unremitting endeavours to cultivate the department of Surgery, are displayed in the works which you have already given to the public; and it is confidently predicted that your talent for observation, quickened by an ardent desire to improve the science, will contribute fresh accessions to our knowledge, and add lustre to the profession.

But it is not merely by your own labours, great as they are, that you benefit society. Placed as a principal teacher in the first medical school in Great Britain, you impart a portion of your energy to your pupils, many of whom will be excited by the influence of your example to professional exertions not unworthy of the place where they received their education.

I am, Sir,

With respect and attachment,

Your most obedient Servant,

J. C. SAUNDERS.

Ely Place, March 12, 1806.

CHAP. I.

A Description of the External Part of the Ear, viz. the Auricle and the Meatus Externus.

THE HUMAN EAR, of which I propose to treat in the following anatomical description, is an organ of the most curious and exquisite structure, composed of many parts, all elaborately formed for the reception, transmission, and perception of sound. The complexity and minuteness of many of its constituent parts render it a very difficult subject for description. It will, therefore, be expedient, in order to increase the perspicuity of the explanation, to adopt a division that shall be easy, natural, and consistent.

The analysis of the human Ear shews, that it is composed of three parts, evidently constructed for different purposes. The external part is constructed relatively to the medium by which the sense of sound is excited, and its configuration is well adapted to collect the pulses of the air, and to direct them inwardly towards the seat of hearing. The internal part is the seat of hearing itself, and consists of a number of cavities, that contain a membranous texture, on which the sentient extremities of the auditory nerves are expanded. The middle part is a beautiful piece of machinery, connected with the external and internal parts, and designed to transmit the impulses of the air to the auditory nerves.

The terms external, middle, and internal, here employed to denote the three divisions of the Ear, express nothing more than their position. They have been adopted, defective as they are, since language does not afford any terms more comprehensive, whether we would derive them from the uses of each division, or the different parts which it comprehends. But the inadequacy of the terms cannot impair the propriety of the division. It is in fact the division of Nature, and results from the different functions, severally performed by the different parts.

The external part has obtained in common language, the appellation of the Ear, a word full as often used to express the whole organ. To avoid the confusion of applying the same general term to the whole as to one of its parts, I shall, in this treatise, call it the Auricle.

The Auricle is placed by the side of the head, and joined by its root to the Os Temporis: The margin of that side, which is turned from the head, is considerably elevated, and the general concavity within the margin is, by the rise of the surface, subdivided into certain curvilineal grooves, all of which tend towards a canal, formed in the root of the Auricle, the Meatus Externus.

The Concha, the deepest and largest depression of the Auricle, is situated at the entrance of the Meatus Externus. The boundaries of the Concha are formed by four eminences, viz. the Tragus, Helix, Antihelix, and Antitragus. The Tragus and Helix bound it before, the Antihelix and Antitragus behind.

The Tragus is placed immediately behind the Condyle of the lower jaw. It rises into a little knob, and lies on the forepart of the Meatus Externus.

The Helix arises from the Concha, which it partially divides into a superior and inferior depression. It advances from its origin a little before the Tragus, is soon reflected in the form of a curve, and in its descent gradually becoming less distinct, is lost in a soft pendulous substance, the Lobe.

The Antihelix lies within, and opposite to the Helix, and is formed with a similar curve. Above it consists of two ridges, which unite, and the eminence, formed by their union, is continuous below with a little projection, called the Antitragus, from its possessing a situation directly opposite to the Tragus.

A considerable groove is formed between the Helix and Antihelix, which increases in depth, as it approaches the Concha, where it terminates. Another groove, formed between the two ridges of the Antihelix, joins the former just before its termination in the Concha.

These are the most remarkable appearances of this side of the Auricle. The opposite side possesses little that requires particular attention. It may be said to be convex, but in the general convexity the projections of the Concha, Helix, and Antihelix, are readily distinguishable.

The Auricle is composed of an elastic cartilage, and the common integuments. Its figure is chiefly derived from the cartilage, in which the eminences and depressions, already mentioned, are fashioned, except the lower part of the Helix and the Lobe. These are nothing more than duplicatures of skin, containing a portion of fat.

The root of the Auricle is disposed in the form of a tube, but it is to be observed, that the cartilage itself does not complete the circle. This is effected by the junction of the Tragus to the Helix, by a ligamentous fascia, and the common integuments.

This tubular part of the Auricle is united to a tubular part of the Os Temporis, and they form by their union the Meatus Externus, a canal leading to the interior parts of the Ear. The length of this canal varies in different subjects from an inch and a quarter to an inch and half, and its area gradually diminishes as it approaches its termination. Its shape is rather elliptical than cylindrical, its direction inwards, with a slight declination. It is not rectilineal but winding. It is first turned upwards, then down-

wards, and is again slightly bent near its termination. Its lower part is longer than the upper, for it terminates, as it were, by an oblique section, which is closed by the Membrana Tympani, in such a manner, that the Membrana Tympani makes an obtuse angle with the canal above, an acute angle below.

The common integuments, having covered the cartilage of the Auricle, enter the Meatus Externus, and having reached the bony portion of this canal, become extremely thin. They form a lining for the Meatus, and terminate in a pouch, that is placed in contact with the exterior surface of the Membrana Tympani.

The skin of the Auricle, and that of the Meatus Externus, are both perforated with numerous small holes, the orifices of sebaceous follicles in the former, in the latter of the ceruminous ducts.

The Ceruminous Glands themselves are placed exteriorly to the Cutis of the Meatus Externus, in the interstices of a reticular membrane. They are about the size of Millet seed, approach to a spherical or elliptical form, and are tinged of a slight yellow by the Cerumen which they contain. Each little gland sends a small duct, that opens in the Meatus Externus, and discharges the Cerumen, which is there found, and answers the purpose of keeping the Membrana Tympani moist.

The Auricle is retained in its situation by the ligamentous connexion of the cartilage with the bone of the Meatus Externus, and by a strong ligament, that passes from an acute point of the Helix to the Zygomatic process of the Os Temporis.

The description just given, is taken from the Adult Ear. In the Fœtal Ear, the parts of which are less completely formed, the Meatus Externus is almost entirely cartilaginous and membranous. Instead of a process of the Os Temporis, forming a considerable part of the Meatus Externus, nothing more is discovered in the Fœtus than a slender piece of bone of an elliptical

figure, but not making a complete ring. It contains the Membrana Tympani, and adheres to the rest of the Os Temporis only by its extremities. The space between the Tragus and this ring of bone, is occupied by a very dense membrane, that seems placed there as a kind of bed, in which bone is afterwards deposited. As ossification extends, the different parts of the Os Temporis are consolidated. Indeed soon after birth, the Fœtal ring is united to the rest of the bone, and is gradually elongated during the progress of growth until it occupies the place of the membranous substance just mentioned.

It has already been said, that the Meatus Externus terminates obliquely, and that its lower part is longer than the upper. A little groove, making three-fourths of an Ellipse, is formed in its extremity. It contains the Membrana Tympani.

The Membrana Tympani is the partition between the external and middle part of the Ear, and is so called from its closing the orifice of a cavity named the Tympanum.

CHAP. II.

A Description of the Middle Part of the Ear, viz. of the Tympanum, of the Machinery contained in the Tympanum, and of certain Parts annexed to each

THE Tympanum is the cavity that lies immediately at the bottom of the Meatus Externus. It is formed between the squamous and petrous portions of the Os Temporis. Its figure, although irregular, approximates to the spherical.

The regularity of the bony superficies, in which the Tympanum is placed, is interrupted by numerous little pits, spiculæ, and foramina. The depth of the Tympanum is not equal in all directions. Its greatest depth is opposite to the aperture of the Vestibule, the least to the apex of the Cochlea. The former scarcely exceeds three lines, the latter is hardly two. The length and breadth of the Tympanum are nearly equal, each measuring about the third of an inch.

The Mastoid cells are placed behind the Tympanum. They are large and numerous, freely communicate with each other, and open by a large aperture in its posterior and superior part. They may be considered as a part of the Tympanum, for the communication is perfectly free, and they are both lined with a delicate and vascular membrane, that secretes a fluid to moisten the internal surface, at the same time that it answers the purpose of a periosteum to the bony superficies.

In the anterior and lower part of the Tympanum is placed the aperture of the Eustachian Tube. The Eustachian Tube proceeds from the Tympanum, passing obliquely forwards and inwards by the side of the internal ala of the plerygoid process of the Os Sphenoides, and opens in the superior and lateral part of the Pharynx above the Velum Palati Mollis. The Eustachian Tubes reach their termination in the Pharynx, with so great a degree of convergency, that if they were produced, they would meet each other at the back of the Vomer.

The Eustachian Tube is composed of bone and cartilage. The bony portion is lined with the same membrane as the Tympanum; the cartilaginous with a reflection of the membrane of the Pharynx, which is blended so intimately with the former, that no line of distinction is perceptible.

The bony portion is an elongation of the Tympanum, and ends in a scabrous extremity, that receives the cartilage. The cartilaginous portion, as it is called, is not entirely composed of cartilage. It consists on the forepart of a dense membranous substance, which, together with the cartilage, affords a surface for the origin of two muscles, the Levator Palati Mollis and Circumflexus Palati.

The two portions united, constitute a tube about an inch and a half, or an inch and three quarters in length, of an elliptical figure, the major axis of which is vertical. The magnitude of this tube varies much in different places. Its orifice in the Tympanum is about two lines in its major axis. Hence it gradually lessens, until it does not exceed one. This magnitude it preserves for a short space, but at the junction of the bony portion to the cartilaginous, it suddenly enlarges, and continues to increase, until it terminates in the Pharynx, where it opens by an orifice, large enough to admit a goose quill.

Besides the apertures already mentioned, viz. the aperture of the Mastoid cells, and that of the Eustachian Tube, two others present themselves in the interior superficies of the Tympanum. These are the aperture of

the Vestibule, and the aperture of the Cochlea; the former called the Fenestra ovata, the latter the Fenestra rotunda.

The Fenestra ovata is placed in the upper part of the internal superficies of the Tympanum, in an oblique direction, but parallel with the plane of the Membrana Tympani. It is not perfectly elliptical. Its upper part is the segment of an ellipse, the lower a straight line, connecting the extremities of the segment. It exactly resembles the base of the Stapes, a bone, hereafter to be described, which shuts it up, and therefore in the recent state, this aperture is not to be discovered unless the Stapes be displaced.

The Fenestra rotunda is lower than the Fenestra ovata, and nearer the Mastoid process. This aperture is also shut in the recent state, by a membrane of an oval figure, similar to the Membrana Tympani, and like that, convex internally. It is placed someway within the Fenestra rotunda, and is not discoverable without dissection, even in the Fœtal Ear, in which the bone is less evolved.

The Tympanum is separated from the Meatus Externus by the intervention of the Membrana Tympani.

The Membrana Tympani is pellucid and of an elliptical figure. Its major axis is placed, neither vertically nor horizontally, but obliquely. It is fixed in the elliptical groove at the termination of the Meatus Externus, except in the posterior and superior part, where the groove is deficient. There it is attached to a rough surface of the bone.

From what has been already said of the oblique termination of the Meatus Externus, it must be evident that the Membrana Tympani is very much inclined, and that its superior and posterior part is not so far distant from the orifice of the Meatus as the inferior and anterior. It is a thin pellicle of Membrane, strengthened without by the cuticle of the Meatus Externus, and within by the lining of the Tympanum. Although always in a certain state of tension, yet it is not a plane; on the contrary, it is

very convex towards the Tympanum and the convexity is of a conical figure, the apex of which is in the centre. To this the Manubrium of the Malleus is attached.

The Membrana Tympani is exceedingly vascular. Numerous little vessels descend along the Manubrium of the Malleus, from which diverging twigs proceed. These form beautiful and intricate inosculations with a plexus of vessels ranged in the margin of the membrane.

The Tympanum contains four little bones, articulated with each other, and forming a chain of communication between the Membrana Tympani, and the Membrane of the internal part of the Ear, in which the sense of Hearing is seated. They are the Malleus, Incus, Os Orbiculare, and Stapes.

The first of these is the Malleus, which may be divided for the purpose of description into three portions, namely, the Manubrium, the Head, and Processus Gracilis.

The Manubrium adheres to the Membrana Tympani. It is incurvated, particularly at its extremity, which reaches the centre of the Membrana Tympani, and draws it into its convex state.

The Head is joined to the Manubrium by a slender portion of the bone, which some have called the neck. It makes a considerable angle with the Manubrium, and its direction is obliquely upwards and backwards. It is of a globular form, but on one side the surface is irregular to fit it for a firm articulation with the Incus.

The Processus Gracilis passes off just between the Head and Manubrium, with which it makes almost a right angle. It is articulated in a particular groove of the Os Temporis, and is fixed by a ligamentous substance, which has been described by anatomists as a muscle. It turns in this groove, and

is, in a word, a pivot, on which the motions of the Malleus are performed.

The second bone is the Incus. It may be divided into the body and two crura.

In the body of the bone is the irregular articular surface, by which it is so firmly connected with the Malleus, as to be almost immoveable.

The two crura are of unequal lengths: The shorter crus is thicker than the other, and is placed almost horizontally. It articulates in a little depression near the aperture of the Mastoid cells. The ligaments, which retain it in this articulation, allow a considerable degree of motion.

The longer crus descends from the body of the bone, is more slender than the other, and bent at its extremity towards the Stapes, with which it articulates by the intervention of the Os Orbiculare. Its direction in the Tympanum is parallel with the Manubrium of the Malleus, and consequently with the Membrana Tympani.

The third bone, the Os Orbiculare, is very small, hardly as big as a Millet seed. Although named the Os Orbiculare, its figure is oval. It may be considered as an inter-articular bone, between the Incus and Stapes, connected with both, but more firmly with the former, to which it generally adheres, when the bones are separated.

The fourth bone is the Stapes. It consists of a base and two Crura, that coalesce to form the head, which is of an oval figure. To this the Os Orbiculare is attached.

The two Crura are bent, and that which is nearest to the Mastoid process is more incurvated than the other. They are grooved on the inside, and a Membrane occupying the area of the Stapes is fixed in the grooves.

The base of the Stapes exactly fits the Fenestra Ovata, which it closes. It is kept in this opening by the membranous lining of the Tympanum, and the membrane of the Vestibule, but enjoys a certain degree of motion. The Stapes passes from the extremity of the Incus to the Fenestra Ovata, in an oblique direction, so that the base is a little higher than its head, and the sides are between the vertical and horizontal line.

These bones are articulated with each other by capsular ligaments, of a degree of tenuity proportioned to their minuteness. They are covered with a fine vascular membrane, from which numerous little vessels proceed, that penetrate their substance. They are the nutritious vessels of the bones, and the membrane may be considered as their Periosteum.

The mechanism of these bones is regulated by the action of two muscles, the Tensor Membranæ Tympani and the Musculus Stapedeus.

The Tensor Membranæ Tympani, is contained in a small bony canal, parallel with the Eustachian Tube, from the cartilage of which its fibres are derived. These fibres are collected into a long round muscle, that passes through this canal and enters the Tympanum by a slender round tendon. The tendon issuing through a small aperture, at an obtuse angle to the line of the muscle, is gently deflected towards the Manubrium of the Malleus, and is inserted into its upper part.

The action of this muscle retracts the Tendon into the aperture of the bony canal. By this the Manubrium of the Malleus is drawn inwards, and the Membrana Tympani, which is attached to it, put upon the stretch.

A similar effect is produced on the membrane of the Vestibule by the contraction of the Musculus Stapedeus, the fleshy belly of which is contained in a canal of bone contiguous to the Stylo-mastoid canal. It sends a small round tendon through an aperture of the bone, which is directed obliquely upwards to the head of the Stapes into which it is inserted.

What remains to be described of the middle part of the Ear is the little nerve of the Tympanum, well known by the name of the Chorda Tympani. As the Portio dura of the Auditory nerve passes through the Stylomastoid canal between the Tympanum and Mastoid process, it detaches a small branch through a particular canal, which opens in the back of the Tympanum, near the groove, that contains the Membrana Tympani.

The Chorda Tympani traverses the Tympanum, lying between the Manubrium of the Malleus and longer crus of the Incus, and enters another little canal nearly opposite to the former. It then continues its course forwards and downwards between the Pterygoid Muscles, and joins the Lingual branch of the Inferior Maxillary nerve. This extremity of the Chorda Tympani is larger than that which is joined to the Portio dura, whence some have considered it as a branch of the Lingual nerve. It is, in a word, a nerve of communication, equally belongs to both, and is connected with the trunk of each at an acute angle.

CHAP. III.

A Description of the Internal Part of the Ear, which contains the Expansion of the Auditory Nerve, and may therefore be considered the Seat of Hearing.

THE Internal part of the Ear, which I am now about to describe, has, on account of the intricacy of the canals and cavities which compose it, been generally denominated the Labyrinth. It comprehends the Vestibule, semicircular canals, and the Cochlea, which are incased in the Petrous portion of the Os Temporis.

The Vestibule is the central cavity, and communicates both with the semicircular canals and the Cochlea; the latter lying in the extreme point of the Petrous portion of the Os Temporis, the former towards the Mastoid cells. The shape of the Vestibule is irregularly spherical. However, on examination, when it is properly laid open, two distinct depressions are observable, one semi-elliptical and situated above, the other hemispherical and situated below. Both are opposite to the Meatus Internus, a canal soon to be described, and the bony partition is thin and perforated with numerous small holes to transmit fibres of the Auditory Nerve.

In the prepared bone, the Vestibule is open towards the Tympanum, but as we have already seen, the Fenestra Ovata is, in the recent state, closed by the base of the Stapes. Six other apertures present themselves in

the Vestibule, five of which belong to the semicircular canals, and the sixth is the beginning of one of the Scalæ of the Cochlea.

The semicircular canals, although universally so called, are all larger than semicircles. They make at least three-fourths of a circle. Their calibre is small, about the size of a common pin, and of an elliptical figure. The smallest part of each canal is about the middle of its curve. They enlarge as they enter the Vestibule, but one extremity of each canal is particularly dilated, and is called Ampulla.

The semicircular canals are three, and are distinguished from each other by names given them from their position or direction. I shall call them the Vertical, the Oblique, and the Horizontal.

The Vertical canal describes its curve in the summit of the Petrous portion of the Os Temporis, and crosses it with its convex side above.

The Oblique, on the contrary, describes its curve in the occipital side of the Os Temporis, and its convexity is placed below.

The Horizontal canal is bent with its convexity towards the Mastoid process, and is directly above a portion of the Stylo-mastoid canal.

The three semicircular canals enter the Vestibule only by five apertures, for the smaller extremity of the Vertical canal joins the smaller extremity of the Oblique, and their orifice is common.

The Cochlea has received its name from its resemblance to the shell of a common snail. The resemblance is nearly external, and is only discernible in the Cochlea of the Fœtus during the first months; for as ossification advances, the bony substance of the Cochlea is blended with the rest of the Petrous portion of the Os Temporis. However, the proper substance of the Cochlea may be discovered even in the adult, by its greater brittleness and yellow colour.

The Cochlea is constructed with a Modiolus or central pillar, on which a Spiral Tube is wound, and a spiral Lamina wound on the same Modiolus, lying within the Spiral Tube and dividing it into two. Its figure is conical and position oblique. It is placed in the anterior part of the Petrous portion of the Os Temporis, contiguous to the canal that lodges the internal Carotid Artery, with its base towards the Meatus Internus and the apex, which is lower than the base, towards the Tympanum.

To facilitate the description of the Cochlea, it will be advisable separately to consider the three parts which form it, that is to say, the Modiolus, the Spiral Tube and Spiral Lamina.

The Modiolus commences from the bottom of the Meatus Internus by a concave plate, perforated with numerous Foraminula, the extremities of small bony tubes that freely communicate with one another, and run from the base towards the apex.

The Modiolus itself consists of these little bony tubes, blended into a mass of a conical figure. The interior fasciculi of tubes are the shortest, and they lengthen towards the centre, in which the longest and largest, which reaches the apex of the Cochlea, is placed. They terminate on the sides of the Modiolus at different distances. At their terminations they bend at right angles towards the Spiral Tube and their orifices describe about the Mediolus, a spiral tract, corresponding with the tube in direction. In proportion as they terminate the Modiolus diminishes, and its apex is exceedingly slender.

The Spiral Tube is wound on the Modiolus, and adheres to its sides. As it runs towards the apex, the curve which it makes is constantly diminishing. It makes two turns and a half from the base to the apex, and gradually decreases in its capacity.

The Spiral Lamina arises from the Vestibule and winds round the Modiolus within the Spiral Tube. Its greatest breadth is at its origin, whence

it gradually becomes narrower, as it approaches the apex of the Cochlea. Two thin plates of bone compose it, and appear to unite at their margin, from which a membranous substance, which is reflected on each side, proceeds.

The Spiral Lamina with the aid of this Membrane, makes a complete septum, and divides the Spiral Tube into two canals, one of which is called the Scala Tympani, from its having an aspect towards the Tympanum, the other the Scala Vestibuli from its arising in the Vestibule.

The Scala Tympani is nearest the base of the Cochlea, and begins from the Fenestra Rotunda, but is prevented from communicating with the Tympanum by the Membrane which closes this aperture.

The Scala Vestibuli begins by an oval orifice between the Fenestra Ovata and the Ampulla of the Vertical canal.

The two Scalæ run parallel with each other, but have no communication except at the apex of the Cochlea.

When the Cochlea is cut obliquely from the base to the apex at a proper distance from the Modiolus, the section exhibits the appearance of three successive compartments, each containing a portion of the septum of the Scalæ. The half turn of the septum occupies the last compartment, and as it joins the extremity of the Spiral Tube, a little hole is left. This is the hole by which the Scalæ communicate.

To obtain a view of this aperture of communication, it is necessary to preserve the membranous part of the septum, for the Spiral Lamina itself does not reach the extremity of the Spiral Tube. This may be ascertained by examination of the macerated Cochlea, in which, when a similar section is made, the extreme point of the Spiral Lamina may be perceived just rising into the last compartment and perfectly detached; but in the recent state, the Membrane, which goes off from the Spiral Lamina to complete

the septum, passes also from its point to the extremity of the Spiral tube, where it is so attached, as to leave the little hole already mentioned.

In the occipital side of the Os Temporis, contiguous to the Vestibule and Cochlea, is the canal through which the Auditory Nerve passes. It is named Meatus Internus, is oval, and about the third of an inch in length. The extremity towards the labyrinth is closed except at the upper part, where a small foramen, which is the beginning of the Stylo-mastoid canal, appears.

Immediately below this foramen, two cribriform plates are placed, the upper opposite to a portion of the semi-elliptical cavity of the Vestibule, the lower to the hemispherical.

A little lower, and separated by a slight ridge, a cribriform sulcus is continued to a round concave cribriform plate, the base of the Modiolus of the Cochlea.

The Vestibule, semicircular Canals, and the Cochlea, are lined with a delicate Periosteum. They contain also a membranous texture, formed into sacs and tubes, and filled with a transparent fluid, similar to the aqueous humour of the Eye.

The membranous sacs and tubes are smaller than the osseous cavities which contain them, but exactly correspond in shape. They adhere very slightly to the Periosteum of the osseous cavities by an exceedingly fine cellular membrane.

The Vestibule contains two membranous sacs, one seated in the hemispherical depression, the other in the semi-elliptical. I shall call them by the names of the depressions, in which they are lodged.

The semi-elliptical sac is larger than the hemispherical, and is that in which the membranous semicircular canals and Scala Vestibuli centre. Al-

though the cavities of these sacs are distinct, the sacs themselves cannot be separated, because their sides are in contact with each other, adhere, and are too delicate to admit of division by dissection.

The membranous semicircular canals exactly resemble the osseous tubes in which they are placed, and, therefore, require no farther description. They open in the semi-elliptical sac.

The Membranous Tubes of the Cochlea correspond with the Scalæ. One arises from the semi-elliptical sac of the Vestibule, the other from the membrane of the Fenestra rotunda, to which it adheres. They communicate, as the two Scalæ do, in the apex of the Cochlea.

The fluid contained in the cavities of these membranes is secreted by their interior surface, in the same manner as the Liquor Pericardii is secreted by the Pericardium. A considerable degree of vascularity seems the necessary consequence of their secretory functions. The vessels which supply them, pass from the Periosteum in a serpentine direction, and so far are easily discovered; but when dispersed on the peculiar structure of the Membranes, they are too minute to admit the red globules of the blood.

The Mebmranous Texture, just described, is destined to receive the ultimate distribution of the auditory nerve or Portio mollis of the seventh pair. It arises from the Tuberculum annulare in the Ventricle of the Cerebellum, and the Crus Cerebelli. As it turns round the Medulla oblongata, it is joined by the Portio dura, which it partially receives in a species of of groove and both enter the Meatus Internus, being connected by a fine cellular membrane.

The Portio dura quits the Portio mollis at the bottom of the Meatus Internus and continues its course through the Stylo-mastoid canal, and is no otherwise connected with the Organ of Hearing, than as it receives the Chorda Tympani.

The Portio mollis consists of two Fasciculi nearly of equal size, one of which supplies the Vestibule and semicircular canals, the other the Cochlea.

The nerve of the Vestibule and semicircular canals subdivides into three branches after forming a gangliform swelling. The largest branch sends its fibrils through the cribriform plate opposite to the semi-elliptical sac of the Vestibule. They pass in a distinct plexus upon the Sac and are lost in a pulpy substance, which vanishes in the Ampulla of the Vertical and Horizontal membranous canals.

The second branch passing through the inferior cribriform plate is dispersed in a similar substance on the Hemispherical sac.

The least branch also passes through a small cribriform plate and is lost on the Ampulla of the Oblique membranous canal.

The Fasciculus of the Cochlea is twisted, an appearance which arises from the mode in which its fibres enter the Modiolus. As they pass through its substance, they form plexuses through the communicating holes of the bony tubes. Some of the fibres issue from the Modiolus through the Foraminula of the Spiral Lamina, but the greater number and the largest issue through the Foraminula between the Spiral Lamina and the junction of the Spiral tube to the Modiolus.

As the nerve detaches its fibres along the spiral tract of the Foraminula, it lessens towards the apex, as the Modiolus itself does, but its central filament passes straight through the central foramen of the Modiolus and ramifies on the half turn of the Spiral Lamina.

The fibrillæ of the nerve may be distinctly seen as they enter the Scalæ of the Cochlea, making a distinct plexus on the Spiral Lamina in the edge

of which a perfect network is formed. This network appears to be continued in a semi-pellucid pulpy substance, which goes from the edge of the spiral Lamina on the membranes of the Scalæ, and is said to resemble the Retina; but a structure so minute and intricate, as this, must for ever elude perfect investigation.

CHAP.

CHAP. IV.

On the Diseases of the Ear.

THE causes of Loss or Imperfection of Hearing are very numerous, as may easily be conceived by those who have contemplated the complexity of the Ear. They are involved in the greatest obscurity, and I am fully sensible that all which I shall offer on this subject is to be considered only in the light of an Essay.

Few attempts have hitherto been made by Anatomists to investigate the morbid changes to which the Ear is liable. On this head we are almost destitute of information, at a period when by their labours the diseases of the other Organs of the body have been ascertained and the symptoms which accompany them recorded. But our Ignorance will soon cease to be the cause of astonishment, if we reflect on the obstacles which oppose our inquiries. These are almost insuperable. Nature has placed the greater part of the Ear in a situation absolutely beyond the reach of examination in the living body, and as its diseases are rarely if ever mortal, morbid Ears are seldom dissected in the dead. Such observations as are related have mostly been made on subjects that have casually fallen into the hands of the Dissector, and the history of the cases is unknown.

But it would not suffice if Anatomy were able to develope every morbid alteration of structure of which this Organ is susceptible. A great object would indeed be gained, but a greater would still remain unaccomplished.

Before the mind of the practitioner can be directed to any determinate object, a history of symptoms must be annexed to each specific change, and these symptoms must be sufficiently distinct. This demands a multitude of dissections and a series of attentive observations. A clear and distinct recital of symptoms is rarely obtained from the deaf. They are conscious of their infirmity, but very few are impressed with a notion that Hearing may be impaired by a variety of causes. The approach of Deafness is insidious and often unattended with pain. Few strong impressions are made on the mind of the patient, and he loses his faculty of hearing so imperceptibly, that in general his friends sooner discover his misfortune than himself.

Here then the labour and the difficulty commence; but the field is open. Anatomists have to the present day avoided this subject, some doubtless convinced of the impracticability, and others disgusted at the difficulty of the inquiry. As Anatomists have neglected the investigation of these diseases, so practitioners have either abandoned such patients to Quacks, or consigned them to the care of Providence.

But although I admit the difficulty in all instances, and in many our total inability to obtain an adequate knowledge, yet I must differ from those who think that such cases should be abandoned. I am convinced that the subject may be very much elucidated, if many individuals, having great opportunities of examining dead bodies, and animated with proper zeal in the inquiry, would employ some portion of their time in the dissection of such diseased Ears as chance may subject to their inspection. By this proceeding, many facts respecting defects or diseased changes of structure in the Ear may soon be obtained. In many instances where a previous acquaintance with the patient affords the opportunity, the attendant symptoms may be ascertained. Thus the observer combining in one view the cause and effect, may be capable in many instances of inventing means of relief.

But it must be admitted that such perfect researches into the cause and seat of the diseases of the Ear however they may enlarge our knowledge, will not in an equal degree augment our ability to remedy them. The

maladies of the interior parts of the Ear constitute a very numerous class, amounting at least to one third of the causes of deafness. As these are seated in the Labyrinth, a part of the Ear, inaccessible in the living subject, operative Surgery is excluded from all chance of relieving them.

The impossibility of curing the defects of the Internal part of the Ear by manual operations is therefore manifest, but it by no means follows that such cases are irremediable. Many morbid changes of the vital Organs of the body, equally inscrutable as the Ear, in the living subject, are when we know the symptoms indicating their existence, successfully treated by the operation of internal remedies, and I have no doubt that deafness in various instances depends on morbific changes which are curable by the general treatment of the constitution. I trust I shall be able to prove in the course of the following pages, that the assemblage of symptoms which practitioners for want of a more appropriate term have conspired to call Nervous Deafness, not only admits of relief, but may be completely cured in the incipient state.

These preliminary observations have been made purposely to display to the reader the difficulty of treating successfully many of the diseases of the Ear, and not with a view to discourage him from the attempt. I know the character of the profession too well to suppose that its members can be deterred by difficulties, or that there are not many who would think no time mispent, that is employed in endeavours to heal the infirmities of the species.

I have necessarily exhibited the dark side of the picture, as my intention in making these reflections has been directed to the most abstruse and inscrutable diseases of this Organ. The prospect will brighten as we enter more into the detail. We shall then find that some are very simple, and attended with too little difficulty in practice, to be introduced in the general outline.

Of those too which occupy the more complicated parts, all are not

equally unknown and remediless. Mr. Cooper has proposed and executed the happy and successful expedient of perforating the Membrana Tympani, in that species of Deafness which an obstructed Eustachian Tube produces.

It has been my humble endeavour to investigate another disease of the Tympanum, the puriform discharge, to ascertain its origin and progressive stages, and to point out a proper mode of treatment.

OF THE DISEASES OF THE MEATUS EXTERNUS.

The diseases which attack the Meatus Externus are the most simple to which the Ear is liable. They admit of examination by inspection and the touch, and are therefore generally well understood.

The Meatus Externus is subject to inflammation. An inflammation of this part in consequence of the hard and unyielding materials which compose it, is accompanied with the most acute pain and a great degree of general excitement. Its cure should be attempted by resolution. It is enough to say that the most active antiphlogistic plan is necessary to accomplish this intention.

When the means employed to reduce the inflammation have not succeeded and matter has formed, it is generally evacuated, as far as I have observed, between the Auricle and Mastoid process, or into the Meatus. If it has been evacuated into the Meatus, the opening is most commonly small, and the spongy granulations squeezed through a small aperture assume the appearance of a Polypus. Sometimes the small aperture by which the matter is evacuated, is in this manner even closed, and the Patient suffers the inconvenience of frequent returns of pain from the retention of the discharge. When the parts have fallen into this state, it will be expedient to hasten the cure by making an incision into the sinus between the Auricle and Mastoid process.

It occasionally happens, that the bone itself dies, in consequence of the sinus being neglected, or the original extent of the suppuration. The exfoliating parts are the Meatus Externus of the Os Temporis, or the external lamina of the Mastoid process.

A short time ago I was consulted by a patient, according to whose account, and as far as I could judge from the examination of parts that were healed, the whole Meatus Externus must have exfoliated; and I saw a child a few weeks ago, in whom the outer part of the Mastoid process was in a state of exfoliation.

The Meatus Externus and Auricle are sometimes affected with an Herpetic ulcerous eruption. It always produces a great thickening of the integuments, and the passage is often so much closed that a great degree of deafness ensues. The ichor which exudes from the pores of the ulcerated surface, inspissates in the Meatus, and not only obstructs the entrance of sound, but is accompanied with a great degree of fœtor. This disease is not unfrequent. I have never seen it resist the effect of alterative medicines, and the use of the applications employed in the following cases.

CASE I.

Miss S. F. applied for a complaint in her Ear, that had for many months greatly diminished the power of hearing. It proved on examination to be an Herpetic ulceration of the Meatus Externus and Auricle. The orifice of the Meatus was almost closed. With difficulty I introduced the nozzle of a syringe, and brought out a considerable quantity of inspissated discharge. The oozing of the ichor was very great.

She was perfectly cured at the end of two months by taking two grains of Calomel every day; and the injection of a lotion of Hydrargyrus Muriatus cum Aqua Calcis, and the application of the Unguentum Hydrargyri Nitrati.

CASE II.

Mr. R. W. applied with similar symptoms only in an inferior degree. He had laboured under the complaint above a twelvemonth. His defect of hearing during this time had varied greatly, according, as I suppose, to the degree of thickening in the parts, or the inspissation of the discharge.

He was cured by a similar treatment in the course of three weeks.

Miss C. N. A similar case. The disease had existed in different degrees of force for several months.

She was cured at the end of a month by the exhibition of Calomel, and the injection of a solution of Argentum Nitratum.

The lining of the Meatus Externus, like that of the nostrils, is capable of producing excrescences. They are generally termed Polypi. Such as have fallen under my inspection more nearly resemble syphilitic warts, and appear to be produced in a similar manner, viz. by irritation. I have never observed these excrescences in the Meatus externus, when the Tympanum is sound. But a purulent discharge from the Tympanum is complicated with the formation of Funguses and Polypi, as will be seen in the proper place. However, I do not mean to deny the existence of these excrescences when the other parts of the organ are sound. I am certain they are very rare, but when they do arise, are easily treated. They should be extracted with Forceps, and the part from which they are torn, touched with caustic, introduced with proper caution, that it may not extend to the Membrana Tympani.

The passage of the Meatus Externus has occasionally been obstructed by an unnatural septum, originating from an elongation or diseased growth of of the Cutis. As we have been informed, this was the state of the Meatus in a case where the Membrana Tympani was perfect, and Hearing was

restored by a laceration of the partition. Vide Mons. Maunoir's communication in the Medical Journal for 1800.

I believe these cases are rare, unless the Tympanum be diseased, but are not unfrequent after a suppuration and puriform discharge. The following is an instance of its having formed after a puriform discharge.

I. Hallam applied at the Dispensary for a very considerable and sudden increase of a deafness, with which he had been many years afflicted. The deafness had originally been produced by a suppuration of the Tympanum, and he recollected, that during the discharge, air had occasionally passed through the Meatus in the act of blowing his nose. The discharge had ceased to flow outwardly, and he was no longer capable of forcing air through the Meatus. He now spoke of a particular sensation, similar to what people experience when they inflate the Tympanum. By placing the patient in the light of the sun, I perceived a septum, which I pierced and lacerated, after which the patient could perceive at nine inches, the tick of a watch, which he was before obliged to place in contact with his Ear. Some difficulty arose to prevent the reunion of parts. It was at last accomplished, and the patient's hearing improved to the degree in which it is usually possessed by those who have lost the Membrana Tympani.

But the most common impediment to hearing that depends on the state of the Meatus Externus, arises from the inspissation of the Cerumen. The quantity which may be collected without impairing the power of Hearing, cannot easily be determined. In many persons the quantity is naturally considerable. But unless its proper consistence be altered, the functions of the passage are not much injured, whereas a small portion of hard Cerumen, lodged on the Membrana Tympani, will deprive a person of his hearing.

The symptoms, which are attached to the inspissation of the Cerumen are pretty well known. The patient, besides his inability to hear, com-

plains of noises, particularly a clash or confused sound in mastication, and of heavy sounds like the ponderous strokes of a hammer.

The practitioner is led by the relation of such symptoms to suspect the existence of wax; but he may reduce it to a certainty by examination.

Any means capable of removing the inspissated wax, may be adopted, but syringing the Meatus with warm water is the most speedy and effectual, and the only means necessary. As the organ is sound, the patient is instantaneously restored by its removal. A little pleasant distress arises from the violent excitement produced in the Ear, as soon as it is acted upon in this state of accumulated sensibility, by its accustomed stimulus.

OF THE DISEASES OF THE TYMPANUM.

The first disease of the middle part of the Ear which I shall endeavour to investigate, is the puriform discharge from the Tympanum. The discharge is ichorous, sometimes tinged with blood, and imparts a yellow colour to a silver instrument. This disease is attended with a loss of hearing proportionate to the injury which the machinery of the Tympanum has sustained, and the sense is variously impaired from the slightest degree up to total deafness.

In general, when the patient blows strongly with the nose and mouth closed, air will be expelled at the Meatus Externus. Whenever this circumstance is observed it is clear that the discharge proceeds from, or is connected with an injury or destruction of the Membrana Tympani. But the reverse by no means proves that the Membrana Tympani is sound, and the discharge therefore confined to the Meatus. It often occurs that the same inflammation which terminates in a suppuration of the Tympanum previously obliterates the Eustachian Tube, which remains permanently

closed after the cessation of the inflammation which occasioned it. I have ascertained this fact by dissection, and I possess a preparation taken from a subject in whom a puriform discharge from the Tympanum had ceased. In this person half the Membrana Tympani had been destroyed, but the remnant had healed and the Eustachian Tube was impervious.

Although air cannot be made to issue at the Meatus Externus, we are not therefore authorized to draw the conclusion that the Membrana Tympani is sound. It probably is so, but it must be ascertained by actual examination. The Ear must be inspected in a strong light. For this purpose the patient should be set in such a position that the rays of the Sun may fall into the Meatus, and illuminate it sufficiently to make the bottom visible; or the Ear may be sounded with a blunt probe, and any person acquainted with the particular feel of the Membrana Tympani, may easily distinguish it by the touch. If the Membrane be defective, the instrument will pass into the Tympanum, the bony superficies of which is still more readily distinguishable.

He, therefore, who will institute a proper examination, cannot fail of arriving at a certain knowledge of this disease, and will not confound it with the Herpetic ulcerous state of the Meatus Externus. In the latter success is certain, and as soon as the ulceration is cured, hearing is perfectly restored; in the former, however perfectly the discharge may be suppressed, the event is very dubious. It is therefore a point on which a practitioner who wishes to determine a priore what benefit can be rendered in any given case, cannot be indifferent.

This state of the Tympanum is produced by various causes. In the Scarlatina Maligna, inflammation of the Tympanum attacks the Patient, and advances to Gangrene. If he survives the fever, the machinery of the Tympanum often sloughs so extensively, that the Membrana Tympani and whole chain of bones is evacuated, and the patient is perfectly deaf.

Most commonly this disease succeeds the Ear-ache, which is in fact an acute inflammation of the Tympanum. If the inflammation should not subside spontaneously or be assuaged by art, the Tympanum and Mastoid cells form a large quantity of pus. After the patient has suffered the most intense pain, the Membrana Tympani ulcerates, and the pus is discharged at once in a large quantity. He is then greatly relieved, but the disease ceases not, the parts supply fresh matter, which continually oozes at the Meatus.

The symptoms produced by inflammation of the Tympanum, are most intense pain in the Ear and Head, a great degree of symptomatic fever, and sometimes slight delirium. The pain fluctuates, and its paroxisms resemble the Tooth-ache. This resemblance has unfortunately caused it to be wholly neglected or very improperly treated. The case obviously requires the most active antiphlogistic treatment, and the absence of every thing stimulative. But the opposite system prevails. The most acrid applications and spirituous liquors are the general means employed for the relief of the patient, an error that unquestionably tends to produce the worst catastrophe which can happen, viz. the suppuration of the parts.

What part the practitioner ought to take on the attack of this inflammation, is quite manifest. If he should be consulted sufficiently early, it will most probably be in his power to stop the inflammation. Then all the symptoms subside. The deafness, which is very great during the paroxism, will gradually lessen, as the deposited lymph, its necessary effect, is absorbed.

Not always, however, will the patient recover his perfect hearing, even when the inflammation has terminated in resolution. But as I am now speaking from observation on cases abandoned to the natural process, I am incapable of deciding how far proper treatment immediately subsequent to the paroxism can obviate the defect which the inflammatory state has left. Few will doubt the efficacy of such remedies as promote absorption. If in parts which are visible, we have ascertained that large quantities of lymph are absorbed before the completion of its organization, what reason have we

to doubt that the same thing is accomplished in parts similarly affected which are not visible? We cannot resist the conclusion, that the Deafness which remains after an inflammation of the Tympanum is not an inevitable consequence, but arises from neglect, and allowing the deposited lymph to become organized; and if the lining of the Tympanum remain permanently thickened, or organized adhesions be formed about the chain of bones, a certain defect must be the result.

But let it be admitted, that the Tympanum has suppurated. Ought the Membrana Tympani to be abandoned to a casual ulceration, or is it better to open it by art? I am inclined to prefer the latter; and if I could be assured by any symptom that suppuration has taken place, I should not hesitate to make a small perforation of the Membrana Tympani and to repeat it, if necessary, taking at the same time every precaution to suppress the fresh collection of matter.

If this mode of treatment were followed, it would be practicable to evacuate the matter, and cure the complaint with trifling injury to the Membrana Tympani, which is generally sacrificed in a spontaneous discharge.

Most frequently the establishment of this disease is slower and more insidious. Slight paroxisms of pain attack the patient, and are relieved by slight discharges. These recur at intervals, until at last the puriform discharge is fully confirmed.

Some practitioners are disposed to regard this as a trivial disease, others as one too dangerous to allow the interference of art. Both are in an error. It is without doubt a disease, destructive in its tendency to the faculty of hearing. It rarely stops until it has so much disorganized the Tympanum and its contents as to occasion total deafness. On this account, it demands the most judicious attempts to arrest its progress, and these attempts are free from danger. How the contrary opinion should have prevailed, is unaccountable; yet many modern practitioners condemn all attempts to cure it. But what argument can be adduced against the cure of this disease

that is not equally conclusive against all others. Is any one an abettor of the obsolete Humoral Pathology? He will contend that the stoppage of a drain which nature has established is pernicious, and the morbid matter will be determined on the internal parts; but how can such a person venture on the treatment of any disease, even the healing of a common ulcer. Some years ago I thought this absurd doctrine had been totally exploded, and yet I constantly hear it adduced to deter patients from interfering with this disease. Is a child the subject of it? The parent is told, it is best to leave it to nature, and the child will outgrow it. Is it an adult? Some other subterfuge equally futile is employed. The truth is, the disease is always tedious and difficult, and not always curable, and many are disinclined to embarrass themselves with the case, who have not candour to make the true statement. Thus patients are induced to refrain from all attempts, until the disease, in its first stages often curable, becomes absolutely impracticable.

The celebrated Heberden, in his commentaries on the causes of diseases and their cure, says, "Frequens puerorum vitium est, interdum quoque "adultorum, in quo Humor mali odoris post aures exit, unde tument auri-"culæ et loca vicina et cuticula in furfures decedit. Quod si humor acrior "fuerit cutis altius exulceratur. *Auris autem intus malo simili interdum affi-"citur ex quo æger fit surdaster. Medicamenta exsiccantia nocent vertendo "humorem in partes interiores.* Nulla alia curatione opus est nisi ut loca "affecta sæpe abluentur aqua tepida et ut pannus unguento aliquo leni de-"libutus interponatur, ne partes vel sibi invicem agglutinentur vel hæreant "vestibus." It is evident, that the writer applies this observation principally to that cutaneous affection of the auricle to which new-born infants and very young children are subject, a trivial complaint almost unworthy of a place in so grave a book. But when he says, "Auris autem intus malo "simili interdum afficitur ex quo æger fit surdaster," it is equally clear, that he alludes to discharges from the Meatus Externus. Now I contend, that discharges capable of making the patient deaf must originate from the Herpetic ulceration of the Meatus Externus, or a suppuration of the Tympanum. In the former, healing medicines, "medicamenta exsiccantia," are the

only medicines which ought to be employed, and I have ample proof that these applications will cure the disease, and not translate it to the internal parts. In the latter, the parts affected are too essential to perfect Hearing to be neglected, and I shall prove by the event of cases, that these may be healed without detriment to the constitution.

But the impropriety of attempting the cure of this disease is not only inculcated in books; many eminent practitioners are tinctured with the same notion. A short time ago I was consulted for a case of puriform discharge in a young lady, who, having heard frequent observations from a practitioner of the old school on the translation of morbid humours was dubious as to the safety of suppressing it. The case was referred to one of the first surgeons and anatomists in this metropolis, who decided against all attempts. And truly for what reason? For fear of injuring the Brain! The brain can only be injured by the exposure and ulceration of the Dura Mater, and the application of substances capable of destroying the bone and Dura Mater can only be an act of madness or the grossest ignorance. But injury of the brain is more likely to result from the continuance of this disease, than the judicious interference of art. For the puriform discharge naturally advances to ulceration, and ulceration to denudation and caries of the bone and separation of the chain of bones. A caries of the Tympanum is therefore ultimately produced. But this will destroy the bone and expose the Dura Mater, and if it were not for that principle, by which membranes that line cavities thicken as the neighbouring parts are ulcerating, and thus preserve their integrity, the brain would perhaps always suffer in the ultimate stage of the puriform discharge from the Tympanum.

But the fact is, the puriform discharge from the Tympanum often exists without a caries of the bone, and antecedently to this is most commonly curable. I have so frequently observed this disease, that I have no hesitation in saying, that there are three stages of it,

First, a simple puriform discharge.

Secondly, a puriform discharge, complicated with Funguses and Polypi.

Thirdly, a puriform discharge with a caries of the Tympanum.

The time necessary to accomplish the transition from one stage to another is uncertain. Years do not effect it in some instances, and in others it seems to advance almost at once to a carious state of the bone.

The puriform discharge from the Tympanum is a local disease, and does not depend on any vice of the constitution. General remedies are therefore very inefficacious. But as a bad state of health is unfavourable to the healing of any parts, so in this particular complaint, any disordered state of the system should be corrected. The chief dependence is to be placed on direct applications to the parts affected.

Blisters and setons have been recommended by some, with a view to effect a derivation of the humour. If they are beneficial, this explanation of their mode of action is not grounded on just reasoning. Some time ago I was averse to their use. But I now think they may be advantageously employed in aid of topical applications. They never can be injurious, but if indiscriminately adopted, the patient will often suffer the pain and inconvenience which they occasion, without reaping any benefit.

As it has been stated that the degree of deafness produced by this complaint is various; so when it is cured, the sense is restored in different degrees. For the deafness during its continuance is sometimes very considerable when the real injury which the organ has sustained is trivial. In the first stage the mere thickening of parts, or the collection of the discharge, must impede the action of the intervening machinery between the external and internal parts of the Ear; and in the second, the mechanical obstruction of the Funguses or Polypi excludes the pulses of the air. On this account there is often a notable increase of the power of Hearing, when the discharge is suppressed in the first and second stage. But as the parts are

invisible, it is difficult, if not impracticable, to decide a priore how far the power of Hearing can be restored. Now this is no valid objection to undertaking the cure. The sense will not be rendered worse by a failure, and if the discharge should be stopped, the disease which caused it is removed, the organ safe from farther injury, and the patient freed from an offensive malady. This argument is conclusive in favour of treating all stages of the disease, but in the last, the sense is almost, if not totally, destroyed ; and although the discharge be stopped, the patient's hearing will be very little, if at all, improved.

In having stated above that the sense of Hearing is often greatly improved by a cessation of the discharge, it must be understood that I confine the observation to cases of the first and second stage, in which a great part of the machinery of the Tympanum still remains. In the third stage, the chain of bones is nearly destroyed, and the pus seems in a certain degree to transmit sounds. I have two or three patients at present who are in the habit of syringing their Ears. They can distinctly perceive light sounds whilst the injected fluid remains, but on its escape again become deaf.

These are examples of caries, and although desirable in many respects to stop the discharge, I am inclined to think that in this stage hearing would not be improved. It would more probably be diminished, as the fluid discharge is, I think, a medium by which the pulses of the air affect the seat of the nerve.

It must be admitted, that the event of these cases is not always gratifying to the practitioner. Often, when he has done his utmost, no great degree of hearing is acquired; nor can the discharge always be suppressed. But this is chiefly attributable to the error committed in allowing the disease to become confirmed. From the success which has attended the cure of many very old cases, I have every reason to suppose that those which are recent would be still more successful. From the popular prejudice, encouraged by the reluctance of medical men, few patients apply in the earlier periods of

the disease. They wait until their patience is exhausted in expectation of a natural cure, and when they do apply, the opportunity is passed.

Nor, according to my observations, are the means which I have seen employed such as are likely to succeed; because the treatment corresponds with some preconception of its nature without any regard to the different stages of the disease. One thinks it a caries of the Tympanum. He has recourse to Tinct. Myrrhæ, and the whole tribe of antiseptics. A second imagines it consists in an ulceration of parts, and treats it with as little delicacy as a common ulcer. A third, hearing that Vinum Opii and Calomel are beneficial in certain diseases of the Eye, employs them here on a forlorn hope.

If a person acts from the impression that this disease exists only under one form, he will, consistently with this opinion, employ one general remedy; but although that remedy should not be improper, he cannot often succeed. The different stages of the disease require very different practice. He only can be successful who will give the greatest attention to individual cases, and vary his means agreeably to the state of each.

When the disease is cured, the healing process is effected by the extension of the cutis of the Meatus into the Tympanum, and its becoming continuous with its Membranous lining. I have a preparation, a dissection of the Ear, in which half the Membrana Tympani had been destroyed as far as the Manubrium of the Malleus, around which the Cutis of the Meatus had grown and joined the lining of the Tympanum.

After the cure of this disease, the Tympanum is exposed to the free ingress and egress of the air, and the mucilaginous discharge inspissates as the mucus of the nose, by the exhalation of its watery parts. By this accident the patient's deafness increases at intervals, for which he often seeks relief. The practitioner, on sounding the Ear, perceives this hardened matter, and conceiving, as is really the case, that it produces the augmentation

of deafness, is tempted to remove it. Nothing stimulative can be safe, nor any rude attempts, for there is great danger of reproducing the discharge. Having learned that a discharge has pre-existed, it will be expedient to leave it to a spontaneous separation.

CASES OF THE FIRST STAGE.

I.

Mrs. S. had been afflicted with a puriform discharge from the Tympanum for five years. On blowing, with the nose and mouth closed, air occasionally issued at the Meatus, as if it escaped at a narrow orifice. The discharge was very great. I could never in this instance render the bottom of the Meatus sufficiently visible to ascertain the degree of injury which the Membrana Tympani had sustained. The escape of air was a sufficient demonstration of its imperfect state, a symptom which still continues although she is now quite well. Notwithstanding the length of time, the disease had not advanced beyond the first stage. It yielded in the space of a month to an injection, night and morning, of a solution of Zincum Vitriolatum. The degree of deafness in this instance was trivial, and she hears perfectly, after the lapse of two years and three quarters since the suppression of the discharge, nor does there appear the slightest disposition to a relapse. The only remaining defect is a morbid sensibility, which subjects her to pain when exposed to loud sounds. This, perhaps, arises from the inability of the muscles to regulate the tension of the chain of bones and the remnant of the Membrana Tympani.

II.

Master B. had laboured under a very great degree of deafness, occasioned by a puriform discharge. The Membrana Tympani in this instance was injured, as air could be blown out at the Meatus. This case also

yielded in two months to the use of a solution of Zincum Vitriolatum, and the patient at present enjoys nearly perfect Hearing.

III.

Mr. S. had been afflicted with a puriform discharge from the Tympanum, proved, as in the former instances, by the expulsion of air at the Meatus. The deafness was so great, that the tick of a watch was scarcely perceptible at the distance of three or four inches. He was cured in three months by a solution of Zincum Vitriolatum, when he was able to distinguish the tick of a watch at rather greater distance than a yard.

IV.

Mary Webb, applied at the dispensary, afflicted with a very great degree of deafness. Examining the Ears, I found a great discharge from each, and air passed out at the Meatus. She informed me that it had been caused by the Ear-ache, that one Ear had been attacked nine months before, the other only two. As a certain degree of inflammatory action still remained, I ordered the Ears to be fomented, and gave the patient laxative medicines for a few days. She then commenced the use of a solution of Zincum Vitriolatum, and was cured at the end of seven weeks. One Ear regained its perfect functions, the other was considerably inferior; but even this was capable of distinguishing conversation with readiness.

V.

Mrs. B. applied for the same disease, with symptoms as in the preceding cases. The deafness was very great. After the use of a solution of Zincum Vitriolatum for four months, the discharge was stopped, and her hearing almost completely restored.

VI.

Ann Thompson, a child, was brought to the dispensary, after a suppuration of the Tympanum in one Ear. The pus had been discharged a few days preceding. I purged the child briskly, and ordered the Ear to be fomented for a few days. I then caused a solution of Cœrussa Acetata to

be injected three times a day. At the end of five weeks the discharge ceased. I could not perceive any difference between this and the sound Ear. But the patient being a child, only six years old, I did not make all the trials I could have wished.

VII.

Mr. T. applied two months after a suppuration of the Tympanum. The deafness was considerable. Air passed out at the Meatus. He was cured at the end of two months, by an injection of Cœrussa Acetata. I ascertained that this Ear was inferior one-fourth to the other.

VIII.

Miss B. applied on account of a puriform discharge from both Ears, which had succeeded frequent attacks of the Ear-ache. One Ear had been diseased a long time, the other only a few months. The Ear last attacked was cured in three weeks, and the power of Hearing restored. The other is considerably improved, but the discharge is not yet suppressed, although astringent injections have been used a long time.

CASES OF THE SECOND STAGE.

I.

Mr. G. applied in consequence of deafness. I learned from the history which he gave me, that he had been afflicted for many years with a puriform discharge, and air had passed out at the Tympanum. At this time it did not pass, and on examination I perceived Funguses at the bottom of the Meatus. I attempted to extract them with a small Forceps, but they would not sustain the pressure. As they bled freely, I destroyed them by pinches. For some days I used a strong solution of Alum. Finding that the Funguses did not re-appear under this treatment, I employed the solution of Zincum Vitriolatum, as in the former cases, when the discharge ceased, and the patient's hearing was remarkably improved.

II.

Mr. F. Surgeon, came under my care, being afflicted with two large Polypi, which protruded at the Meatus. He informed me, that long before their appearance he had had a puriform discharge, which was very profuse. Some time before he noticed the polypi, the deafness had become total. I extracted both with the Forceps; one came out entire, the other was torn, and the root remained. I pinched and tore the root at the end of twenty-four hours, and forty-eight hours after, when the congealed blood had separated, touched it with the Argentum Nitratum. He left me with direction to inject a solution of Argentum Nitratum, and under this management the discharge stopped, and Hearing was restored.

III.

Mr. H. sought to be relieved from a large Polypus, which came out at the Meatus. It had appeared after a puriform discharge, which had continued during eight years. For a long time air passed out at the Meatus in blowing his nose. This symptom had ceased about the time the excrescence was first observed. The Polypus was extracted and brought out entire. A few days after he was again able to force air out of the Tympanum. He used night and morning an aluminous injection. At the end of three months the discharge has ceased; the part where the Polypus grew is cicatrized, and Hearing greatly restored. Still this Ear is much inferior in accuracy of perception to the other. He could not, at the time of his application, distinguish a single word with this Ear, with which he can now hear a person converse in a moderate tone of voice, at the distance of twelve feet.

IV.

Master B. applied in consequence of a puriform discharge from the Tympanum, which was extremely offensive, and was often mixed with blood. Such was its acrimony, that the auricle and neck were excoriated by it. Air had formerly passed out at the Meatus, as it would even now, in the course of repeated efforts. I examined the Ears, and found Funguses at the bottom of the Meatus. The deafness was so great, that I had no expec-

tation of affording any relief in respect to Hearing. However, I undertook the suppression of the discharge. On account of the Funguses, I used the Argentum Nitratum. He was of a weak habit, and I therefore administered the Cinchona as an auxiliary. He applied three months ago, the discharge is greatly diminished, and his Hearing improved in a remarkable degree. He can hear clearly what is said to him in a moderate tone of voice at the distance of eight or ten feet.

We are justified by the event of these cases in drawing the conclusion, that the first and second stages are both curable, and that the ultimate advantage which hearing derives from the cure of the second, is nearly equal to that of the first. The apparent advantage is much greater. The mechanical obstacle which these excrescences oppose to the entrance of sound nearly deprives the afflicted person of his hearing. The patient is therefore most agreeably surprised at the success attending their extirpation. But in the eye of the practitioner, Polypi and Funguses are only incidental occurrences, and their removal reduces the disease to the first stage. The equality of success cannot therefore excite his astonishment.

Of the Obstruction of the Eustachian Tube.

A very great degree of deafness is produced by an obstruction of the Eustachian Tube. When this has happened, air can no longer be admitted into the cavity of the Tympanum, and either the included portion is absorbed, or else remains. In the latter case, the included air, incapable of yielding in any other way than by condensation, counterbalances the pulses excited by sounding bodies. In the former, the pressure of the atmosphere will carry the Membrana Tympani into the Tympanum as far as it can go, in which state it will rest, and cannot vibrate in any considerable degree. Each Hypothesis accounts for the phœnomenon. But I am in-

clined to think, that subsequently to the obliteration of the Eustachian Tube, the included air is absorbed, and the Tympanum filled with Mucus. I have found the cavity in this state in two instances of dissection in which the Eustachian Tube was closed.

The obstruction of the Tube most frequently arises from syphilitic ulcers in the throat, or sloughing in the Cynanche Maligna. The deafness ensues on the healing of the ulcers, that is, when the obstruction is complete. The descent of a nasal Polypus into the Pharynx and enlarged Tonsils have also been known to close the tube.

If the patient blows, with his nose and mouth stopped, he does not experience that peculiar sensation which arises from the inflation of the Tympanum. He speaks only of the loss of the sense, and complains of no particular symptom. The deafness differs in this respect from all other species, in which the patient is harrassed with most distressing noises which are false perceptions, arising from a diseased state of the auditory nerves, or proceeding from real impressions on the nerves produced by morbid causes in the organ.

Generally the obstruction comes on in consequence of some notable disease in the throat, and the cartilaginous extremity is most commonly the seat of it. Yet it occasionally takes place in the bony portion of the Tube. It is then slower in its progress, proceeds from no obvious cause, and consists in an inordinate ossification filling up the canal.

We are destitute of a perfect diagnostic symptom, by which we can be assured when deafness is produced by an obstructed Eustachian Tube. The incapability of inflating the Tympanum only renders it probable. Many people who hear perfectly are incapable of producing this sensation, at least in a great many trials. We are, therefore, compelled to trust to the patient's account. This will be sufficient when the obstruction has been preceded by an ulceration or disease of the throat. Otherwise, the patient's history will not always conduct to the discovery.

The world is indebted to the observation and penetration of Mr. Astley Cooper, for restoring the Hearing which this obstruction destroys. He had observed in suppurations of the Tympanum, which had injured and even destroyed the Membrana Tympani, that the sense of Hearing was only impaired, not totally lost; and that the degree of deafness when the Membrana Tympani was only injured by no means equalled that produced by the obstructed tube. Reflecting on this, he was induced to consider that a small puncture of the Membrana Tympani would be of trivial detriment even to a sound Ear, and in this instance would be the means of restoring to the Organ the exercise of its functions. This happy expedient he himself executed with great success, a success fully confirmed by a similar result of the operation in other hands.

The operation is performed by passing an instrument into the Meatus, and pushing it through the anterior and inferior part of the Membrana Tympani. It is unnecessary to state the reason for making the puncture in this place. The position of the Manubrium of the Malleus evidently demands this precaution. A little crack will immediately be perceived similar to what is occasioned by the puncture of parchment, more particularly if the tube be closed, as the sound will then be more acute, from the rapid entrance of the air through a narrow aperture.

The instrument ought not to penetrate far into the Tympanum, lest it should puncture its vascular lining, as the escape of blood into the cavity would for a short time frustrate the operation, even if it should ultimately be successful.

When the puncture has been successfully made, the patient is instantaneously restored to perfect Hearing. The effect of the operation is the immediate substitution of the small hole in the Membrana Tympani for the Eustachian Tube; and air being admitted into the Tympanum, the mobility of the Membrana Tympani returns, and the action of the machinery of the Tympanum is re-established.

The only obstacle to the complete success of this puncture is its tendency to close. For this reason it is often necessary to make rather a large hole in the membrane before you can insure the patient against the recurrence of the deafness. But a large hole diminishes the perfection of the sense. Tension is the state essential to the Membrana Tympani. This tension is not diminished by a small perforation. But if the Membrana Tympani be much lacerated or detached at its circumference, the tension will be lessened; yet even then the patient receives a striking benefit. To this imperfection we must however submit, and I am inclined to think a larger opening expedient than what can be made by a simple perforation with the instrument proposed by Mr. Cooper.

It has already been observed that a perfect diagnostic symptom is a desideratum in this species of deafness. If a deafness be accompanied with noise, it is highly improbable that an obstructed Eustachian Tube is the cause of it. It certainly is not, if the Tympanum can be inflated.

But there are some dubious cases of deafness in which a surgeon would reluctantly refrain from taking the chance of this operation. In such he cannot do wrong by piercing the Membrana Tympani. It has been found that its disposition to close is very great, even when the Eustachian Tube is impervious, and this is still greater when the tube is open. It is generally re-united in three or four days, but if the opening should remain fistulous, no injury results from it.

It would be superfluous to introduce the particular cases of success which are related by Mr. Cooper. They may be found in his paper published in the Philosophical Transactions for 1802. But I am authorized by him to say, that Mr. Round, whose case is there mentioned, continues to enjoy the relief he at first experienced.

The following case, which came under my own care, will illustrate what has been advanced respecting the closing of the puncture.

Mr. G. K. had been deaf for thirty years. I could scarcely make him sensible of what I addressed to him, even when I spoke directly into his Ear, in the loudest tone of voice. The deafness had succeeded the loss of a part of the Palate by Syphilis. I had no doubt from the manner in which he had become deaf that this was a case of obstructed Eustachian Tube.

I placed him in the sun, and passing a probe to the anterior part of the Membrana Tympani, made a small perforation. A crack immediately ensued, and in the space of a few seconds he heard distinctly the chirping of sparrows on a tree at a great distance. In a word, his hearing was perfectly restored.

In the space of three days his deafness recurred, and at the end of a week I again punctured the Membrana Tympani with the same result. Before the end of a week the deafness again recurred, and at the end of a fortnight, I pierced the Membrana Tympani a third time with equal success.

The opening was now somewhat larger; but the deafness relapsed in a fortnight. I did nothing for a few weeks. Seeing no amendment, I passed a probe through the Membrana Tympani, and extended the opening to the circumference. He was again restored, but not so perfectly as before. This opening I believe remains perfect at the present time.

On the Diseases of the Internal Part of the Ear.

The nature of the deafness which arises from the diseases of the Internal part of the Ear, is at present completely obscure, from our great ignorance of the morbid changes, which are the immediate cause of the defect. If we reflect on the component parts of the Labyrinth, we cannot refrain from coming to the conclusion, that it originates in a want of sensibility in

the nerve, some alteration in the structure of the Membranes on which the nerve is expanded, or change in the properties of that fluid which is contained in the Membranes, and is the immediate agent in impressing the sentient extremities of the nerve. On the latter head, as we are informed by Mr. Cline, he found in the dissection of the Ear of a person born deaf that the labyrinth, instead of its aqueous fluid, contained a thick caseous substance. This must have been incapable of undulating in the cavities of the labyrinth and is fully adequate to account for the total absence of the sense.

That a total deafness may exist without any defect in the mechanism of the exterior parts of the Ear, without any defect in the membranous structure on which the nerve is expanded, in the water which it contains, or in the nerve itself, at least as far as can be traced by the eye, I have myself ascertained by dissection.

The first instance was the Ear of a child, from the Asylum for the deaf and dumb, which died at Guy's Hospital. The disease was such as caused the inspection of the head after death. Mr. Swift, of Oxford, a student at Guy's, cut out for me the Os Temporis. I dissected the Ear with the minutest attention, and could not perceive the slightest defect in the structure of the parts. The nerve was apparently perfect, and I think we must admit that the deafness arose from an original want of power in the nerve, caused by a deviation from its natural structure too minute for our means of inspection, or a deficiency of that inscrutable principle on which its functions depend.

The second was a dissection of a man's Ear, who died of a cancer in Guy's Hospital. He was a patient of Mr Cooper's, and had been deaf for many years. I was equally unable to detect in these ears any organic disease, and as I knew the symptoms were such as are called nervous deafness, I paid the utmost attention to the condition of the labyrinth.

The whole class of the diseases to which the internal part of the Ear is

subject may be denominated nervous deafness. In this sense it is a generic term and signifies every disease the seat of which is in the nerve or parts containing the nerve. But in its general acceptation the term is more specific.

The general character of this class is great changeableness. The symptoms are noises in the head of various kinds, the murmuring of water, the hissing of a boiling tea-kettle, rustling of leaves, blowing of wind, &c. Other patients speak of a beating noise corresponding with the pulse, and increasing by bodily exertion in the same degree as the action of the heart. The cause of this impression is certainly the pulsation of the Arterial system, but I confess myself at a loss to explain what the change is which renders the organ susceptible of this impression. Nor can I at all determine whether the small arteries which ramify in the interior of the labyrinth are the immediate agent, or the internal Carotid, which passes close beneath the Cochlea. Whatever be the cause, the species is distinct, nor is the patient who has this symptom, affected with the various noises mentioned before.

All these confused and harrassing sounds are false perceptions in the organ, but they arise less frequently (if I may so say) in the nerve itself, than from the condition of the parts about the nerve. I formed this conclusion from observations on syphilitic deafness, of which the following is a striking instance, and it evidently depended on some change in the labyrinth.

Mr. B. applied to me, in a case of extreme deafness. He complained of various sounds, as the blowing of wind, rustling of leaves, &c. which were so loud, that he often could with difficulty disbelieve their reality. I examined the Ear, and there was no wax, and on blowing his nose, he inflated the Tympanum. I considered it a case of nervous deafness, and despaired of rendering him any service. But as it was not of long standing, and he laboured under a great heaviness and dejection of countenance, and had a white tongue, I was tempted to try how far the deafness might be

relieved by the mitigation of the constitutional disorder. I therefore prescribed. In about three weeks he complained of having a cold and sore throat. I found a syphilitic ulcer. On putting him under a course of mercury, the ulcer healed in a fortnight. But the patient had taken mercury five weeks before his hearing was much improved. In fine, he recovered his Hearing completely, and all the symptoms subsided.

In two or three other cases of syphilitic deafness the symptoms have been precisely the same, and the event a cessation of the symptoms and recovery of Hearing.

When I reflected on the event of these cases, I could not but consider that some change had been produced in the structure of parts adjacent to the nerve, and had been the proximate cause of the symptoms, rather than that the nerve itself had been affected. It is the most reasonable inference, as the mercury, which cured it, is more calculated to exhaust than impart energy to the nerves.

Being forcibly struck with the congruity between deafness produced by Syphilis and the concomitant symptoms of nervous deafness, I could not avoid concluding, that although the remote cause be different, the proximate cause is the same in each. Analagous to this is defective vision, arising from opacity, which may result from common inflammation or specific. In this case the immediate cause is the deposition of Lymph.

The change from the specific cause in either instance is most manageable, because we are furnished with a remedy which, as soon as its action is produced, arrests the progress of the disease. But as the opacity in a syphilitic ophthalmia is often too far organized to be absorbed, so in syphilitic deafness, when the syphilis is cured, the effect is often irremovable, and the injury to the function of the affected organ permanent. There is a period, therefore, at which syphilitic deafness is irremediable, and this is more remarkably the case with nervous deafness.

Having satisfied myself that the proximate cause of Syphilitic and nervous deafness was the same, I was determined to try the success of an analogous treatment in a recent case of nervous deafness. I was soon furnished with an opportunity of bringing this to the test.

CASES OF INCIPIENT NERVOUS DEAFNESS

SUCCESSFULLY TREATED.

I.

J. Waiton applied at the dispensary for relief. He had been extremely deaf for two months. The Meatus contained little wax, and he could inflate the Tympanum. He complained of noises in his head, such as I have described above. His deafness was so great, that I could scarcely make him hear what I said. He was a robust man and plethoric.—I put him on a most rigid diet, and gave active cathartics three times a week. For the first fortnight the doses were Calomel *Gr. viij.* at night, and Natron Vitriolat. *Oz. iss.* in the morning. Blisters were also applied behind the Ears three times successively at intervals of a week. He continued on this plan for six weeks, the cathartics being regulated according to circumstances. His hearing was now restored, but slight noises still remained. He was much reduced, and I gave him small doses of Calomel every night, and Sarsaparilla twice a day for a fortnight. The noises had now left him, he was put on his usual diet, and took Cinchona. At the end of ten weeks he was perfectly well.

II.

J. Clinch, a lad, applied at the dispensary, afflicted with a very great degree of deafness. The noises in his head were trivial, compared with the other case. He had little wax, and could inflate the Tympanum. He could hear a watch tick at only three inches from his Ear. I applied blisters behind the Ears four times successively, at intervals of a week. He took every night Calomel *Gr. ij.* twice a week a solution of Magnesia Vitriolata. At the end of five weeks he heard a watch tick at the distance of a yard.

He was a good deal reduced, and I changed the plan to the Cinchona. He left me at the end of two months, when he could distinguish the tick of a watch at rather greater distance than a yard.

III.

Wm. Higgins, a boy, applied at the dispensary. He had been very deaf six weeks. He had little wax, could inflate the Tympanum, and had no catarrhal symptoms. He was always complaining to his mother of singing and noise in his Ears. He was treated with three blisters in succession, at intervals of a week; took Calomel *Gr. iss.* every night, and a solution of Magnesia Vitriolata twice a week. He was perfectly cured at the end of five weeks.

IV.

Wm. Bygrave had been deaf for two months with singing and noise in his Ears. The symptoms were the same as in the other instances. His health was in other respects very good. The diminution of Hearing was much less than in the other cases, and yielded to the use of two blisters, brisk Cathartics, and rigid diet, in a little more than three weeks.

V.

Wm. Harvey applied at the dispensary. He had been exceedingly deaf for six months; otherwise in perfect health. In blowing his nose, air passed into the Tympanum, &c. The noises in his head were perpetual and harrassed him much. He was treated very much in the same manner as the other cases. He experienced but a trifling relief at the end of three weeks. I almost despaired of success, and was principally induced to persevere by his anxiety to be cured. He continued the blisters for two months, gradually growing better in that time, so as to hear a watch tick at about two yards, although when he first applied he was obliged to place it in contact with his Ear.

VI.

J. Kirwan, a lad, applied at the dispensary on account of a deafness

of some months. His symptoms were precisely as those mentioned in the former cases. His general health perfect. He was cured on the same plan as the others in three weeks.

I shall not weary the reader with the recital of any more cases. These are sufficient to establish the point that the incipient state of these symptoms may be relieved, and that a strict antiphlogistic treatment and means of promoting absorption ought to be employed.

Confirmed nervous deafness is, without doubt, hopeless, but I know not a priori how to determine, when attempts are vain. This does not altogether depend on the time but the degree of mischief done to the organ, and the periods at which it becomes incurable must be various. The case of longest standing is that of Wm. Harvey. This did not yield until the plan had been carried to an extreme, to which few patients would be inclined to submit. Beyond this time I should think it irremediable.

My object is to direct the attention of the practitioner to the commencement of this species of Deafness. When early application is made, it behoves him to take the case seriously in hand, for no time is to be lost, and active means in the beginning will often succeed.

It is far from my inclination to excite a hope that old cases of this species of deafness admit of cure. I have never seen or heard of any cured by any plan of treatment whatsoever, and as to the various vaunted remedies with which the public prints are daily teeming, I know them to be absolutely inefficacious and often prejudicial.

EXPLANATION OF THE PLATES.

PLATE I.

THIS Figure represents a section of the Cranium and Face, made for the purpose of shewing in one view the Meatus Externus, the Membrana Tympani, and Eustachian Tube, that the relative position of these parts may be distinctly comprehended.

The right side of the Face is removed by means of two sections, a longitudinal and a transverse, the former of which is made a little on the right of the Septum Nasi, the latter a little before, and parallel with the Meatus Externus. The two sections incline towards each other, and meet at an obtuse angle.

The right side of the Velum Palati Mollis is separated from the bony palate, and the Pharynx preserved and displayed in a lateral view.

The anterior part of the Meatus Externus is opened from the beginning of the Tragus to the Membrana Tympani, which lies at the bottom, and separates it from the Tympanum. The anterior part of the Eustachian Tube is also opened, and a probe lies in it, and passes from its orifice in the upper and lateral part of the Pharynx into the Tympanum, which is left unopened.

a. The Meatus Externus. The letter is placed exactly at the junction of the bone and cartilage which compose this Canal.

b. The Membrana Tympani.

c. The Eustachian Tube, with a probe in it. The head of the probe serves to mark the aperture of the right nostril in the Pharynx.

PLATE II.

FIG. I.

This Figure represents an interior view of the Membrana Tympani and Eustachian Tube, which have been divided from the petrous portion of the Os Temporis by a transverse section, and of the lateral part of the nostril divided from the Septum Nasi, with a portion of the Velum palati mollis, and Pharynx annexed. It is given with the design of shewing the relative position of the aperture of the Eustachian Tube to the Membrana Tympani, and its oblique course from the Tympanum to the spot where the Nostril and Pharynx communicate.

a. The Eustachian Tube.
b. The Membrana Tympani.
c. The Malleus attached to the Membrana Tympani.
d. The Chorda Tympani passing over the Malleus and Membrana Tympani.
e. The section of the Pharynx.
f. The section of the Velum palati mollis.

FIG. II.

This Figure represents a dissection of the Os Temporis to shew the chain of bones between the Membrana Tympani and Vestibule, precisely in their proper situation; for the bone is so cut that the Stapes rests on the lower part of the Fenestra Ovata, the Malleus is attached to the Membrana Tympani, and the Incus is in its artiulation near the aperture of the Mastoid cells.

a. The Malleus.
b. The Incus.
c. The Stapes.

FIG. III.

This Figure represents a dissection of the Ear, in which the anterior part of the Meatus Externus is cut off, and the Tympanum opened. The Eustachian Tube is also opened, and the view of it is the same as in Plate I. This Figure shews the Membrana Tympani, the Malleus, and Tensor Membranæ Tympani attached to it. As the Tym-

Fig 1.

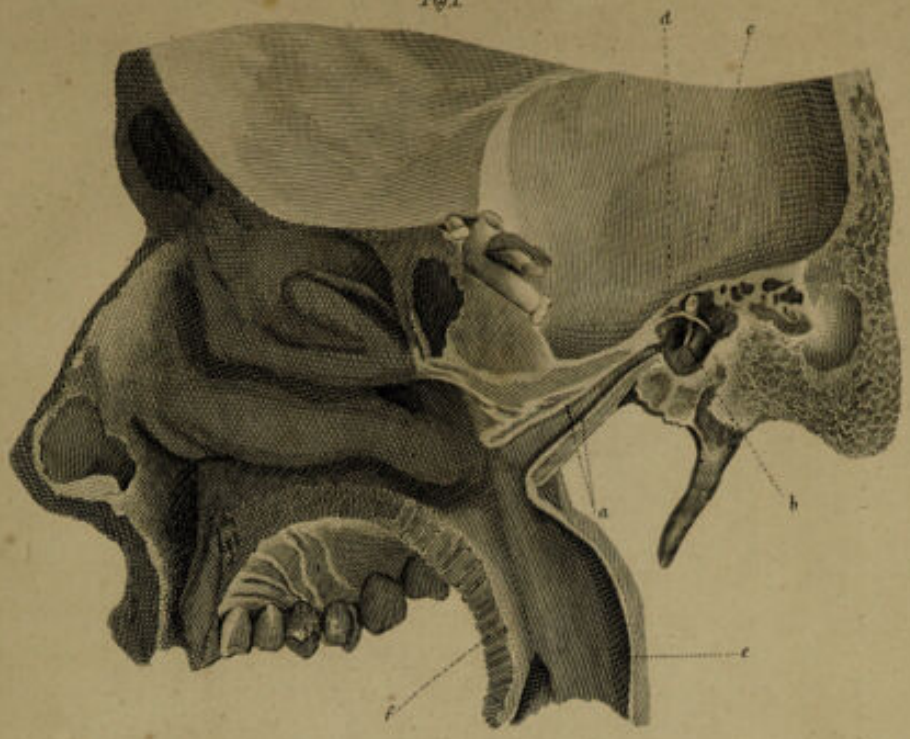


Fig. 2.

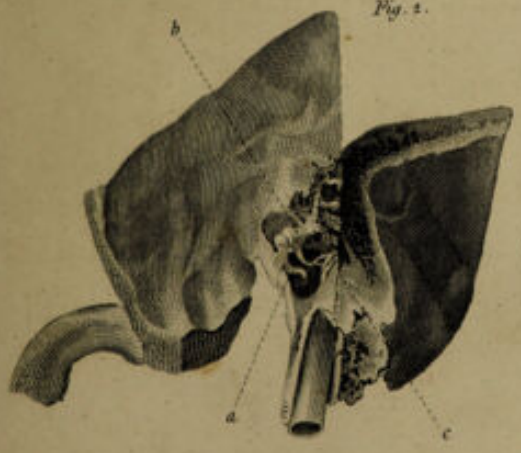


Fig 3.

Printed March 1.1821 for Richard Phillips New Bridge Street Blackfriars

Printed March [illegible] for Richard Phillips New Bridge Street Blackfriars

Heath Sc.

panum is opened, the size of this cavity may be judged of, as well as the degree of convexity which is proper to the Membrana Tympani, a circumstance best observed in a lateral view.

a. The Meatus Externus.
b. The Membrana Tympani.
c. The Eustachian Tube.
d. The Malleus.
e. The Tensor Membranæ Tympani, sending its tendon through a little foramen of bone, and inserted into the Manubrium of the Malleus.

PLATE III.

Fig. I.

This Figure represents the Fœtal Os Temporis, to shew the slender bony ring that contains the Membrana Tympani. This ring is elongated by subsequent ossification into that considerable process of the adult bone, called by Osteologists the Meatus Auditorius Externus.

a. The Ring of bone.
b. The Membrana Tympani.

Fig. II.

This Figure represents in different positions the individual bones, which form the chain of connexion between the Membrana Tympani and the Membrane of the Vestibule.

1. A View of the Malleus, as seen within the Tympanum.
a. The Manubrium.
b. The Head.
c. The Processus Gracilis.

2. A View of the Malleus, as seen from the Meatus Externus.
a. The concave portion of the Manubrium, the extremity of which reaches the centre of the Membrana Tympani. The whole of this surface is attached to the Membrana Tympani.
b. The articular surface on the head for its junction with the Incus.

3. A View of the Side of the Incus, that faces the Membrana Tympani.

a. The longer Crus.

b. The shorter Crus.

c. The articular surface for its junction with the Malleus.

4. A View of the Side of the Incus, that faces the Labyrinth.

a. The longer Crus, having the Os Orbiculare on its extremity.

b. The shorter Crus, which articulates in a depression close to the aperture of the Mastoid Cells.

5. A View of the Stapes, as seen by a person who holds it with the base towards him, and the straight part of the base lowermost, and looks at the same time into the hollow of its Crura.

a. The Head.

b. The Base.

c. The two Crura, of which the most incurvated lies towards the Mastoid process.

6. A View of the Incus and Stapes articulated to shew the intervening Os Orbiculare.

a. The Os Orbiculare.

7. A View of the whole chain of bones, articulated, with the Tensor Membranæ Tympani, adhering to the Manubrium of the Malleus.

FIG. III.

This Figure represents the exterior portion of the Mastoid process and Tympanum, both having been divided by a vertical section, to exhibit the Mastoidal cells, the internal surface of the Membrana Tympani, and the Portio Dura of the Auditory Nerve, turned out of the Stylo-mastoid canal. The section is continued beyond the Tympanum, and cuts the Os Sphenoides in such a manner as to make a section of the Foramen Spinosum, the Foramen Ovatum, and to separate the Ala Minor from the body of the Os Sphenoides directly within the Foramen Opticum. By the section of the Os Sphenoides the Inferior Maxillary nerve is laid bare, and the angle of the lower jaw remains to shew one of the branches of this nerve, viz. the Dental, entering the Dental canal. The object is to shew the Chorda Tympani, and its connexion with the sublingual branch of the Inferior Maxillary and the Portio Dura of the Auditory Nerve. On this account both these nerves are dissected and displayed. The precise course of the Chorda Tympani through the Tympanum is demonstrated by the preservation of the Malleus and Incus in their proper situation. It lies on the Membrana Tympani, passing over the Manubrium of the Malleus, between it and the longer Crus of the Incus.

a. The Mastoidal cells.

b. The Membrana Tympani.

c. The Portio Dura of the Auditory Nerve, turned out of its canal; and the little twig of the Chorda Tympani going off through the bone to enter the Tympanum is marked ⁎.

d. The Inferior Maxillary Nerve.

e. The Dental branch.

f. The Sublingual branch.

g. The Chorda Tympani.

FIG. IV.

This Figure represents the interior portion of the Mastoid Process, the interior part of the Tympanum, viz. that part which is opposite to the Membrana Tympani, and the Eustachian Tube, connected with the Tympanum. This View is given by a section similar to that of the last Figure; and allowing for the variation of different subjects and a slight deviation of the Saw, the two portions laid together would compose a complete Ear. The Stapes remains in sitû, fixed in the Fenestra Ovata, and the Tendon of the Stapedeus Muscle is seen inserted into its head. Its base is concealed in the hollow of bone that bounds the Fenestra Ovata. The Fenestra Rotunda is visible, situated a little below the Stapes. This section also exposes the Portio Dura of the Auditory Nerve, which winds between the Tympanum and Mastoid cells. At one part, the Horizontal Canal is close to it, and is here opened, that their proximity may be observed. The Internal Carotid Artery is also dissected and introduced. Its course behind the part of the Tympanum which is elongated into the Eustachian Tube and its contiguity to the Cochlea appear in this Figure.

a. The interior superficies of the Tympanum. The line which marks it is drawn from the elevation of the surface that covers the apex of the Cochlea.

b. The Eustachian Tube slit open.

c. The Stapes.

d. The Tendon of the Musculus Stapedeus, issuing through a little foramen in the bone.

e. The Fenestra Rotunda.

f. The Portio Dura of the Auditory Nerve.

g. The Horizontal Canal.

h. The Internal Carotid Artery.

FIG. V.

This Figure represents a portion of the interior Superficies of the Tympanum dissected to shew the Stapedeus Muscle and the Canal of bone, which lodges the Tensor Membranæ Tympani.

a. The Musculus Stapedeus, dissected by opening the bone which contains it.

b. The Stapes, receiving the Tendon of the Musculus Stapedeus.

c. The Canal of the Tensor Membranæ Tympani.

d. The little hole through which the tendon of the Tensor Membranæ Tympani is deflected.

FIG. VI.

This Figure represents the Skeleton of the interior superficies of the Tympanum (the Mastoidal Cells being in outline) that the Fenestra Ovata and Fenestra Rotunda may be seen.

a. Fenestra Ovata.

b. Fenestra Rotunda.

PLATE IV.

FIG. I.

This Figure represents a dissection of that part of the Labyrinth which forms the interior superficies of the Tympanum. The position of the central cavity, the Vestibule, may be known by the Fenestra Ovata. The Cochlea is placed before the Vestibule, with its apex inclined towards the Tympanum, and below the horizontal line. The two turns and half of the Spiral Tube (the Spiral Lamina being removed) are shewn, and the communication of this Tube with the Vestibule. A portion of the Vertical and Horizontal semi-circular Canals are opened and traced, as far as they can be seen, in this view.

a. The Fenestra Ovata.

b. The Cochlea: the line is drawn from its apex.

c. The Vertical semi-circular Canal.

d. The Horizontal semi-circular Canal.

FIG. II.

This Figure represents a dissection of the Occipital side of the Os Temporis, to shew the Meatus Internus; the Oblique semi-circular canal, and the junction of its smaller extremity with that of the Vertical.

Fig. 1.

Fig. 2.

Fig. 3.

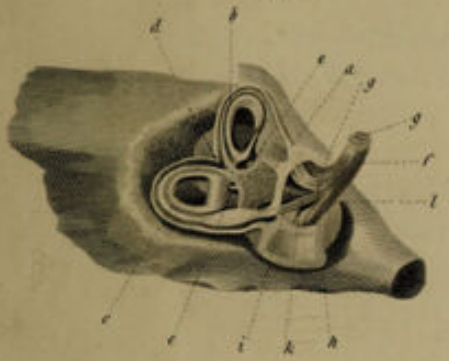


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Kirkland del.

Heath Sc.

a. The Meatus Internus.
b. The Oblique Canal.
c. The Vertical Canal.
d. The common part of the two Canals.

FIG. III.

This Figure is copied from Professor Scarpa. It is a magnified view of the larger Membranous Sac of the Vestibule, and the Membranous semi-circular Canals, and is intended to illustrate the distribution of the Portio Mollis upon them.

a. The Sac in which the semi-circular Canals and Scala Vestibuli terminate.
b. The Vertical Canal.
c. The Oblique Canal.
d. The common termination of the Vertical and Oblique Canals.
e.e. The Terminations of the Horizontal Canal.
f. The Portio Mollis.
g.g. The Portio Dura.
h. The Branch of the Portio Mollis supplying the Sac of the semi-circular Canals.
i. The Branch of the Hemispherical Sac.
k. The Twig supplying the Ampulla of the Oblique Canal.
l. The Fasciculus of the Cochlea.

FIG. IV.

This Figure represents a dissection of the Cochlea, in which the Scala Vestibuli is cut open through its whole extent, and the Cochlea is set upon its base, that the observer may be able to judge of its height. This dissection is designed to shew the Spiral Lamina, with its Membrane, that makes the Septum between the Scala Vestibuli and Scala Tympani, which remains closed.

a.a.a. The turns of the Spiral Lamina, or Septum.
b. The Fenestra Ovata.
c. The Fenestra Rotunda.
d. The Apex of the Cochlea.

FIG. V.

This Figure represents a dissection of the Cochlea, in which the Cochlea rests on its base, and one side of the Scala Vestibuli is opened. The section exhibits the appearance of three compartments, and a portion of the Septum of the Scalæ is seen in each. Its principal object is to shew the little hole by which the two Scalæ of the Cochlea communicate. To understand this Figure, the reader must observe, that the Scala

Tympani is not touched, that it begins under the Septum, at the Fenestra Rotunda, makes parallel turns with the Scala Vestibuli, and terminates at the common Foramen of the Apex.

a.a.a. The turns of the Spiral Septum.

b. The Fenestra Ovata.

c. The Fenestra Rotunda.

d. The Hole of communication between the Scalæ.

FIG. VI.

This Figure represents an oblique section of the Cochlea on the side of the Meatus Internus. It lays open both the Scalæ, the portion of the Canal below the Spiral Lamina being the Scala Tympani, that above, the Scala Vestibuli.

1.2.3.4. The edges of bone, made by the section of the Spiral Tube. 1.2. the cut edges of the first turn.—2. 3. ditto, of the second turn.—3 and 4. ditto of the third or half turn.

a. The first turn of the Spiral Lamina.

b. The second turn.

c. The third or half turn.

FIG. VII.

This Figure represents a dissection in which the Spiral Lamina is left in connexion with the Modiolus and the Vestibule, from which it derives its origin. The Fenestra Ovata and the aperture of the Scala Vestibuli are laid into one, by breaking down the partition between them.

a.a.a. The turns of the Spiral Lamina and the Modiolus.

b. The cavity of the Vestibule.

c. The hole of communication between the Scalæ.

FIG. VIII.

This is a magnified view of Fig. 7, to shew the Plexus of the Portio Mollis in the Spiral Lamina, on the side of the Scala Vestibuli.

FIG. IX.

A magnified view of a similar section to that of Fig. 6, with the exception, that the third turn of the Spiral Tube is not opened. It is left closed, because the half turn of the Spiral Lamina is too minute to admit of the nerves being seen in this view. It is meant to shew the Plexus of the Portio Mollis in the Spiral Lamina on the side of the Scala Tympani.

J. M'Creery, Printer,
Black-Horse-Court, Fleet-Street, London.