

A descriptive catalogue of preparations illustrative of the diseases of the ear : in the museum of Joseph Toynbee.

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From the author.

A

DESCRIPTIVE CATALOGUE.

THE HISTORY OF THE

REPUBLIC OF THE

UNITED STATES

OF AMERICA

A
DESCRIPTIVE CATALOGUE

OF PREPARATIONS ILLUSTRATIVE OF

THE DISEASES OF THE EAR,

IN THE MUSEUM OF

JOSEPH TOYNBEE, F.R.S.

LONDON:

JOHN CHURCHILL, NEW BURLINGTON STREET.

1857.

LONDON :

F. SHOBERL, PRINTER TO H.R.H. PRINCE ALBERT, 51, RUPERT STREET.



TO

SIR JOHN LIDDELL, C.B., M.D., F.R.S.,

DIRECTOR-GENERAL OF THE MEDICAL DEPARTMENT OF THE
ROYAL NAVY.

DEAR SIR JOHN,

Permit me to avail myself of the occasion of printing the Catalogue of my Museum, to record, thus publicly, my deep sense of gratitude for the invaluable opportunity which, during many years, your great kindness has afforded me, of prosecuting my researches into the Pathology of the Ear; a kindness, enhanced by its entire disinterestedness, since, when it was first experienced, I was only known to you through some of my published papers.

Believe me to be,

Dear SIR JOHN,

Your most sincerely and obliged,

JOSEPH TOYNBEE.

18, *Savile Row*, December, 1856.

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INTRODUCTION.

WHEN, in the year 1839, I entered upon a systematic study of the Diseases of the Ear, the conviction was soon forced upon me, that its pathology had been almost entirely neglected. This conviction induced me to commence a series of dissections of that organ, which have been continued up to the present time, and now amount to 1,659. They may be classified as follows:—

I. Diseased ears of deaf persons, the history of whose cases was known to me	-	-	-	-	272
II. Diseased ears of deaf persons, the history of whose cases was unknown to me	-	-	-	-	223
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					<hr/>
					1,659
					<hr/>

Some of the results of these dissections, as laid before the Royal Society, the Royal Medical and Chirurgical Society, the Pathological Society, and the British Medical Association, have been published in the Transactions of those bodies; but much matter still remains to be communicated to the Profession, and in this volume a further instalment is contained.

It would be wrong to suppose that the Catalogue of my Museum is issued as a complete synopsis of the diseases to which the organ of hearing is subject. Neither by that Catalogue, nor by the tabulated results of the dissections appended to this volume (see Appendix), can any idea be conveyed of the amount of various functional disease to which the ear is liable, nor of those diseases arising from temporary congestion of blood, or other derangement of the circulation. These reasons prevent the catalogue from giving a due idea also of the frequency of the cases in which the nervous system of the ear is disordered. And further, as the trumpet-shaped extremity of the Eustachian tube could not always be removed for dissection, and as, when it was obtained, a considerable portion of the blood from its mucous membrane was very generally lost, it was not always practicable to decide whether the tube was or was not obstructed, or whether its lining membrane was congested, or relaxed during life. Yet, judging from practical experience, there can be little doubt that this appendage of the hearing apparatus is more often affected than the morbid conditions detailed in this volume would seem to indicate.

Notwithstanding these drawbacks, the dissections detailed in the following pages justify me in expressing the hope that they will be regarded as a solid basis, on which ultimately a complete system of Aural Pathology may be reared: meanwhile, it may be interesting to indicate briefly the several results to which they have led:—

I. The discovery of the existence of osseous tumours in the external meatus and their structure.

II. The detection of the presence of molluscous tumours in the external meatus; a disease which, in consequence of the accompanying discharge of mucus, has hitherto been confounded with "otorrhæa."

III. The abolition of the terms "otitis" and "otorrhæa," and the substitution of names indicating the tissue affected, and the peculiar nature of the affection.

IV. The discovery of the existence of the dermoid layer of the membrana tympani, which plays so important a part in the diseases of that membrane. It was previously supposed that the epidermoid layer was in direct contact with the fibrous layers.

V. The ascertaining of the true relations of the two fibrous laminae of the membrana tympani, and the existence and offices of the "tubular tensor tympani ligament."

VI. The construction and application of the artificial membrana tympani in cases of perforation or destruction of the natural membrane.

VII. The demonstration that the functions of the ossicles are analogous to those of the iris of the eye, modifying the access of sonorous vibrations as the latter does the undulations of light, attuning the labyrinth for the reception of either loud and harsh, or very low and very delicate vibrations.

VIII. The establishment of the existence as a disease, of membranous and osseous ankylosis of the stapes to the fenestra ovalis, one of the most common causes of deafness.

IX. The proof that the Eustachian tube remains always closed, except during the momentary act of swallowing, when its muscles cause it to open.

X. The use of the "otoscope" as a means by which the condition of the Eustachian tube may always be diagnosed, without the use of the Eustachian catheter.

XI. The various diseases which give rise to caries of the petrous bone, and implicate, in their progress, the dura mater, the cerebrum, and the cerebellum, have been described, their nature and extent indicated, and means for their amelioration suggested.

It has long been the opinion of medical men, that the successful prosecution of aural surgery was opposed by almost insurmountable obstacles. Without, however, attaching any undue weight to the results to which pathological research has already led, may it not reasonably be expected that the same energy, and patient, persevering inquiry which have so successfully surmounted obstacles—surely not less formidable—in other branches of the Profession, will, in this also, be rewarded by discoveries calculated to advance medical science?

I am desirous of expressing how deeply I stand indebted to numerous friends in different parts of the country, for kindly furnishing me with specimens for dissection, accompanied with notes, by which means I have been enabled to add greatly to the numbers of by far the most important class of dissections, that of “diseased ears of deaf persons whose history was known to me.” In the Dedication I have already attempted to express my feelings of gratitude to Sir John Liddell for the facilities he afforded me when he presided over the Medical Department of Greenwich Hospital. It is my wish to impress strongly upon my professional brethren, that the investigation of Aural Pathology has but commenced, and that I am as anxious as ever to prosecute further researches. The process of removing the petrous bone is attended with so little trouble, that I venture to express a hope to be aided by the profession in general, in obtaining specimens for dissection in cases falling under their observation. (See Appendix.)

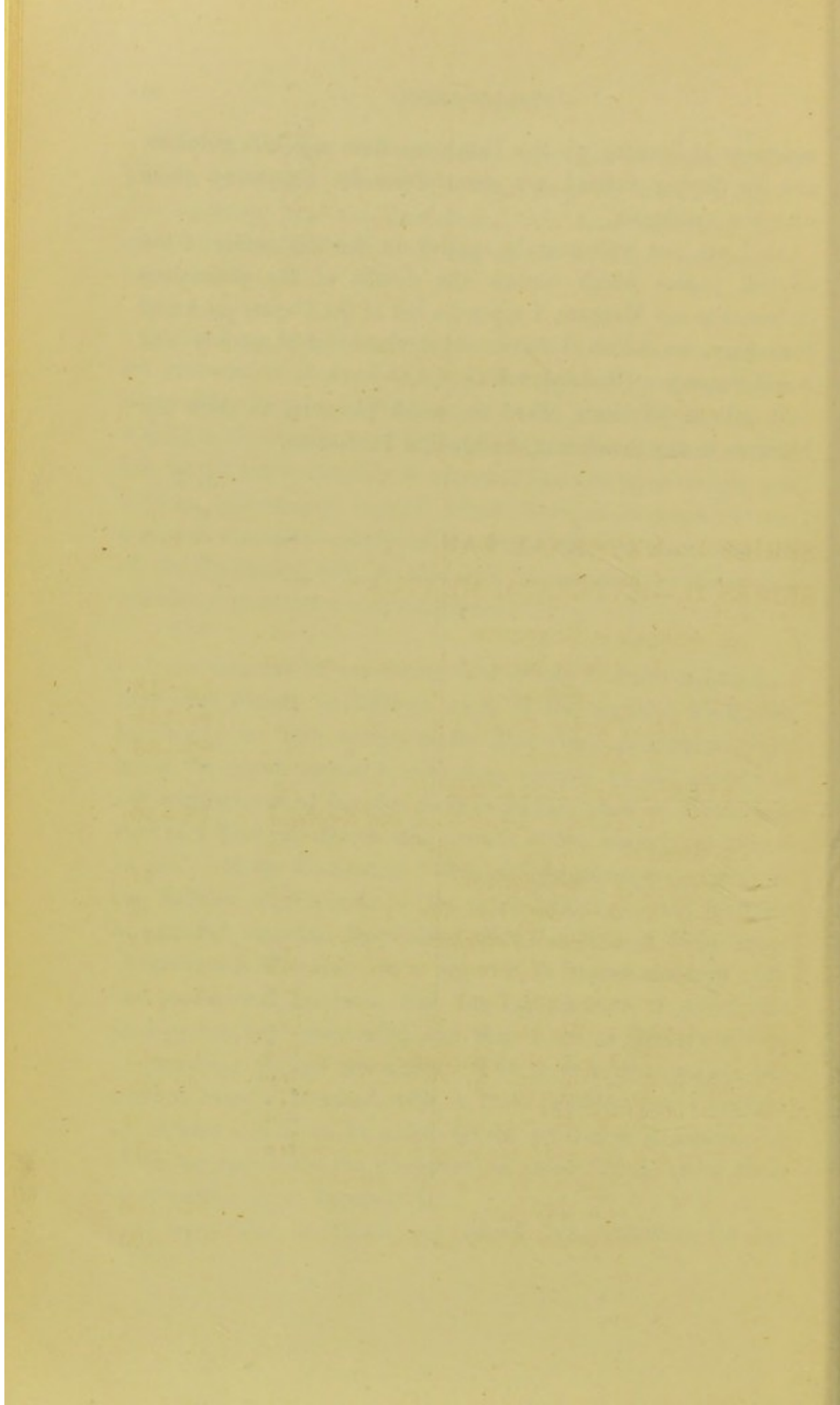
I have also to thank my friend, Mr. HINTON, for his

assistance in drawing up this Catalogue from my MS. volumes, and for having verified my descriptions by comparing them with the specimens.

As I am not unfrequently applied to for the names of the original papers which contain the details of the dissections embraced in my Museum, I append a list of the Papers on Aural Pathology, to which I have added those on Anatomy and Aural Surgery. (See Appendix.)

It will at all times afford me much pleasure, to show my Museum to any member of the Medical Profession.

J. T.



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CATALOGUE

OF

PREPARATIONS OF THE DISEASES OF THE EAR.

SERIES I.—EXTERNAL EAR.

1. A model of the external ear of a child, in which there was no meatus externus. See *Medical Times and Gazette*, No. 311, June 17, 1856.
2. A drawing of an ear, in which no external meatus existed.
3. An external ear, the lobule of which contains calcareous matter.

SERIES II.—MEATUS EXTERNUS.

A. ABNORMAL CONTENTS.

1. *Accumulation of Cerumen, and its Effects.*

- 1 *a.* Cerumen in masses.
- 2 *a.* Various specimens of cerumen, some of them containing a large quantity of hair.
- 3 *a.* Mass of cerumen filling the external meatus, and moulded upon the surface of membrana tympani.
4. Portions of cerumen presenting casts of the external surface of the membrana tympani.
5. A large mass presenting a cast of membrana tympani.
6. Masses of cerumen with hair and epidermis.

7. Osseous meatus dilated by cerumen.
8. Meatus dilated by cerumen. (See No. 160.)
9. Meatus dilated by cerumen. Membrana tympani ossified. Auditory nerve and membranous vestibule atrophied. *History*.—Male, aged 79. Could not hear a shout. Had been deaf 40 years. (See No. 160.)
10. *Left ear*. Cerumen in external meatus: absorption of part of the anterior wall. Membrana tympani thick and white.
11. Osseous meatus diseased from presence of cerumen. Membrana tympani thick and white: it is flat and connected to inner wall of tympanum by firm membranous bands.
12. The meatus was full of cerumen and epidermis. The anterior osseous wall is thin and perforated by orifices, one as large as a pea. The lower wall is rough, and presents a worm-eaten appearance. The membrana tympani is dull: the dermoid layer at the upper part is detached from the surface of the radiating fibrous layer, and there is a space between them. It is connected by membranous bands to the inner wall of the tympanum.
13. Meatus dilated from cerumen; osseous walls partly absorbed: posteriorly communicating with mastoid cells, inferiorly with the jugular fossa; cerumen projected into the mastoid cells.
14. Posterior wall of meatus rough, and dilated by cerumen; membrana tympani concave and uneven.
15. Meatus dilated from cerumen; inferior wall partly absorbed. Membrana tympani very concave, the cartilaginous ring exposed from the dilation of the meatus.
16. *Left ear*. From a male, aged 80. Deaf 12 years. Meatus dilated from cerumen: portion of posterior wall absorbed. Stapes partially ankylosed.
17. *Right ear*, from preceding case. The meatus slightly dilated at its aperture: stapes ankylosed.
18. Meatus dilated by cerumen: walls much thinned.

2. *Foreign Bodies.*

19. Meatus dilated by cotton wool and epidermis: aperture into mastoid cells: membrana tympani atrophied: malleus partly

destroyed: stapes ankylosed: labyrinth very thick and opaque.

20. From a male, aged 88. Very deaf. Meatus dilated and diseased from cotton wool and epidermis.
21. Portions of lint removed from the ear in a case in which the membrana tympani was perforated.
22. A piece of paper which had been in the meatus for six months.
- 22*a*. A piece of tobacco, which had been put into the ear for the relief of toothache. It had been there for some months.
23. A fragment of slate pencil, which was in contact with the membrana tympani.
- 23*a*. A pin removed from the external meatus; the head was in contact with the membrana tympani.
24. Some husks of rye-seeds, removed from the meatus of a petrous bone, otherwise healthy.
- 24*a*. Part of a plumstone, removed from the meatus of a child: it had been put in five months previously by a school-fellow.
- 24*b*. A percussion cap covered by cerumen. It was removed from the meatus of a woman, where it had remained, without producing any inconvenience, for 18 years.

3. *Epidermis.*

25. Epidermis, forming a complete cast of meatus externus and membrana tympani.
26. A similar cast.
27. A similar cast.
28. Thickened epidermis from the meatus.
29. Very thick, discoloured do.
30. Portions of thickened epidermis.
31. A portion of do.
32. Do. from external meatus.
33. Very thick epidermis from do.
34. Meatus, containing diseased epidermis attached to thickened membrana tympani.
35. Epidermis from meatus, which has acted as a foreign body and caused irritation.

36. Meatus very largely distended by collection of epidermis: anterior and posterior walls partly absorbed, an orifice in anterior wall near the membrana tympani, and several small orifices in the posterior wall which communicated with the mastoid cells. The membrana tympani is flat, very white and thicker than natural, the circular cartilaginous band is exposed.

B. EFFECTS OF INFLAMMATION.

1. *Dermoid Layer thick and congested.*

38. Dermoid layer thick and congested.
39. Do.
40. Do.

C. POLYPI.

1. *Fibro-Gelatinous.*

41. Two large fibro-gelatinous polypi, with small roots.

2. *Raspberry Vascular.*

42. Raspberry, or vascular polypus.

3. *Globular Vascular.*

43. Globular vascular polypus.
44 to 44g. Several specimens of the fibro-gelatinous polypus.

D. MOLLUSCOUS TUMOURS AND THEIR EFFECT ON THE BONE.

45. Small molluscosus tumour, causing destruction of upper third of membrana tympani.
46. Molluscosus tumour in situ.
47. *Right ear.* A molluscosus tumour has caused absorption of upper wall of meatus, and also of the superior wall of the tympanum, so that the dura mater was in contact with it. (See No. 50.)
48. Absorption of the posterior wall of meatus to a slight extent from the presence of a molluscosus tumour.
49. The same disease of greater extent, the cancellous structure being exposed.

50. *Left ear.* Absorption of posterior and superior part of osseous meatus from presence of molluscos tumour. (See No. 47.)
51. Absorption of posterior wall near to membrana tympani, by do.
52. The meatus contained three molluscos tumours, one at the lower part of the orifice, a second in the substance of the superior osseous wall, near the membrana tympani, the contents of which projected into the tympanic cavity; a third in the lower part of the posterior wall between the circular cartilage of the membrana tympani and its sulcus. (*Right ear.* See No. 629.)
53. The outer part of the meatus contained cerumen, the inner half was occupied by a molluscos tumour which had caused considerable dilation of the meatus. This tumour had caused the whole of the long process of the malleus to disappear by absorption, and had pressed the membrana tympani (which remained entire) inwards, so that its inner surface was in contact with the whole outer surface of the incus. The head of the malleus remains firmly attached to the incus. At the lower wall of the meatus the tumour had caused absorption of the bone near to the membrana tympani, and had produced an aperture into the tympanic cavity. The stapes was fixed more firmly than natural. The semicircular canals contained a large quantity of otconie. (John Brown, æt. 87, 1850.)
54. Osseous wall of meatus partly absorbed at lower and inferior part from presence of molluscos tumour. (See No. 487.)
55. A small molluscos tumour has caused absorption of the bone at the upper wall of the meatus. The membranous labyrinth was thick. *History.*—Male, æt. 72. Could hear a very loud voice with this ear. Deaf for many years, but much worse about four years before his death.
56. A molluscos tumour, as large as a hazel-nut, occupied the whole of the posterior part of the meatus, and projected into the mastoid cells and tympanic cavity. It had also caused absorption of the superior wall of the tympanum, producing atrophy of the dura mater, which was but slightly adherent

to the bone. Inferiorly in the meatus it had caused absorption of the lower wall, near to the membrana tympani, so that the inferior margin of that membrane was unattached, and in the tympanic cavity it had produced absorption of the lower wall, and the fossa jugularis was laid open: anteriorly it had produced an orifice in the osseous lamina, separating the cavitas tympani from the carotid canal. The superior half of the membrana tympani was entirely destroyed, and the remaining part was very thick, and had fallen in. *History*.—R. Wood, æt. 66. Acute pain in right ear, from which there was profuse discharge. He died of apoplexy.

57. Portion of the contents of the above tumour.

57a. Portion of a molluscous tumor removed during life. (Miss M., æt. 17. 1856.)

C. OSSEOUS WALLS.

1. *Lower Wall partly deficient.*

- 60. A small orifice in inferior wall of meatus.
- 61. The inferior wall of meatus incompletely developed.
- 62. Do. do.
- 63. A small orifice in inferior wall of meatus near membrana tympani.
- 64. An orifice of considerable size near the membrana tympani.
- 65. Osseous wall of meatus deficient at lower and inner part: the jugular vein was in contact with its lining membrane. Bands of adhesion in tympanum.

2. *Meatus dilated.*

- 66. Meatus dilated, especially at upper and outer part. superior wall of the tympanum imperfect.
- 67. Meatus dilated, chiefly at anterior part: superior wall of tympanum imperfect.
- 68. Meatus dilated, chiefly at upper and anterior part: superior wall of tympanum imperfect.

3. *Meatus contracted.*

70. The anterior and posterior surfaces of the lower wall of the meatus present a bulging, by which the calibre of the tube is diminished.
71. Do. do.
72. Meatus contracted near the membrana tympani by bulging of the anterior and inferior walls. The layer of bone between the mastoid cells and lateral sinus very thin.
73. Meatus narrowed by hypertrophy of anterior and inferior walls.
74. Meatus externus contained dark purulent matter. Its osseous walls are in so highly diseased and thickened a state that the passage is almost obliterated. The inferior wall is dark in colour, rough and carious. The membrana tympani is reduced to a dense mass of fibrous tissue about one-third of its natural size. The cavitas tympani is much diminished in size by the enlargement of its osseous walls and thickening of its lining membrane. The ossicula, however, still retain their position. The dura mater was attenuated and firmly adherent to the superior wall of the tympanum, and more particularly to that portion of the bone which formed the upper boundary of the meatus. The lateral sinus, also, was very firmly attached to the bone answering to the mastoid cells. The carotid canal is much narrowed by the increased thickness of its parietes, especially of the lower wall, which partakes of the thickening of the adjacent wall of the meatus. The coats of the internal carotid artery, at the point of constriction, are greatly attenuated, the external tunic having almost disappeared, and the internal one become of an opaque whiteness, hard and brittle. The internal carotid artery of the right side has undergone a similar change, though to a less extent. (*Right ear.* See No. 844.)
75. Stricture of the meatus from bulging of the inferior osseous wall. Membrana tympani greatly hypertrophied, white and opaque.
76. Meatus very small, about half the natural size.

- 77. The opposite ear, presenting a similar narrowing of the meatus.
- 78. Meatus much narrowed by bulging of the lower wall.
- 79. Meatus contracted near the membrana tympani by bulging of the inferior and posterior walls. (See No. 86.)
- 80. Meatus flattened and contracted: lower wall partly deficient.
- 81. Meatus contracted by bulging inwards of the anterior wall: membrana tympani red, thick, and tense.

4. Meatus containing Bony Growths.

- 82. Meatus contracted to about half its natural size by bony growth, chiefly from the posterior surface: surrounding bone exceedingly dense. Superior wall of tympanum imperfect.
- 83. Meatus contracted by bony growth from the posterior wall.
- 84. Meatus contracted by bony growth from inferior and posterior wall: osseous substance very dense.
- 85. From a man, aged 57. Meatus contracted by a bony growth at the posterior part.
- 86. Meatus greatly contracted by bony growths from anterior and posterior walls. Membrana tympani very concave, of a dark leaden hue. The tympanum contains numerous adhesions, connecting the malleus and membrana tympani to the promontory. (See No. 79.)
- 87, 88. In each meatus there is a bony growth from the lower half of the posterior wall.
- 89. From a man, aged 59. A bony growth at the lower part of the meatus.
- 90. Meatus contracted by bony growth from the posterior wall: carotid canal contracted.
- 91. Meatus greatly contracted by a bony protuberance from the posterior wall.
- 92. Meatus contracted by bony growth from the posterior wall. Cavitas tympani contains broad bands of adhesion.

5. Osseous Walls partly Absorbed from Inflammation.

- 94. From a patient who died from small-pox. Mucous membrane of tympanum congested: chronic inflammation of

fibrous layers of membrana tympani and of osseous meatus. The meatus contained a large mass of cerumen. The fibrous laminæ of the membrana tympani have undergone ulceration. They have entirely disappeared in the upper third of the membrane, the mucous layer, having fallen inwards, has become attached to the promontory and stapes, and formed a septum, dividing the tympanic cavity into two, which had no communication with each other. The lower one was continuous with the Eustachian tube, the upper one with the meatus externus. The long process of the incus had been absorbed: the body remained attached to the malleus; the upper wall of the tympanum was very thin and of a dark colour, a considerable quantity of blood which filled the posterior portion of the tympanic cavity was distinctly seen through it. A portion of the upper wall of the meatus externus, close to the ulcerated portion of the membrana tympani has been absorbed.

95. *Left ear.* The membrana tympani is very thick and white, especially at its circumference; it is more flat than natural. The lining membrane of the meatus is red and soft, and the epidermis very thick. The upper and posterior osseous wall of the meatus close to the membrana tympani presents an orifice about the size of a small pea, so that at this point the circumference of the membrana tympani is free and has no attachment to the bone. The stapes is fixed more firmly than natural. The tympanum contains mucus, its lining membrane is thickened. (*Right ear.* See No. 453.)
96. *Left ear.* The upper wall of the osseous meatus, at its inner extremity, presents a circular orifice two lines in diameter, which opens into the upper part of the tympanum. The upper part of the membrana tympani is attached to a membrane stretched across the lower part of this orifice. The lower part of the membrana tympani is healthy. (*Right ear,* See No. 799.)
97. *Left ear.* Lower wall of the meatus is partially absorbed. Stapes more fixed than natural. (*Right ear.* See No. 564.)
98. Meatus externus was full of cerumen: the upper and posterior

wall, at its inner extremity, has been removed, apparently by absorption, and it no longer gives attachment at this part to the membrana tympani. The inferior third of the membrana tympani is white and thick like parchment. To this part is attached the inferior extremity of the long process of the malleus. The upper two-thirds of the fibrous laminae have been entirely destroyed, leaving the mucous lamina alone persistent. This mucous lamina is concave, extremely thin and transparent, and gives attachment to the incus and malleus, its upper and posterior part is adherent by a firm membranous band to the stapes and promontory. The head of the malleus is firmly ankylosed to the upper wall of the tympanic cavity; it is also immoveably attached to the body of the incus by means of dense ligamentous fibres. The posterior conoid process of the incus has been entirely absorbed, its long process is disconnected from the stapes. The stapes is connected more firmly than natural to the circumference of the fenestra ovalis. Posterior to the incus, where the osseous wall of the meatus has been absorbed, there is a thin septum of mucous membrane, which separates the cavity of the mastoid cells from that of the meatus. The tensor tympani muscle is atrophied. The carotid canal is one-third less than natural, and the internal carotid artery is not quite half the size of that on the opposite side. The upper wall of the tympanum is thicker than natural, and its cerebral surface has lost its smooth aspect. The Eustachian tube is healthy. (*Left ear.* See No. 343. *Carotid artery.* See No. 699.) *History.*—Male, aged 60. Was able to hear the click of the nail. Period of deafness unknown.

99. The lower wall of the meatus is rough, partly absorbed, and appears to have been inflamed. Lower wall of tympanum imperfect.
100. Meatus was filled with cerumen and epidermis. The bone forming the posterior wall was rough and partly absorbed. *History.*—Male, æt. 68. He had a discharge from the ear some time since, and portions of dead bone came away.

6. *Osseous Walls carious.*

101. The meatus, at the lower and posterior part, presents a rough carious excavation, about three lines in each diameter. (See No. 110.)
102. A thin lamina of dead bone from the meatus of a child aged five years.
103. Portions of dead bone from the meatus after chronic inflammation, in a child aged five years. Discharge had existed from a month after birth, and the exfoliation of the bone was preceded by the formation of a polypus. The removal of the bone was followed by complete recovery.
104. Small portion of dead bone from the meatus, after scarlet fever.
105. A portion of dead bone from the meatus.

SERIES III.—MEMBRANA TYMPANI.

A. EPIDERMOID LAMINA.

107. The epidermoid lamina of membrana tympani thick and opaque. The stapes partially ankylosed. Otoconie more abundant than natural. (See No. 190.)
108. A mass of thickened epidermis, nearly the size of a bean, removed from the surface of the membrana tympani. The patient (aged 21) was deaf, and affected with noise in the head and giddiness; the removal of the mass of epidermis was followed by entire recovery.
109. The epidermoid and dermoid layers of the membrana tympani much thicker than natural. The dermoid layer vascular and soft.
110. The epidermoid and dermoid layers of membrana tympani thicker than natural. (See No. 101.)
- 111 and 111 a. Epidermoid lamina thick, with general thickening of the membrana tympani.

B. DERMOID LAMINA.

112. Dermoid lamina of membrana tympani thick.
113. Dermoid and fibrous laminæ of membrana tympani thick.

114. A small growth (? polypoid) from the surface of the dermoid lamina of the membrana tympani. The membrane is adherent to the promontory; mucous membrane of tympanum thick.

C. RADIATE FIBROUS LAMINA.

116. Radiate fibrous lamina thickened. The stapes was firmly attached to circumference of fenestra ovalis by thickening and solidification of the connecting membrane. (See No. 514.)
117. The opposite ear presenting similar disease. (See No. 515.)
118. Radiate fibrous lamina very thick.
119. Radiate fibrous lamina very thick.

D. CIRCULAR FIBROUS LAMINA.

120. Circular fibrous lamina thick and white. The incus was ankylosed to stapes. (See No. 643.)
121. Circular fibrous lamina thickened. There was a small quantity of mucus covering the inner portion of the meatus, the membrane was softened. The tympanic cavity contained mucus and rhomboid crystals. *History*.—Male, æt. 23. Died from small-pox on the thirteenth day. Was delirious several days; not deaf.
122. Circular fibrous lamina thick, white, and dense; causing the membrane to be more rigid than natural.
123. Circular fibrous lamina thick and white.

E. BOTH FIBROUS LAMINÆ.

124. Both fibrous laminæ thickened, especially the radiate.
125. Both fibrous laminæ very thick.
126. Both fibrous laminæ slightly thickened.
127. Fibrous laminæ of the membrana tympani inflamed. The membrane is very concave; its inner surface is adherent to the promontory; at its superior and anterior part there is a small orifice; the malleus does not appear to be attached to it. There is a semicircle of white calcareous matter near the inferior and posterior part of the circumference of the mem-

brane. The tympanum contains numerous bands of adhesion. (See No. 128.)

128. The membrana tympani is fallen in, so as to lie nearly flat against the promontory; fibrous laminæ inflamed and thickened. Mucous membrane of tympanum thick, cavity full of yellow mucus. (See No. 127.)
129. Degeneration of the fibrous laminæ after ulceration. Membrana tympani concave, very thick and yellow like cartilage; there is a large orifice anteriorly. The canalis caroticus is contracted.
130. Membrana tympani yellow and very concave. Anteriorly to the malleus the fibrous laminæ have been destroyed, and the mucous lamina is exposed over a surface three quarters of a line in diameter. The bone at the superior part of the membrana tympani has been absorbed over a surface about a line in diameter, and the mucous membrane of the tympanum is exposed. The tympanic cavity is full of bands of adhesion. The carotid canal is contracted.
131. Fibrous and mucous laminæ much thickened.
132. Fibrous laminæ ulcerated over a circular spot about a line in diameter in the anterior inferior portion of the membrane. Mucous lamina persistent.
133. A small orifice in fibrous laminæ at posterior part of membrana tympani. Mucous lamina persistent.
134. *Right ear.* The fibrous laminæ of the posterior and superior third of the membrana tympani are destroyed, the mucous lamina remaining; this portion is very concave and adheres to the stapes. The posterior and inferior two-thirds of the membrane are very thick and white. The carotid canal contracted to half its natural size. (See No. 134a.)
- 134a. *Left ear.* In the same state as the former specimen. The inferior extremity of the long process of the incus is absorbed, and the stapes is firmly attached to the membrana tympani.
135. *Right ear.* Membrana tympani more concave than natural; the posterior half is extremely thin; the fibrous coats apparently having been destroyed by ulceration, the mucous lamina only remains: it is extremely thin and flaccid, and

- its inner surface is adherent to the inferior extremity of the long process of the incus. The anterior half of the membrana tympani is thick and white like cartilage, especially at its circumference; near to the handle of the malleus it is very vascular, the vessels being large and tortuous. The superior osseous wall of the tympanum is very much thicker than natural, and it presents towards the cavity of the skull an exostosis about a line in depth, and four or five lines in circumference. The stapes is attached to the fenestra ovalis much more firmly than natural. *History*.—Male, æt. 62. Hard of hearing for many years; about three years before his death became much more deaf after a violent cold, so that he required to be spoken to in a loud voice. Could hear the click of the nail. (*Left ear*. See No. 161.)
136. Fibrous laminae of membrana tympani ulcerated at posterior and superior part; mucous lamina remaining.
137. Membrana tympani of a man, æt. 65. It is concave and thick; at the posterior part, close to the handle of the malleus, there is an orifice of oval shape, about a line in its longest diameter. The remaining portion of the membrane is white and thick like parchment, and tense. The meatus contained cerumen. The mucous membrane of the tympanum is thicker than natural.
138. *Right ear*. Meatus very red and soft, especially at the inner third. The membrana tympani consists only of some delicate fibres lined by mucous membrane: it is fallen in (with the malleus) so as to be in contact with the promontory. The head of the stapes, disconnected from the incus, pushed out the membrana tympani, and formed a slight projection. By the falling in of the membrana tympani, what was the cavity of the tympanum now forms part of the meatus. *History*.—Male, æt. 53. Thirty-seven years before his death he had an attack of fever, which caused deafness in the right ear. Thirteen years ago, after another attack of fever, he became deaf in the left ear also. With the right ear he could hear a loud voice at a distance of two feet. On the left side he required a loud voice close to the ear.

139. *Left ear.* In the same state as the previous specimen. The base of the stapes also is white, expanded and partially ankylosed.

F. MUCOUS LAMINA.

141. Membrana tympani of a boy, æt. five years, who died from scarlet fever. Deaf. The membrane was vascular, the mucous lamina thick. The tympanum was completely filled with mucus. (See Nos. 315 and 639.)
142. Membrana tympani of a girl, æt. ten years, who died from smallpox on the twenty-second day after the appearance of the eruption. Deafness originated from the attack of smallpox; she heard well previously. Her mother was deaf. *Left ear.* The membrana tympani is white, but the surface reflects the light and is smooth. The mucous lamina is very thick and white. It is three or four times as thick as the membrana tympani itself when in a natural state. There is a small space, about a line and a-half in diameter, towards the centre of the membrane, which is less thick. The tympanic cavity was completely full of thick and very tenacious mucus; this mucus consists of very large corpuscles, composed of a membranous envelope, enclosing distinct rounded granules. Some of the cells are full of granules, others contain only a few. The mastoid cells contained blood; mixed with the blood discs were granules and fine transparent scales or lamellæ. The mucous membrane of the tympanum was very thick. It partially concealed the ossicles, binding them together more firmly than natural. The epithelial cells covering this thick mucous membrane were globular, and they stood out from the surface like the vesicles of the leaves of the ice-plant.
143. Membrana tympani, the mucous lamina thick. [Smallpox.]
144. Left membrana tympani of a boy, æt. 21 months, who died of fever. The mucous lamina is very thick. The tympanic cavity is nearly filled with thick white mucus, and its lining membrane is very thick, red, and soft. The internal auditory meatus was very large. (See No. 233.)

145. Membrana tympani of woman, æt. 20, who died from typhus fever: was very deaf for five days before death. *Left ear.* The membrana tympani is thicker, softer, and whiter than natural. The mucous membrane of the tympanum was very thick, and firmly encircled the stapes, which it almost concealed. The fossa fenestræ rotundæ was concealed by it. The blood-vessels of the cochlea were distended with blood. The stapes was fixed more firmly than natural in the fenestra ovalis, owing to rigidity of the connecting membrane. (See Nos. 296 and 741. Membranous ankylosis.)
146. Membrana tympani of a woman, æt. 50, who died from pneumonia. The mucous lamina is thick; the tympanum contained bands of adhesion.
147. Membrana tympani. Mucous lamina thick.
148. Membrana tympani. Ossific matter deposited on its inner surface.

G. ALL THE LAMINÆ.

150. From a man, æt. 74, who died from apoplexy, having been deaf some years. *Right ear.* The membrana tympani is white, thick, concave; bands envelope the ossicula. The base of stapes is enlarged and fixed more firmly than natural to fenestra ovalis. (See Nos. 176, 734, 735, and 739.)
151. From a man, æt. 76. Deaf for thirty-six years: probable cause, the noise of cannon during naval engagements: could hear the click of the nail. *Right ear.* Membrana tympani very thick, its structure being converted into a yellow irregular mass, nearly as hard as bone. It is fallen in, so as to be nearly in contact with the promontory.
152. From a man, æt. 82. Deaf during many years, subject to frequent colds. Required shouting to. *Right ear.* Membrana tympani, all the laminæ thick. Stapes more fixed than natural.
153. *Left ear.* All the laminæ of membrana tympani thick.
154. Membrana tympani thick. Bands of adhesion surround the stapes.

155. Membrana tympani. All the laminæ thick and adherent to each other.
156. Membrana tympani. All the laminæ thick.
157. Membrana tympani. All the laminæ thick. Bands of adhesion in tympanum.
158. Membrana tympani. Anterior and inferior part thick and white.
159. From a man, æt. 63. Black pigment cells deposited in the membrana tympani. (Melanosis.)
160. Membrana tympani of a man, æt. 74. Deaf for forty years: could not hear a shout. It is thick like cartilage. At the lower part there is a large calcareous patch. Anteriorly there is an orifice about a line in diameter. (See No. 8.)

H. CALCAREOUS.

161. *Left ear.* (See Nos. 135 and 516.) A crescent-shaped calcareous deposit in the membrana tympani. The inferior extremity of the long process of the incus was much atrophied, and the articulation between it and the stapes much larger than natural. Stapes partially ankylosed; its base thicker than natural, and the lower border projected into the cavity of the vestibule; the crura of the bone appearing to have been pressed down, or drawn downwards by bands of adhesion.
162. From a man, æt. 70. The membrana tympani contains a small white deposit at its upper and posterior portion.
163. From a man, æt. 70. Deaf. *Right ear.* The membrana tympani contains a crescentic calcareous deposit near its lower border. Stapes partially ankylosed. The membranous labyrinth was of a dark colour, as if blood had been effused and partly absorbed. The vessels in the modiolus of the cochlea were distended; the lamina spiralis was of a dark colour, and covered by a dark soft substance.
164. Membrana tympani calcareous in parts.
165. Membrana tympani contains a large calcareous deposit ante-

riorly, the posterior part destroyed. The edges of the orifice are adherent to the stapes.

166. The membrana tympani contains a calcareous deposit.

167, 168. Small calcareous deposits in the membrana tympani.

169. Membrana tympani containing two large oval deposits of calcareous matter, in its anterior and posterior portions respectively. At its lower part the fibrous laminae are destroyed over a circular spot about a line and a half in diameter.

170. *Right ear* in the same state.

I. CONCAVE, ATROPHIED, AND RELAXED.

176. *Left ear*. The membrana tympani is more concave than natural; its surface has somewhat the aspect of ground glass, having numerous white spots upon it, which are produced by thickened epidermis. The incus and stapes are connected together and to the promontory by bands of adhesion. The base of the stapes is expanded, and it projects somewhat into the vestibule. (See Nos. 150 and 739.)

177. From a man, æt. 70. Hard of hearing for seven or eight years. *Right ear*. Membrana tympani very concave. Stapes partially ankylosed. Cochlea contains abundant pigment. (See No. 215.)

178, 179. From a man, æt. 75. Relaxation of membrana tympani. Each meatus contained several hairs. The epidermoid layer of each membrana tympani was thick and opaque, presenting the aspect of ground glass. Instead of presenting the usual convexity posterior to the malleus, each membrana tympani at this part had a lax and shrivelled aspect. When the tympanic cavity was distended with air by means of a blow-pipe, this portion assumed its natural convex aspect, but returned to its former state as soon as the pressure was removed. When pressed by a probe, it felt quite flaccid, and had the appearance of silver paper. Each carotid canal was slightly contracted.

180. Malleus partly detached from membrana tympani. From a man, æt. 46. Not deaf. *Left ear.* The membrana tympani is of normal thickness, but more flat than natural. The inferior third of the long process of the malleus is detached from the membrana tympani, and projects into the cavity of the tympanum.
181. From a man, æt. 72. Became deaf about five years before his death with giddiness, suffered much from noises in the ears, especially on the right side. Twelve months before his death he required to be spoken to in a distinct voice near to him. *Right ear.* Membrana tympani much more concave than natural, the lower extremity of the handle of the malleus being much drawn inwards. Upon looking at the internal surface, it is observed to have the shape of a funnel. The lower extremity of the long process of the malleus is detached from the membrane, and projects into the cavity of the tympanum. Membranous bands fill the greater part of the tympanum, surrounding the ossicles, and somewhat impeding their motions. One, which is very broad and strong, connects the membrana tympani to the promontory. The cochlea contains much black pigment. The membranous labyrinth is congested. (See No. 182.)
182. *Left ear.* The membrana tympani, like that of the right ear, is very concave, and the inferior extremity of the long process of the malleus is partly detached from it, *i. e.*, only a few scattered fibres connect them. Some of the fibres of the radiate lamina are very much atrophied, and others appear to have been ruptured. These changes are no doubt to be attributed to the drawing in of the membrana tympani and malleus by the membranous bands which connect them to the promontory. The circular fibres have also been ruptured in parts. (See No. 181.)
183. From a man, æt. 85. *Right ear.* The membrana tympani is delicate and atrophied, except at the part around the malleus, which was yellow and thick.
184. *Left ear.* The membrana tympani is very thin, flat, and seems to have lost its attachment to the malleus, which pro-

jects into the tympanic cavity. This atrophied condition is probably the result of inflammation of the fibrous layers.

K. CONNECTED BY BANDS TO THE INNER WALL OF TYMPANUM.

185. *Right ear.* Membrana tympani thickened, and connected by bands to the promontory.
186. *Left ear.* Membrana tympani thickened, very concave, and adherent to the promontory.
187. From a man, æt. 55. Deaf in left ear. *Right ear.* Membrana tympani healthy in structure, adherent by a broad band to the promontory.
188. *Left ear.* Membrana tympani flat, and much thicker than natural; it is firmly adherent to promontory.
189. Membrana tympani thick and opaque, at the anterior part is a narrow elongated band of calcareous matter. It is connected to the inner wall of tympanum by numerous bands.
190. Membrana tympani more concave than natural; tense; its inner surface connected to the promontory by strong bands of adhesion; ossicula rigid. (See No. 107.)
191. From a man, æt. 65. Deaf for thirty years; the deafness commencing in right ear about ten months after an injury, occasioned to it by the report of a cannon. Could only hear a very loud voice; subject to noises in the head. *Right ear.* Membrana tympani very thick, white, and opaque, especially at the posterior part; it is fallen in, and adherent to the promontory, the tympanic cavity being nearly obliterated. Stapes partially ankylosed. Lamina spiralis of the cochlea very thick.
- 192, 192 a. Membrana tympani connected to promontory by membranous bands.
193. Membrana tympani concave, thick, and white, connected by bands to the promontory.
194. Membrana tympani connected by a broad membrane to stapes and promontory, very concave.
195. Membrana tympani adherent to promontory.
196. Membrana tympani thick and opaque, connected to promontory by a broad membranous band.

197. Membrana tympani united by a thick, white membranous band to the promontory.
198. Membrana tympani partly destroyed, fallen in, connected by bands to stapes and promontory.
199. Membrana tympani connected by thin bands to promontory.
200. Membrana tympani adherent by bands to promontory.
201. Membrana tympani adherent by a broad band to promontory.
202. Membrana tympani adherent by a broad band to stapes and canal for portio dura nerve.
203. Membrana tympani adherent by bands to inner wall of tympanum.
204. Membrana tympani and incus adherent by bands to promontory.
205. Membrana tympani fallen in, connected to inner wall of tympanum by numerous firm bands of adhesion.
206. Membrana tympani perforated, and adherent to stapes and promontory.

L. FALLEN IN AND ADHERENT TO THE INNER WALL OF TYMPANUM.

210. From a man, æt. 59. Deaf. Died from pneumonia. *Right ear.* Membrana tympani nearly destroyed by ulceration; a portion at the posterior part is fallen in, and adheres to the stapes and promontory. Mucous membrane of the tympanum very thick; it was covered with purulent matter. The osseous walls of the tympanum are thick and soft, while to the upper one the dura mater adhered very firmly. From the extension of the disease the carotid canal is diminished in size. The internal carotid artery was so contracted, that on being opened at the point of contact with the wall of the tympanum, it was found wrinkled up, and presenting the appearance of an old ulcer of the intestines.
211. *Left ear.* Membrana tympani greatly thinned by disease; it is fallen in, and is in contact with the inner wall of the tympanum in nearly the whole of its extent. Carotid canal contracted.
212. From a woman, æt. 64. Died from pneumonia. *Right ear.* Membrana tympani very concave externally; it is thick,

white, and cartilaginous, and firmly adherent to the inner wall of the tympanum. The mucous membrane of the tympanum is very thick, with small patches of yellow scrofulous matter adhering firmly to its surface. The incus, the crura of the stapes, and the greater part of the malleus have disappeared, and the membranous labyrinth is very much atrophied.

213. *Left ear.* The upper half of the membrana tympani has been destroyed; the remaining portion is very thick and opaque, and firmly adherent to the inner wall of the tympanum. The mucous membrane of the tympanum is but slightly thicker than natural. The malleus and incus have both disappeared, and the stapes is adherent at its cervix to the remnant of the membrana tympani. In the bands of adhesion which connect the membrana tympani with the inner wall of the tympanum, small yellow masses of scrofulous matter, of a caseous consistence, are interspersed. The membranous labyrinth is atrophied.

214. *Right ear.* The membrana tympani has been partially destroyed; some cellular tissue, and a few fibres only remain. These fibres were attached to the malleus externally, and to the promontory internally; the lower part of the tympanic cavity has thus been obliterated. The upper part of the tympanum and the mastoid cells contain a dark, thick matter, like coagulated blood, which was visible through the upper osseous wall of the tympanum, which is translucent. The mucous membrane of the tympanum is thick, and of a dark colour. The vestibular cavity is in a diseased state, the membranous labyrinth atrophied. The dark matter in the tympanum was visible through the base of the stapes. *History.*—Male, æt. 40. Died from smallpox. Deaf: he could hear when spoken to in an ordinary tone near to his bed. He had had scarlet fever when a child; since which time he had been somewhat dull of hearing, but he was considerably worse during the attack of smallpox; he died on the eleventh day after the appearance of the eruption. (See No. 316.)

215. *Left ear.* Membrana tympani very concave and thick,

- adherent to inner wall of tympanum. Mucous membrane of tympanum very thick, covered with mucus. The fluid of the labyrinth and cochlea opaque: otoconie very abundant. (*Right ear.* See No. 177.)
- 216, 217. Membrana tympani partially destroyed by ulceration, fallen in and adherent to the inner wall of the tympanum. The membrane of the fenestra rotunda greatly thickened and of dark colour. On the right side the stapes partially ankylosed. (See *Transactions of the Pathological Society*, 1852-3, vol. iv, p. 251.)
218. Membrana tympani very concave. Inner surface in contact with promontory.
219. Membrana tympani adherent to inner wall of tympanum; containing a thick, white deposit at upper and posterior part.
220. Membrana tympani and malleus in contact with stapes.
221. From a man, æt. 71. *Right ear.* Membrana tympani fallen in and adherent to the promontory. (Left ear healthy.)
222. From a man, æt. 72. *Left ear.* The meatus was full of cerumen. The lower part of the membrana tympani is destroyed; the surface of the promontory is seen covered only by a delicate membrane. The inferior extremities of the malleus and incus are nearly in contact with, and are attached to, the promontory. The lower extremity of the incus is detached from the stapes, and the neck of the latter projects towards the external meatus. The tympanic cavity is filled by thick mucous membrane. The lower osseous wall of the tympanum is imperfect.
223. Membrana tympani, anterior half destroyed; posterior half adherent to promontory.
224. Membrana tympani absent, excepting a part of the mucous layer, which is in contact with the promontory.

M. PERFORATED.

227. Membrana tympani nearly destroyed; portions of its mucous layer adherent to stapes and promontory.
228. From a female, æt. 16. Died from fever after seven weeks illness. She was in a certain degree deaf from the com-

mencement of the attack. *Right ear.* The meatus externus contained a large quantity of purulent secretion, and the lining membrane was soft and ulcerated. The membrana tympani is destroyed, except a small portion at posterior and inferior borders. The mucous membrane of the tympanum is thick, soft, and ulcerated, the long process of the malleus has been partly absorbed. The tympanic cavity contains a thick, white matter; the mastoid cells are filled with a dense mucus. The dura mater is very loosely connected to the upper wall of the tympanum, and the periosteum of the fossa parotidea is very easily separable from the bone. The mucous membrane of the eustachian tube was healthy.

229. *Right ear.* Membrana tympani entirely destroyed, except a small, thick, white strip, about half a line in width, remaining at its circumference. The inner surface of the remnant at the point to which the malleus is attached, is bound to the inner wall of the tympanum by firm bands of adhesion, which entirely conceal the stapes. The long process of the malleus has partially disappeared, but the processus brevis is firmly adherent to the remnant of the membrana tympani. The internal part of the head of the malleus presents an exostosis of nearly equal size with the head of that bone. The surface of the malleus and incus is rough, and they are surrounded by caseous matter. The upper wall of the tympanum is dark and infiltrated with fluid. The tensor tympani muscle is atrophied to half its natural size. *History.*—Male, æt. 53. Died of pneumonia. He had become deaf after a scrofulous disease when young, and continued so during the rest of his life.
230. Membrana tympani: orifice in centre, the margin of which is adherent to the stapes. The outer part of the membrane is white and thick.
231. Membrana tympani, larger part absent; the remnant, much thickened, is adherent to the promontory. *History.*—Female, æt. 50. Had been deaf for many years.
232. The membrana tympani of a child, æt. 18 months, who died of measles. It was thick and red, the red appearance being

due to the congested mucous layer. There are two small perforations at the lower part. The tympanum contained yellow tenacious muco-purulent fluid, its mucous membrane thick and red.

233. Right membrana tympani of a boy, æt. 21 months, who died from fever. Inner surface thick: in the central part was an orifice in the mucous and fibrous coats, which was covered by thick epidermis. This epidermis having been removed, mucus escaped from the tympanic cavity. The tympanum was nearly filled by thick, white mucus, and its lining membrane was very thick, red, and soft. (See Nos. 144, and 317.)
234. From a man, æt. 61. *Right ear.* The fibrous layers of the membrana tympani, at its posterior half, have been entirely destroyed. The mucous layer has fallen inwards, and is attached to the stapes and long process of the incus. The canalis caroticus is slightly contracted. (*Left ear.* See No. 787.)
235. Membrana tympani perforated at lower and anterior part. The upper portion, with the long process of the malleus, is adherent to the promontory. The tympanum and mastoid cells contain numerous bands of adhesion.
236. *Right ear.* The whole of the membrana tympani has been destroyed except a narrow circular band, the margin of the upper portion of which is attached to the inner wall of the tympanum, just below the fenestra ovalis. The long processes, both of the malleus and incus are absent. Numerous firm bands of adhesion connect the ossicles and the remnant of the membrana tympani to the inner wall of the tympanum.
237. *Left ear.* The central portion of the membrana tympani (about the extent of a pea) was very thin and concave, and broke down on being touched. The circumference, to the depth of three quarters of a line above and half a line below, remained, and the upper part was adherent by a broad band to the inner wall of the tympanum. The long process of the malleus is absent.
238. From a man, deaf for a long time. *Right ear.* The meatus

was full of cerumen; the surface of the bone, at the posterior part, is rough, and presents small depressions. Membrana tympani opaque, very concave; at the superior and posterior part is an orifice, which communicates with the tympanic cavity; the inner surface is adherent to the promontory by a broad band.

239. *Left ear.* Meatus in same condition as that of right ear. Membrana tympani partly destroyed, and adherent to incus and stapes. The handle of the malleus is absorbed.

240, 241. From a man, æt. 64. In each membrana tympani there is a circular orifice, three quarters of a line in diameter, between the malleus and the posterior part of its circumference. This orifice was covered by the epidermoid layer, which was complete.

242. From a man, æt. 72. Membrana tympani not much thicker than natural; but at its anterior part there is an orifice about a line and a-half long by three quarters of a line broad. Near the posterior border are two very small deposits of calcareous matter.

243, 244. From a man, æt. 80. Deafness for many years, first occasioned by a cannonade. The membrana tympani in each ear is thick and white at superior part; lower part destroyed.

245. From a man, æt. 70. Very hard of hearing. *Left ear.* The inferior and posterior portions of the membrana tympani destroyed: the superior part to which the malleus is still adherent is thick, fallen inwards, and adherent to the promontory. Mucous membrane of tympanum thick. Stapes disconnected from the incus.

246. From a man, æt. 70. *Left ear.* The posterior third of the membrana tympani is destroyed, exposing the incus, stapes, and chorda tympani nerve. The anterior two-thirds of the membrane is thick and white. Right ear healthy.

247. Membrana tympani perforated at superior and posterior part: margins not thickened.

248. Membrana tympani thick and opaque; it presents an orifice a line in diameter at the anterior part: the mucous membrane of the tympanum is thick and red.

249. Posterior and superior third of the membrana tympani destroyed: the mucous layer adherent to the stapes.
250. The greater part of the membrana tympani destroyed: the margins of the orifice connected to the stapes.
251. Membrana tympani partially destroyed: adherent to promontory.
252. Membrana tympani partially destroyed: adhesions in the tympanum.
253. The membrana tympani presents two orifices at the posterior part.
254. Membrana tympani presenting an orifice at the central part: the mucous layer thick.
255. Membrana tympani presenting an orifice in the lower part: the end of the long process of the malleus has disappeared.
256. Membrana tympani adherent to promontory; mucous membrane of tympanum very thick.
257. Membrana tympani thick, and adherent to stapes.
258. Membrana tympani adherent to promontory.
- 258, 258 *a*. From a woman, æt. 60. Died from bronchitis. She had been deaf for several years; the deafness had come on gradually. There were repeated accumulations of wax in the ears, the removal of which afforded partial relief. Each meatus contained a large quantity of cerumen. Membrana tympani white, concave, the short process of malleus very prominent. The mucous membrane of the tympanum is thickened, and numerous bands of adhesion connect the membrana tympani with the inner wall of the tympanum and the ossicula with each other.
259. From a man, æt. 27. Died from consumption. Had been slightly deaf of right ear. *Right ear*. Numerous bands of adhesion connect the ossicula to each other, and the membrana tympani to the inner wall of the tympanum. Left ear healthy.
260. From a woman, æt. 40. Died from uterine disease. *Right ear*. Membrana tympani white, thick, and more concave than natural. Mucous membrane of tympanum very thick, and also white. The tympanum and mastoid cells contained a white, glairy fluid.

261. *Left ear.* In a similar condition. The membrana tympani and incus are connected to the inner wall of the tympanum by strong bands of adhesion.
- 263, 264. Membrana tympani adherent to the promontory; mucous membrane of tympanum thick.
265. *Right ear.* Membrana tympani white and thick, having an orifice in upper part. The mucous membrane of the tympanum thick and vascular, the tympanum contained a mucopurulent fluid. The left ear in a similar state. *History.*—Female, æt. 21. Died from erysipelas. When a child, she had scarlet fever, and was afterwards deaf, and troubled with a discharge from both ears.
- 266, 267. From a man, æt. 60. The membrana tympani in each ear presents an orifice.

SERIES IV.—CAVITAS TYMPANI.

A. ABNORMAL CONTENTS.

1. *Mucus and Epithelium.*

270. Mucus removed from the tympanum of a woman, æt. 22, who was deaf. (See No. 334.)
271. Mucus that escaped from the tympanum through an orifice in the membrana tympani.
272. Another specimen of tympanic mucus from the same case.
273. Thick, dark-coloured mucus from the tympanum.
274. Mucus from the tympanum.
- 275, 276. Cavitas tympani distended with mucus.
277. The tympanum contains a mass of epithelium cells, which occupies the larger part of it.
278. The tympanum contains an accumulation of epithelium.

2. *Lymph and Blood.*

279. The tympanum nearly full of firm lymph.
280. *Right ear.* The tympanum contains a mass of soft, pale substance, which surrounds the stapes, and partly conceals the other ossicles. *History.*—Male, æt. 79. Deaf for four

or five years; the deafness came on slowly from cold. The right ear was the worst. He could hear the click of the nail. He suffered from a feeling as of stopping up on the right side of the head, and from noise like the ticking of a clock; was worse during a cold. The membrana tympani, on examination, was seen to be white, concave, and thick. The act of blowing the nose was accompanied with a feeling of cracking and bursting in the ears.

- 280 *a. Right ear.* The meatus contained purulent fluid and thickened epidermis. The membrana tympani is fallen in to the promontory, of a dark colour, and thick. The anterior part of the tympanum is filled with a firm mass, resembling a partially decolourized clot: the posterior part is filled with a clot of comparatively recent blood, which appears to extend into the mastoid cells. The malleus and incus are freely moveable; the base of the stapes is somewhat less moveable than natural. *History.*—Male, æt. 79. At times, when a boy, was hard of hearing, which he attributed to bathing: for fifty years had been decidedly deaf; it varied much, being worse during a cold. He could only hear a loud voice; had a beating noise in his head. Died from cancer of the liver. (*Left ear*, see No. 701 *a.*)

3. *Scrofulous Matter.*

- 281, 282. From a girl, æt. $2\frac{1}{2}$, who died from phthisis. *Right ear.* Membrana tympani entirely destroyed by ulceration; the tympanum contained some scrofulous matter, although the lining membrane is so swollen as nearly to fill the cavity. *Left ear.* Membrana tympani thick, white, and soft; the mucous membrane of the tympanum very thick and red. The tympanum is nearly filled with a mucus so dense as to be almost solid. Examined by the microscope, this substance was found to be mucus in combination with scrofulous matter.
283. From a girl, æt. 9, who died from diseased hip and phthisis. *Left ear.* The mucous membrane of the tympanum is thick,

soft, and ulcerated. The tympanum contains serofulous matter. The stapes is entirely concealed. (Right ear healthy.)

284, 285. The tympanum of each ear is distended with serofulous matter.

4. *Calcareous Matter.*

286. The tympanum contains calcareous matter, deposited chiefly upon its inferior and posterior walls.

287. The incus dislocated, and impacted in the mastoid cells, and surrounded by calcareous matter.

B. MUCOUS MEMBRANE THICK.

288. Mucous membrane of tympanum very thick.

289, 289 *a*. From a child, æt. 7, who died with tubercles in nearly all the organs of the body. *Right ear*. Strong bands of adhesion between the membrana tympani and incus. In both ears the mucous membrane of the tympanum is thick, soft, and vascular, so as nearly to conceal the stapes, and filling the greater part of the cavity, which latter also contained mucus and serofulous matter.

290. Mucous membrane of the tympanum very thick; incus and stapes partially concealed.

291. From a woman, æt. 62. Died of gangrene. Deaf in the left ear. *Right ear*. The membrana tympani is unusually concave; its internal surface about the centre is not more than a quarter of a line from the promontory. The membrane is also, in parts, rather opaque, especially at the circumference, and its internal layer is white, and slightly thickened. The mucous membrane of the tympanum is rather thicker, and more vascular than natural, and is also very tough. A firm band of adhesion connects the cervix of the malleus with the long process of the incus, and another membranous band connects the anterior surface of the long process of the incus with the promontory and with the stapes, which latter bone

- it completely envelopes. The tensor tympani muscle is of diminished size. (Left ear, see No. 805.)
- 292, 293. From a child, æt. 6 months, who died of pneumonia. The membrana tympani of each ear is white, and contains red vessels of twice or thrice their natural dimensions. The mucous membrane of the tympanum is so thick as nearly to fill the tympanic cavity. The stapes and incus are almost concealed. The tympanum contains a white, muco-purulent matter, which is thick and tenacious, and distends the mastoid cells. [Note. This thick condition of the mucous membrane illustrates one possible mode of formation of bands of adhesion, for the mucous membrane of the promontory is here in contact with the membrana tympani and malleus.]
- 294, 295. From a boy, æt. 3, who died from scarlatina. In each ear the membrana tympani is thick, and of a reddish white hue. The mucous membrane of the tympanum is so much thickened as nearly to fill the cavity, but is not ulcerated.
296. Mucous membrane of tympanum thick; ossicula partly concealed. (For *History*, &c., see No. 145.)
297. Female, æt. 25. Died of pleuritis. *Right ear*. Membrana tympani more concave than natural. The mucous membrane of tympanum very red, thick, and soft. The dark colour of the mucous membrane of the tympanum is distinctly observable through the membrana tympani.
298. At the inferior and anterior part of the membrana tympani is an orifice about half a line in diameter, with thick margins. The mucous membrane of the tympanum is thick: the tympanic cavity contains a considerable quantity of mucous.
299. Mucous membrane of tympanum very thick: the stapes concealed.
300. Membrana tympani and mucous membrane of tympanum thick; the stapes surrounded by thickened membrane.
301. Membrana tympani and mucous membrane of tympanum thick.
302. Mucous membrane of tympanum thick around the stapes.
303. Membrana tympani and mucous membrane of tympanum

thick. Adhesions between the membrana tympani and incus.

304. Mucous membrane of tympanum very thick.

305. A portion of thickened mucous membrane of the tympanum; from a boy, æt. $3\frac{1}{2}$, who died of dysentery. (See No. 640.)

306. A portion of thickened mucous membrane of the tympanum; from a woman, æt. 20, who died from typhus fever: deaf five days before her death. (See Nos. 145 and 755.)

307. A portion of the mucous membrane of the tympanum rather thicker than natural.

C. MUCOUS MEMBRANE—EFFECTS OF SCROFULOUS INFLAMMATION.

308. From a child who died of enteritis. A degree of deafness had been perceived. *Right ear.* Membrana tympani white. The tympanum was quite full of a white, purulent mass, consisting of oleaginous globules and scrofulous granular matter. The mucous membrane is thick, and very vascular. The head of the malleus is rough, and disjoined from the incus: the tendon of the tensor tympani muscle is ulcerated and reduced to a fine thread. The incus and stapes are concealed by the thickness of the membrane. The mastoid cells are filled with pus.

308 *a.* *Left ear.* In the same general state as the right. The vascularity of the mucous membrane was imparted to the osseous wall of the tympanum, and to the membrana tympani, which is crowded with vessels.

309. Mucous membrane of the tympanum thick, from scrofula.

310. Mucous membrane of the tympanum thick, from scrofula.

311. Mucous membrane of the tympanum thick, from scrofula. Bands of adhesion uniting the ossicula.

D. EFFECTS OF MEASLES.

312. From a male infant, æt. 9 months, who died from measles. *Left ear.* The membrana tympani presents a large orifice at the posterior part. There is ulceration of the mucous

membrane of the tympanum, and the incus is disconnected from its attachments, and lies free in the tympanic cavity, which contains pus. The stapes is completely concealed by the thick mucous membrane. (See No. 333.)

313. From a male child, æt. 2 years, who died from measles. *Right ear.* Membrana tympani thick and white. The mucous membrane of the tympanum is inflamed and thickened. The tympanum contained mucus.
314. *Left ear.* The tympanum is in the same condition as that of the right ear. (No. 313.)

E. EFFECTS OF SCARLATINA.

315. From a boy, æt. 5, who died from scarlatina. The tympanum was completely filled with mucus; the mucous membrane thick and vascular. (See Nos. 141 and 639.)
316. A portion of greatly thickened mucous membrane from the tympanum of a man deaf since scarlatina in early life. (See No. 214.)
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317. Portion of thickened mucous membrane of the tympanum from a boy, æt. 21 months, who died from fever. (See No. 233.)
318. Mucous membrane of the tympanum thick from smallpox.

F. MUCOUS MEMBRANE—EFFECTS OF ACUTE INFLAMMATION.

319. Dermoid meatus, membrana tympani, and mucous membrane of tympanum of a red colour, and containing numerous vessels distended with blood. Bands of adhesion in tympanum and mastoid cells. *History.*—Male, æt. 22. Three weeks before death complained of pains in right ear, as if a foreign body were there. The pain became very severe. Died of fever, after a week's illness. Ulceration of ileum.
320. Mucous membrane of tympanum in a state of acute inflammation.
321. Mucous membrane of tympanum (acutely) inflamed, of a deep red colour, and thick.

322. Mucous membrane of the tympanum and mastoid cells, of red colour, and thick.
323. Mucous membrane of the tympanum of a pale red colour.
324. Mucous membrane of tympanum inflamed. The tympanum contains numerous bands of adhesion of a deep red colour. Membrana tympani perforated at anterior and lower part.
326. From a woman, æt. 38, who died of dropsy. Deaf. *Right ear.* The membrana tympani is rather dull towards the posterior and superior part, and a round fleshy-looking substance is visible beyond it. The membrane is also much more concave than natural; and at its central region there is a round portion, about a line in diameter, which is white. The surface is smooth and shining, and the white appearance evidently arises from the presence of some substance near its internal surface. The tympanum is nearly filled by a firm gelatinous-looking substance of a red hue, and which is the mucous membrane of the tympanum in a highly tumified condition. This is the substance which was seen through the membrana tympani, the inner surface of which being in contact with the mucous membrane covering the promontory explains the peculiar appearance of its central region. The handle of the malleus is also in contact with the mucous membrane of the promontory; a small quantity of mucus existed in the tympanic cavity. The membrana tympani appears to be drawn inwards, at its upper and posterior part, by adhesions which connect it firmly with the inner wall of the tympanum.
327. *Right ear.* Membrana tympani white and soft, and in a state of ulceration; towards the upper and posterior region there is a small orifice. Mucous membrane of tympanum thick, soft, and ulcerated. The tympanum contains a large quantity of white muco-purulent matter. The dura mater is separated from the mucous membrane of the tympanum by a very thin layer of bone, to which the latter is very slightly attached. The left ear was healthy. *History.*—Female, æt. 29. Died of jaundice, with diseased liver and kidneys. She was deaf in the right ear, in which she had had

- frequent gatherings, ending in copious discharges. She also suffered from violent pains in the head, which at times were almost intolerable, but these were relieved by the discharge.
328. From a man, æt. 28. Died of apoplexy. He was slightly deaf. *Right ear.* The surface of the membrana tympani is smooth, but at its posterior part, for the space of three-quarters of a line close to its attachment, there is a band of a red colour. The mucous membrane of the tympanum is generally red and thick, but more especially that portion of it, for the distance of three-quarters of a line, which coats the inner surface of the membrana tympani.
- 329, 330. From a child, æt. 2½, who died from consumption. In each ear the membrana tympani is thick and soft and of a white colour. The mucous membrane of the tympanum is thick and soft, and the tympanic cavity full of muco-purulent matter.
- 331, 332. From a child, of one year old, who died from hydrocephalus. It was scrofulous. The mucous membrane of the tympanum in each ear is red, and swollen to four or five times its natural thickness. The cavity is full of yellowish white mucus, which, to the naked eye, wears the appearance of pus, except that it is more tenacious. The osseous walls of the tympanum are red, and the lower wall which separates it from the jugular vein is dark-coloured. The mastoid cells are nearly filled by the thickened lining membrane. The membrana tympani of the left ear presents a large ulcerated orifice about its centre.
333. *Right ear.* From an infant, æt. 9 months, who died from measles. The mucous membrane of the tympanum is red, soft, and pulpy.
334. From a woman, æt. 22. Deaf. Died from diseased heart. *Right ear.* Membrana tympani much more concave than natural; its circumference, for the extent of half a line, is white and thick. It is adherent to the inner wall of the tympanum by firm membranous bands. The mucous membrane of the tympanum and mastoid cells is much thicker and softer than natural. (See No. 270.)

335. *Left ear.* The mucous membrane of the tympanum is thick and soft.
- 336, 337. From a child, who died from scrofula. The mucous membrane of the tympanum in each ear is very thick.

G. MUCOUS MEMBRANE ULCERATED.

338. From a man, æt. 68. Deaf in right ear. *Right ear.* Membrana tympani destroyed; the lower two-thirds of the long process of the malleus removed. The mucous membrane of the tympanum ulcerated, the cavity full of thick soft membrane, and offensive discharge. Upper wall of tympanum of a green colour.

H. CONTAINING MEMBRANOUS BANDS OF ADHESION.

340. From a man, æt. 67, who died of gangrena senilis. *Left ear.* The meatus externus contained a collection of cerumen lying in contact with the membrana tympani, which is more concave than natural. The whole of the inner surface of the long process of the malleus is connected by a strong band of adhesion to the stapes and the inner wall of the tympanum. The stapes is entirely hidden, and the mucous membrane, covering the ossicula and lining the mastoid cells, is very much thickened. (*Right ear.* See No. 761.)
341. From a man, æt. 44, who died of a diseased bladder. He had been growing gradually deaf during many years. The eustachian tube was pervious. *Right ear.* The meatus contained a large quantity of cerumen. Membrana tympani white, shining, and concave. The mucous membrane of the tympanum is thick, and bands of adhesion connect the stapes, malleus, and incus to the membrana tympani.
342. From a man, æt. 70. Died of disease of the heart. Hard of hearing. *Right ear.* Membrana tympani dull like lead, but not much thicker than natural; the tympanum completely full of cellulo-fibrous tissue, which connects the ossicles and the membrana tympani to the promontory.
343. *Left ear.* The meatus contained cerumen. Membrana

tympani soft, flaccid, and as if sodden; it is of a leaden hue, the handle of the malleus being scarcely visible: at its circumference, for the breadth of a line, there is a band of a darker colour than the central part; this is produced by thickening of the mucous lamina. The mucous membrane of tympanum is slightly thicker than natural: the posterior and superior part of the cavity is full of a firm membranous cellular tissue, apparently organized lymph, which surrounds the upper part of the malleus and incus, connecting them together, and to the stapes. (See No. 98.)

344. From a man, æt. 76. *Right ear.* The membrana tympani is concave, and the inferior extremity of the malleus is detached from it and projects into the cavity of the tympanum. Numerous firm bands of adhesion connect the malleus and other ossicles to the inner wall of the tympanum. The canal for the superior petrosal nerve is as large as a crow's quill.

345, 346. *Right ear.* Membrana tympani thick and concave. Numerous bands of adhesion connect the ossicles to the tympanic walls, and to the membrana tympani. Ossicles not so moveable as natural. *Left ear.* Membrana tympani destroyed, except a narrow portion posteriorly: the ossicula remain, and are connected to each other and to the tympanic walls by broad bands of adhesion. The tympanum contained secretion of black colour. *History.*—Male, æt. 70. Had been deaf in the left ear since the battle of Trafalgar: for three weeks after the battle was almost entirely deaf, but afterwards became better. During the four years preceding his death became more deaf: subject to noises of a tinkling character in the left ear during a cold. Could hear a watch on pressure over the right ear: with the left could hear a click of the finger nails.

347, 348. *Right ear.* Membrana tympani: lower two-thirds destroyed, the lower margin of the upper third is connected to the thick mucous membrane of the tympanum, which shuts off the mastoid cells from the tympanic cavity. The mastoid cells were full of a dark-coloured serous fluid, epi-

thelinm and cholesterine. Mucous membrane of tympanum very thick. Labyrinth healthy. *Left ear.* In the same state as the right ear, except that the fluid in the mastoid cells was transparent. The stapes was fixed. The mastoid cells were separated from the tympanic cavity by a distinct band between the inner wall of the tympanum and the upper part of the membrana tympani. *History.*—Male, æt. 67. Had been deaf for thirty or forty years after a naval engagement: was subject to roaring noises in both ears, which sometimes ceased for a day or two. At times there had been discharge from both ears. Up to about two years before his death he could hear the click of the finger nails with each ear, but before he died he became unable to hear the voice.

- 349. A portion of some bands of adhesion removed from the tympanum of a man, æt. 84.
- 350. The same, treated with acetic acid.
- 351, 352. Bands of adhesion connecting the malleus to the incus and promontory. Superior wall of the tympanum partly deficient.
- 353. Bands of adhesion connecting the malleus to the stapes and promontory.
- 354, 355. Bands of adhesion connecting the stapes to the inner wall of the tympanum.
- 356, 357. Bands of adhesion connecting the membrana tympani, malleus, and incus, to the inner wall of the tympanum.
- 358. A broad band of adhesion connecting the incus to the membrana tympani.
- 359. Bands of adhesion connecting the incus to the membrana tympani, and also to the stapes and inner wall of the tympanum.
- 360. All the ossicula connected to each other, and to the inner wall of the tympanum, by numerous bands of adhesion.
- 361. Base of the stapes entirely surrounded by delicate bands of adhesion.
- 362. Bands of adhesion connecting the malleus and incus to the tendon of the tensor tympani muscle.

363. A broad band of adhesion between the long processes of the malleus and incus, which are considerably approximated.
364. Incus and stapes connected to each other, and to the walls of the tympanum by bands of adhesion. The stapes entirely embedded in them.
365. All the ossicula connected together, and to the walls of the tympanum by bands of adhesion.
366. Malleus adherent by bands to the incus, and to the inner and upper wall of the tympanum: broad bands of adhesion in the mastoid cells.
367. Membrana tympani connected by a band of adhesion to the incus; also the tendon of the stapedius muscle to the promontory.
368. Bands of adhesion connecting the incus and stapes to the inner and superior wall of the tympanum.
369. The membrana tympani and all the ossicula connected together, and to the inner and posterior walls of the tympanum by bands of adhesion.
370. Bands of adhesion connecting the membrana tympani to the malleus, incus, and stapes. The stapes connected to the adjacent portions of the tympanic wall, especially to the promontory.
- 371, 372. Membrana tympani connected by bands of adhesion to the ossicula and promontory.
373. Thick bands of adhesion, enveloping all the ossicula, and connecting the membrana tympani to the promontory.
- 374, 375. Bands of adhesion connecting the membrana tympani to the long process of the incus.
376. Bands of adhesion connecting the membrana tympani to the incus, and the incus and stapes to the walls of the tympanum.
377. Bands of adhesion connecting the membrana tympani and malleus to the long process of incus and promontory. The membrana tympani is more concave than natural.
378. Bands of adhesion connecting the malleus to the superior and internal walls of the tympanum. Membrana tympani very concave, being almost in contact with the promontory.
379. Malleus connected by bands of adhesion to the long process

of the incus, and to the tendon of the tensor tympani muscle.

380. Broad bands of adhesion connecting the malleus to the superior and inner wall of the tympanum, and the long process of the incus to the posterior margin of the membrana tympani.

381 to 385. Bands of adhesion connecting all the ossicula together, and to the inner wall of the tympanum.

386 to 389. Bands of adhesion connecting the incus and stapes to the inner wall of the tympanum.

390 to 394. Bands of adhesion surrounding the stapes, and attaching it to the inner wall of the tympanum.

397, 398. From a girl, æt. 11, who died from phthisis. *Right ear.* Membrana tympani opaque, and very concave. At its posterior part is an orifice of a line in diameter, through which the fenestra ovalis is seen. The margins of this orifice are smooth and defined; the upper one is attached to the neck of the stapes. The mucous membrane of the tympanum is slightly thickened; the cavity contains a small quantity of mucus, which the microscope shows to be composed of epithelial corpuscles. The posterior portion of the membrana tympani is attached by fine adhesions to the stapes and inner wall of the tympanum. The upper third of the long process of the incus has disappeared, and it is no longer attached to the stapes. *Left ear.* Membrana tympani opaque and thick, and more concave than natural. At its posterior part a defined portion of the membrane, to the extent of two lines in length, and one in breadth, is much thicker, and quite white, probably in the first stage of calcareous degeneration. The surrounding portion of the membrane has an increased vascularity. The mucous membrane of the tympanum is thick and soft, and exhibits innumerable large vessels distended with blood. The tympanum contains muco-purulent fluid. The stapes is almost entirely concealed in the thick, soft and vascular membrane. In this case the right ear presents traces of former disease, from which it had, to a certain extent, recovered. The left ear was in a state of active

disease at the time of death. *History*.—The patient was in the hospital for six weeks previous to death, and was not supposed to be deaf until a few days preceding that event, when she complained of great pain in the left ear, accompanied with deafness. No doubt, however, can exist that she was deaf in the right ear during a considerable period, though the deafness was not detected until the left ear became diseased.

399. Bands of adhesion extending across the tympanum; stapes firmly fixed.
400. From a man, æt. 30, who died of bronchitis. Bands of adhesion surrounding the stapes.

I. CANAL FOR THE PORTIO DURA NERVE IMPERFECT.

401. The osseous wall of the canal for the portio dura nerve is deficient for a narrow space, about three-quarters of a line in length, in the upper part of its course around the tympanum, the neurilemma of the nerve being in contact with the tympanic mucous membrane.
402. The osseous walls of the canal are entirely wanting throughout the greater part of its course around the tympanum.
403. The canal is deficient at the superior and inferior thirds.
404. The canal is deficient at the inferior two-thirds.
405. The osseous walls of the canal are deficient for a space of about a line and a half above the fenestra ovalis, and at the inferior fourth.
406. The osseous walls of the canal are wanting superiorly and inferiorly; in the central part of its course the nerve is separated from the tympanic mucous membrane by a very thin and translucent lamina of bone.
407. The canal is deficient at the superior third.
408. The canal is deficient at the superior and inferior portions.
409. The canal is deficient at the middle third.

K. SUPERIOR OSSEOUS WALL HYPERTROPHIED.

- 410, 410*a*. From a man, æt. 85, who had been deaf for many years. *Right ear*. The meatus externus contained a large mass of hardened epidermis, pressing on the membrana tympani, which is opaque. The tympanum contained mucopurulent fluid. The superior wall of the tympanum is greatly hypertrophied, being more than half an inch in thickness. The canal for the carotid artery is greatly contracted. *Left ear*. The superior wall of the tympanum is similarly hypertrophied. The canal for the carotid artery is contracted to a less degree.

L. SUPERIOR OSSEOUS WALL EXPANDED.

411. The tympanic cavity is so expanded that its superior and posterior walls are so thin as to be translucent.

M. SUPERIOR WALL PARTLY DEFICIENT, THE MUCOUS MEMBRANE OF THE TYMPANUM BEING MORE OR LESS IN CONTACT WITH THE DURA MATER.

412. Orifice in the roof of the tympanum, about three lines in length by one and a-half in breadth, exposing the head of the malleus. The mucous membrane of the tympanum is nearly continuous across the orifice. The membrana tympani is partly destroyed, and adherent to the promontory. Bands of adhesion connect the malleus and stapes to the inner wall of the tympanum.
- 412*a*. A very small orifice in the roof of the tympanum, which is generally thin and translucent.
413. Several small orifices in the roof of the tympanum; the mucous membrane of the tympanum continues across them.
414. A large orifice in the roof of the tympanum, above the attachment of the posterior crus of the incus, and a smaller one corresponding with the commencement of the eustachian tube.

415. The bone partially deficient over a large part of the roof of the tympanum ; the mucous membrane continuous.
- 416, 417. Several small orifices in the roof of the tympanum ; the bone, to a great extent, translucent.
418. A large part of the roof of the tympanum deficient : several small orifices in the plate of bone forming the roof of the mastoid cells.
419. An orifice of square form, and about four lines in diameter, in the posterior portion of the roof of the tympanum ; it is traversed at right angles by narrow bands of bone. There are several small orifices in other portions of the bone.
420. The larger portion of the upper wall of the tympanum is absent ; numerous small osseous laminæ, arranged perpendicularly, are observed, which project into the cerebral cavity slightly above the level of the surrounding bone. This orifice is three-quarters of an inch long, and half an inch broad ; a crescent-shaped band of bone, about half a line in diameter, divides it into an outer larger, and an inner smaller portion. In this case the prominence of the vertical laminæ of bone affords evidence that the defective state of the tympanic wall is the result of arrest of development, and has not been produced by pressure of the brain, as supposed by some pathologists. The crescentic band of bone, which is so well marked in this specimen, may be less distinctly observed in many others, especially in Nos. 421, 422, and 423.
421. A large irregular orifice, involving the larger part of the roof of the tympanum ; a crescentic band of bone, passing in a direction inwards and forwards, divides it into two nearly equal parts.
422. The larger portion of the roof of the tympanum is deficient ; numerous vertical laminæ of bone occupy the posterior portion of the orifice.
423. Roof of the tympanum very thin, and in parts deficient ; at the external and posterior part there is a large orifice, across which the mucous membrane is continuous.
424. Roof of the tympanum deficient for a space nearly an inch in length, and about a line in breadth, extending from within

outwards and backwards. Anteriorly to the tympanum, and near the junction of the squamous, with the petrous portion of the temporal bone, there is a depression extending into the cancellous structure, about three lines in length by one in breadth.

425 to 429. Roof of the tympanum deficient to a slight extent: the mucous membrane continuous.

430 to 432. A small orifice in the posterior portion of the roof of the tympanum.

433 to 450. Orifices of considerable size in the roof of the tympanum, which is generally thin and translucent.

N. THE INFERIOR OSSEOUS WALL DEFICIENT, THE MUCOUS MEMBRANE OF THE TYMPANUM BEING MORE OR LESS IN CONTACT WITH THE OUTER SURFACE OF THE JUGULAR VEIN.

453. *Right ear.* Membrana tympani flatter and much thicker than natural; the lower half is white, like parchment; the mucous membrane lining the tympanum is thick, especially the portion surrounding the ossicula: the cavity contained mucus. The layer of bone between the jugular vein and the tympanum is incomplete. The stapes is fixed more firmly than natural in the fenestra ovalis. From a man, æt. 54. (See No. 95.)

454. From a man, æt. 60. The lower wall of the tympanum is formed by a membrane, in which a small plate of bone is deposited. The membrana tympani was very concave.

455. The lower wall of the tympanum is formed partly by a very thin and translucent plate of bone, and partly by a membrane. It presents an orifice of oval shape, and about a line in length.

456. The lower wall of the tympanum is very thin, and presents an irregular triangular orifice, about a line and a half in diameter.

457. The larger portion of the lower wall of the tympanum consists of membrane only.

458. The lower wall of the tympanum is very thin and translu-

- cent; for a space, about the size of a small pea, it consists of a layer of membrane, containing a little osseous deposit.
459. The lower wall of the tympanum is very thin and translucent, and perforated by many minute orifices.
460. Lower wall of the tympanum translucent, and presenting a small oval orifice.
461. An orifice in the lower wall of the tympanum of the size of a small pea, with two or three minute orifices around it. The lower wall of the meatus externus also presents an orifice about the size of a mustard-seed.
462. The larger portion of the lower wall of the tympanum is deficient.
463. The lower wall of the tympanum is entirely absent, except a very thin lamina of bone at the inner angle.
- 466, 467, 468. The lower wall of the tympanum is perfect, but exceedingly thin and translucent.
469. Lower wall of the tympanum imperfect in several places.
470. Lower wall of the tympanum presenting several minute orifices.
- 471 to 476. The lower wall of the tympanum consists, in part, of membrane only.
- 477 to 480. The lower wall of the tympanum is deficient in parts.
482. There is an orifice in the layer of bone between the lateral sinus and the mastoid cells, which allows of a communication between the two cavities.

SERIES V.—EUSTACHIAN TUBE.

A. DILATED.

484. Eustachian tube very large; there is an orifice, the size of a small pea, between it and the canal for the internal carotid artery, so rendering that canal continuous with the cavity of the tympanum.

B. STRICTURE.

485. Stricture of the Eustachian tube; the mucous membrane covered by dense fibrous tissue.
486. *Left ear.* The central portion of the membrana tympani is white and thick; the lateral portions are extremely soft and attenuated. The tympanum and mastoid cells were filled with white, thick mucus, and no air was discoverable in them. The mucous membrane of the tympanum was thicker than natural. The internal portion of the Eustachian tube, for the length of half an inch, is healthy; but at about that distance from the tympanum there is a sudden constriction, and for the length of about a line and a half the tube is so contracted, that even when the anterior wall was removed, it was with difficulty that a bristle could be introduced into the opening. The cause of the stricture appears to be an enlargement of the external and internal walls of the tube. The external osseous wall is, at this part, twice its natural thickness, and somewhat rough; the internal wall is forced outwards by dilation of the carotid canal. The mucous membrane of the tube was healthy. *History.*—Male, æt. 45. Died of phthisis. Had become gradually deaf in the left ear for six or seven years. (See *Monthly Journal of Medical Science*, August, 1850.)
487. *Right ear.* Eustachian tube obstructed by hypertrophy of its bony walls. The tympanum was full of a dark, slate-coloured fluid, which gave a colour to the membrana tympani, and to the upper wall of the tympanum. Membrana tympani concave, thick, and containing, except at its upper fourth, a broad crescentic layer of calcareous deposit. *History.*—Male, æt. 70. Became deaf about four years before his death, after sleeping in a damp bed. He required to be spoken to in a loud voice within two yards. There was cerumen in the meatus on each side, after the removal of which he could hear a watch upon pressure on the ear on the right side. On the left, he could only hear the click of the finger-nails. (*Left ear.* See No. 54.)

488. Eustachian tube impervious at its entrance into the tympanic cavity. Membrani tympani very thick.

489, 489 a. *Right ear.* The Eustachian tube was so much contracted at the part where the cartilaginous is continuous with the osseous portion, that it only just admitted the passage of an ordinary-sized pin, which it firmly embraced. On withdrawing the pin, and looking through the orifice, it was observed to be a mere point. The stricture depends upon the enlargement and projection towards its cavity of the cartilaginous walls of the tube, which, however, appear to be simply hypertrophied, and not affected with disease. The mucous membrane lining the tube, and also that of the tympanum are healthy. The membrana tympani was also healthy. The base of the stapes was so firmly fixed, that upon endeavouring to remove it the crura were separated from it. Upon opening the vestibule, the membrane surrounding the base of the stapes was seen to be thicker and more rigid than natural. The otoconie appeared more abundant and whiter than usual. *Left ear.* The Eustachian tube was contracted by disease of the cartilaginous portion, but it was not possible to say to what extent it was closed, as the anterior wall had been broken up. On the posterior wall there was a bulging of the cartilage, which, with a similar one anteriorly, greatly diminished the calibre of the tube. The tympanum contained thick, white, viscid mucus: the membrana tympani, and mucous membrane of the tympanum were thicker than natural. The stapes adhered more firmly than natural to the margin of the fenestra ovalis; the vestibule contained a reddish fluid, and the bloodvessels were large, and distended with blood. *History.*—Male, æt. 66. Had been deaf for about seven or eight years. The affection was attributed to a cold, and had been attended with pain in the ears. He suffered from ringing noises in the left ear. There were sometimes cracks on the right side, after which he heard better for a time. About a year before his death, he was able to hear the click of the finger-nails on each side.

490. *Right ear.* Eustachian tube obstructed by a bulging of the

anterior bony wall. Membrana tympani concave, posterior part very thin, and composed of very delicate, cellular tissue. The left ear was in a similar condition. *History*.—Male, æt. 66. Had been deaf for forty-two years, having first become so from the firing of a piece of ordnance. He was at first rendered entirely deaf, but after some weeks he began to improve, and continued to improve for some twenty years. Since then he has become worse, and two years before his death he required to be spoken to in a loud voice. He suffered from “noises like a din.”

C. OBSTRUCTED BY FIBRINE.

491. Eustachian tube and tympanic cavity full of dense fibrine.

SERIES VI.—OSSICULA.

A. ANKYLOSIS OF THE STAPES TO THE FENESTRA OVALIS.

- 492, 493. From a man, æt. 64, who died from asthma. The stapes of each ear is ankylosed by bony union to the circumference of the fenestra ovalis. The ears are in other respects healthy.
494. From a man, æt. 52, who died from dropsy. He was deaf. *Right ear*. The membrana tympani is smooth externally, but opaque from thickening of its mucous layer. The mucous membrane of the tympanum is very thick, and the stapes is completely ankylosed to the margin of the fenestra ovalis.
495. From a woman, æt. 36, insane: deaf, especially in the right ear; died from consumption. *Right ear*. Membrana tympani; posterior two-thirds destroyed by ulceration; what remains is in a state of ossific degeneration; the seat of the bony deposit being in the fibrous laminæ of the membrane. The mucous membrane of the tympanum is so much thickened that the stapes scarcely projects from the fenestra ovalis, to the margin of which it is firmly ankylosed. The disease has extended from the tympanum to the carotid

canal, the internal wall of which is much thickened, and its calibre reduced to a third less than the natural size. The external wall of the carotid canal is also deficient in more than one place, leaving at those points the mucous membrane of the tympanum in contact with the external surface of the internal carotid artery. The membranous labyrinth is much atrophied, and its peculiar fluids deficient in quantity. The base of the stapes is seen projecting into the cavity of the vestibule, being three or four times its natural thickness, and perfectly white.

496. From a woman, æt. 34, who died after an attack of fever, which lasted six weeks. She was insane; so deaf that she could not hear a shout. She had had several attacks of fever. *Left ear.* Mucous membrane of the tympanum thick. Only a small portion of the crura of the stapes was seen, the larger portion being hidden in the cavity of the vestibule. The base of the stapes is completely ankylosed to the fenestra ovalis. In both ears the labyrinthine humours were very deficient.
- 497, 498. From a man, æt. 36, who died from phthisis. He was deaf in both ears, but especially in the right. The stapes in each ear is partially ankylosed to the fenestra ovalis. In the right ear the fluids in the vestibule are much diminished in quantity.
499. From a man, æt. 64, who died from pneumonia. He had been deaf in the left ear from childhood, having had a scrofulous affection of the ear. *Left ear.* The membrana tympani is almost entirely destroyed; a fragment remains posteriorly, which is fallen in and adherent to the promontory, and a small portion is still attached to the long process of the malleus. The tympanum contained a small quantity of pus; its mucous membrane is dark-coloured and much thickened. The stapes is fixed more firmly than natural in the fenestra ovalis. The carotid canal is slightly contracted. The right ear was healthy.
500. From a woman, æt. 48, who died from cancer. She was not very deaf. The stapes in each ear was almost com-

pletely concealed by the thickened mucous membrane of the tympanum, and by bands of adhesion.

501. Stapes partially ankylosed.

502, 503. From a man, aged about 50. Deaf. *Right ear.* The meatus externus was white and deprived of cerumen. Membrana tympani and mucous membrane of the tympanum healthy. The base of the stapes is expanded, and projects into the cavity of the vestibule, so as to form within it an oval protuberance which is smooth, of an opaque white colour, and firmly adherent to the vestibular parietes. The walls of the vestibule are perfectly healthy, and may be distinguished from the base of the stapes by their difference of colour. The crura of the stapes are disconnected from the base. *Left ear.* Meatus externus dry, and deprived of cerumen. Stapes completely and firmly ankylosed to the margin of the fenestra ovalis; it is entire. (See *Medico-Chirurgical Transactions*, vol. xxiv.)

504, 505. From a woman, æt. 79, who died from gangrena senilis. She had been deaf for several years; the disease commenced by a succession of attacks of earache. *Right ear.* The membrana tympani is white and thicker than ordinary parchment, to which it bears a great resemblance. The mucous membrane of the tympanum is thick: the base of the stapes is firmly ankylosed. *Left ear:* in the same state. (See *Monthly Journal of Medical Science*, March, 1849, p. 569.)

506. Stapes firmly ankylosed, a broad band of adhesion occupying the posterior part of the tympanum, and covering the fenestra rotunda. (See No. 733.)

507, 508. Base of the stapes expanded; bands of adhesion in the tympanum, mucous membrane thick.

509. Stapes ankylosed. Tympanum containing numerous bands of adhesion.

510. The lower and posterior third of the base of the stapes is ankylosed to the margin of the fenestra ovalis.

511. From a woman, æt. 87. Deaf during a few years preceding death. *Right ear.* The meatus externus was dry, and con-

tained no cerumen. The membrana tympani was more concave and tense than natural, the fibrous laminæ white and slightly thickened. The stapes is fixed more firmly than natural to the margin of the fenestra ovalis. The tympanum contains numerous bands of adhesion, connecting the ossicula, and especially the stapes, firmly to the inner wall of the tympanum. The left ear was in a similar condition. (See *Monthly Journal of Medical Science*, February, 1849, p. 523. Mrs. L.)

512. *Right ear.* Stapes completely ankylosed, the surface articulating with the os orbiculare more flat than natural. The malleus connected to the incus by bands of adhesion, tensor tympani muscle atrophied. The membrane of the fenestra rotunda is thickened. The cochlea had a deep red colour, the cochlearis muscle (*Todd and Bowman*) was larger than natural. (See No. 746.) In the left ear the stapes was also completely ankylosed, and the membranous vestibule thickened. (See No. 724.) *History.*—Male, æt. 48. Deaf for about five years before death: could hear a shout on the right side, no sound at all on the left. The deafness commenced during a very severe ulceration of the throat after syphilis.
513. From a man, æt. 50, who died from hæmoptysis. *Left ear.* Membrana tympani whiter and thicker than natural, the thickening depending on hypertrophy of the mucous lamina. The stapes was surrounded by bands, and was adherent to the margin of the fenestra ovalis more firmly than natural.
- 514, 515. From a man, æt. 80. Very deaf. In each ear the stapes is firmly attached to the margin of the fenestra ovalis by means of thickening and solidification of the connecting membrane. The crura of the stapes are much atrophied. (See Nos. 116 and 117.)
516. Stapes firmly attached to the margin of the fenestra ovalis, so that some force was required to move it. Upon examining the cavity of the vestibule, the base of the stapes is observed to be thicker than natural, and the lower border

projects into the vestibule, the crura of the bone appearing to have been pressed down, or drawn downwards by the bands of adhesion which connect it to the inner wall of the tympanum. (Deaf. See Nos. 135 and 161.)

- 517, 518. From a man, æt. 65. *Right ear.* The meatus externus was distended by cotton-wool; the lining membrane was more vascular than natural. The stapes adhered to the margin of the fenestra ovalis more firmly than natural, so that, upon being withdrawn, a small portion of it remained in contact with the margin of the fenestra. *Left ear.* The meatus externus was distended by cerumen. The stapes was much smaller than natural, the space between the crura being one-third less than natural; the base also is diminished in size. The fenestra ovalis is smaller than that of the right side, being partially obliterated by a deposit of bone.

518*a.* The stapedes from the above case.

519. *Left ear.* The external meatus was full of cerumen. Membrana tympani very concave, the epidermoid and fibrous laminae thick and opaque. The ossicula are less moveable than natural. The mucous membrane of the tympanum is thick, and bands of adhesion connect the ossicula. The base of the stapes is so firmly fixed in the fenestra ovalis that, when the malleus is pressed inwards, it is scarcely moved. The membranous labyrinth is somewhat atrophied. The right ear was in a similar condition. *History.*—Male, æt. 78. Deaf for thirty-eight years, after a fall upon his head from a height of ten feet, which produced insensibility for two hours. The right ear has been useless ever since the accident, the left ear has not varied much. He hears with the left ear the click of the finger-nails; suffers from noise in the head, and a cracking when he turns his head quickly.

520. Stapes partially ankylosed.

521. Stapes partially ankylosed, chiefly at the posterior and inferior border.

522, 523. Stapes partially ankylosed. In the right ear numerous bands of adhesion connect all the ossicula to the walls of the

tympanum. In the left ear a few delicate bands extend between the crura of the stapes and the superior wall of the tympanum. *History*.—Male, æt. 85. Had been deaf for five or six years. The deafness commenced during a cold, and was worse when he had a cold; he required speaking to loudly near him. Cerumen was removed from the meatus.

524, 525. Stapes ankylosed to the fenestra ovalis. In the right ear the membrana tympani is perforated, and the posterior margin is adherent to the wall of the tympanum. The crura of the stapes are detached from the base. In the left ear the ossicula are connected together by bands of adhesion, which extend into the mastoid cells.

526, 527. From a man, æt. 73. The base of the stapes ankylosed to the fenestra ovalis; the crura connected by delicate bands to the promontory.

528, 529. *Right ear*. Meatus externus very large, full of cerumen. Membrana tympani opaque, thick, and flat. The mucous membrane of the tympanum much thicker than natural; and a large part of the cavity filled by bands of adhesion, which connect the ossicula together, and to the walls of the tympanum. The mucous membrane was red. The stapes was fixed to the fenestra ovalis more firmly than natural, and its base, as seen from the vestibule, is thicker and whiter than natural. The membranous vestibule contained a larger quantity of otoconie than natural: it formed at the posterior and superior part an irregular patch nearly half a line in diameter. *Left ear*. The epidermoid and fibrous laminae of the membrana tympani are somewhat thickened. The mucous membrane of the tympanum is hypertrophied, and the stapes is firmly fixed in the fenestra ovalis. *History*.—Male, æt. 87. Ten or eleven years before death deafness came on without any assignable cause. It was not worse during a cold, but was so in thick weather. He suffered from occasional giddiness, and rumbling noises in both ears, especially at night. He was able to hear the click of the finger-nails with each ear.

530. From a man, æt. 63. *Left ear*. The stapes is much more

firmly attached to the margin of the fenestra ovalis than natural. The membrana tympani and ossicles are more fixed than usual. The right ear was healthy.

- 531, 532. From a man, æt. 67. *Right ear.* Meatus full of cerumen and epidermis. Membrana tympani more rigid than natural, scarcely moving when the tensor tympani is drawn. The stapes is fixed. *Left ear.* The stapes is more fixed than natural.
533. From a man, æt. 77. *Right ear.* Stapes ankylosed. Bands of adhesion between the malleus and incus.
534. From a man, æt. 80. *Right ear.* The meatus contained cerumen. Stapes completely fixed. In the left ear the stapes was firmly fixed by rigid membrane. The meatus also contained cerumen.
535. From a man, æt. 65. *Left ear.* Stapes completely ankylosed. The otoconie was more abundant than natural. (*Right ear*, see No. 730.)
536. From a man, æt. 70. The base of the stapes is somewhat expanded and white; it adhered to the fenestra ovalis more firmly than natural.
537. Membrana tympani partly destroyed, fallen in to the promontory. Stapes completely ankylosed.
- 538, 539. *Right ear.* The membranous meatus was so thin that, at the posterior part, its presence could hardly be detected, and the bone at first sight appeared denuded. Membrana tympani quite transparent, more concave than natural, the bright spot is not triangular, but elongated. There was a line of pigment cells extending along the posterior part of the upper half of the handle of the malleus. The tensor tympani muscle was not more atrophied than is usual in extreme old age; and when it was drawn in the direction of its course, the membrana tympani moved nearer to the promontory than usual. The mucous membrane of the tympanum was not thicker than natural, but several bands of adhesion connected the posterior part of the stapes and the long process of the incus to the margin of the mastoid cells. The malleus and incus were in a normal state, except that the orbicular

process was perhaps slightly expanded. The chief deviation from the normal state was observable in the stapes: the articular process, like that of the incus, was perhaps slightly flattened; the outer half of the anterior crus had its usual translucent appearance, but the inner half is white like enamel, the line of separation between the healthy and diseased parts being very defined. Near to the point which is usually attached to the base, the anterior crus was observed to have a free extremity, which was separated from the base itself by a thick, soft, whitish tissue. The base projected slightly into the cavity of the vestibule, and was somewhat rounded. *Left ear.* The petrous bone is very light. The wall of the mastoid cells, to which the sterno-mastoid muscle was attached, is so thin as to be translucent; and, upon tearing from its surface the fibres of the muscle portions of the bone as thin as paper, were removed, and the cavity of the cells was exposed. The membranous meatus was so atrophied that it could not, at the posterior part, be detected; the epidermis at that point covered the bone. Membrana tympani more concave than natural; instead of the usual triangular spot, there was a narrow bright line around the anterior three-fourths of the membrane, which corresponds with the change of direction from the flat part near the circumference to the concave part at the centre. The malleus was rather more moveable than usual, and the membrana tympani perhaps rather more relaxed. The upper wall of the tympanum was very thin, and in parts the bone was absent: the tensor tympani muscle was large, strong, and natural. The mucous membrane of the tympanum was rather thicker than natural, the malleus and incus normal. The crura of the stapes were only connected to the base through the medium of a thick membrane. The free extremities of the crura were rounded, and had not the appearance of a recent fracture. The base of the stapes was larger and thicker than natural, and projected slightly into the cavity of the vestibule. It was white like enamel, and the bone forming the inner wall of the vestibule

had, near to the base of the stapes, undergone a similar change. There was a very faint line, which indicated the point of distinction between the two parts. *History*.—J. C., æt. 86. At the age of forty, dulness of hearing gradually came on, and increased until the age of sixty, when he was obliged to have recourse to a speaking-trumpet. By means of this trumpet, he could hear a loud voice.

540, 541. *Right ear*. The meatus contained cerumen. The membrana tympani was less moveable than natural, and became more and more rigid as it was pressed inwards, until it felt like a piece of solid bone. The tensor tympani muscle was atrophied. The stapes was firmly fixed to the fenestra ovalis: the base, seen in the vestibule, was white like ivory: the posterior half of the base was expanded and projected into the vestibule; the anterior half was on a level with its walls. The membrane of the fenestra rotunda was much thickened: the membranous vestibule was atrophied. The fluid of the cochlea was more opaque than natural, and floating in it were observed rounded globules of the size of pus, and blood discs. In the cochlea was a large quantity of black pigment. The nerve was somewhat atrophied. *Left ear*. In the some state as the right ear, except that the base of the stapes did not bulge into the cavity of the vestibule, but the line around its circumference was perceptible. The cochlea did not contain so much black pigment: the membrane of the fenestra rotunda was not so thick. The membrana tympani was more concave than natural. (See No. 756.) *History*.—Male, æt. 84. Was wounded in the head at Trafalgar in 1805. Two days afterwards he felt very deaf, and a permanent deafness gradually ensued. For twelve years preceding his death, in 1852, he had been so deaf that he could only hear a shout close to the left ear.

542, 543. From a man, æt. 68. *Right ear*. The stapes is so firmly attached to the fenestra ovalis that it requires considerable pressure to move it. The base is somewhat expanded. *Left ear*. The stapes is less firmly fixed.

544, 545. From a man, æt. 63. Entirely deaf in the right ear.

Could only hear a shout with the left ear. *Right ear.* Membrana tympani destroyed, except a very narrow strip at the upper and posterior part, to which the body of the malleus is attached. The long process of the malleus is absent, the head articulates with the incus: the inferior extremity of the incus is absent, so that it does not articulate with the stapes. Mucous membrane of the tympanum thick, concealing the ossicula. The base of the stapes projects slightly into the cavity of the vestibule. *Left ear.* The membrana tympani, with the exception of a small portion anteriorly, about a line in diameter, is of a yellowish white colour, very thick and quite hard, the upper half is firmly adherent to the promontory. The tympanum is nearly full of the same calcareous matter into which the membrana tympani is converted. The malleus and incus are firmly pressed against and fixed to the promontory. The stapes is completely ankylosed.

546. From a man, æt. 71. *Right ear.* The membrana tympani contains a crescentic deposit of calcareous matter near its inferior and anterior border. Stapes completely ankylosed.
- 548, 549. From a man, æt. 71. *Right ear.* Stapes more fixed than natural. *Left ear.* Stapes fixed: lower wall of tympanum imperfect.
- 550, 551. From a man, æt. 69. *Right ear.* The tympanum contains numerous bands of adhesion. The stapes was more fixed than natural. *Left ear.* Stapes partly fixed: base expanded. The cochlea contained an excess of pigment.
- 552, 553. From a man, æt. 76, who had been becoming slowly dull of hearing for a long time. *Right ear.* Membrana tympani white like parchment, and more concave than natural. The stapes is so fixed, that when the base is pressed upon, it can only just be made to move. Bands of adhesion of considerable firmness connect the ossicula with various parts of the tympanum. *Left ear.* In the same state as the right, except that there are only two or three delicate threads of adhesion connecting the stapes to the canal for the portio dura nerve.

554. From a man, æt. 77. Deaf in the right ear. *Right ear.* Membrana tympani mottled: transparent in one or two parts, but white and leaden at others. Tympanum filled by mucus. Stapes ankylosed.
- 555, 556. From a man, æt. 71. *Right ear.* The meatus contained pus. The anterior part of the membrana tympani is absent, the posterior part is disorganised, fallen in, and attached to the promontory. The upper part of the tympanum was full of thick membrane and dark purulent matter. The malleus is drawn inwards to the promontory; its lower part is absent. The incus is disarticulated from the stapes and pressed upwards. Stapes firmly fixed. *Left ear.* A dark-coloured matter, resembling blood, occupied the tympanum, and was also found on the floor of the fossa auditoria interna. The stapes is fixed. The tympanum contains bands of adhesion.
- 557, 558. From a man, æt. 80. Deaf. In each ear the fibrous layers of the membrana tympani are very thick and yellow: the membrana tympani is very concave. The tympanum is full of thick mucous membrane and mucus. In the left ear the stapes is ankylosed.
- 559, 560. From a man, æt. 68. In each ear the base of the stapes is fixed much more firmly than natural: the tympanum contains bands of adhesion, and the membrana tympani and malleus, on being pressed, moved much less than usual.
561. From a man, æt. 71. The stapes is more fixed than natural. The malleus and incus are connected by a broad firm band of adhesion.
- 562, 563. From a man, æt. 63. The stapes is ankylosed in each ear. Otherwise healthy.
564. From a man, æt. 80. *Right ear.* Stapes more fixed than natural. The lower wall of the meatus was partially absorbed. (See No. 97.)
- 565, 566. From a man, æt. 74. Deaf. In each ear the eustachian tube was much larger than natural, and the base of the stapes projected into the cavity of the vestibule.
- 567, 568. *Right ear.* The fibrous laminae of the membrana

tympani are much thickened. Bands of adhesion connect the membrana tympani, ossicles, and promontory. The base of the stapes is expanded, and more fixed than natural. *Left ear.* Membrana tympani thickened; bands of adhesion in the tympanum. Base of the stapes white, expanded, and ankylosed. The meatus externus on each side is partly absorbed, from the presence of cerumen. *History.*—Male, æt. 77. He first became deaf forty-two years before his death, when, being somewhat deaf from a cold, he was engaged in a naval action, after which the deafness was much increased. Since that time it had become worse, being increased by colds. He suffered from noises in both ears. He felt cracking in them when he blew his nose. Two years before his death he could hear the click of the fingernails with each ear, but could hardly distinguish the voice with the left ear.

569. *Left ear.* Membrana tympani much thicker, more opaque and rigid than natural; the mucous membrane of the tympanum thick. The chain of bones is almost as fixed as if it consisted of but one, having two fixed extremities. The base of the stapes is firmly ankylosed. Upon looking at the base of the stapes from the cavity of the vestibule, it is observed to have its natural colour, but the adjacent wall of the vestibule is white and thick, and projects, in the form of two curved lines, into the vestibule, one above and one below, the lower one being the larger. *History.*—Male, æt. 74. Forty-five years ago he was rendered very deaf by the report of a cannon. He remained so for fourteen days; the left ear then partially recovered, but he has never heard with the right ear since. He could only hear a loud voice close to the left ear. Had sometimes "terrible noises." Was worse during a cold.

- 570, 571. *Right ear.* The meatus contained cerumen. Membrana tympani thick, white, concave, tense: its inner surface is firmly adherent to the long process of the incus. The stapes is firmly fixed by membranous ankylosis. The mucous membrane of the tympanum is much thicker than natural;

bands of adhesion occupy the tympanic cavity. *Left ear.* In the same condition as the right ear, but the stapes is less firmly fixed. *History.*—Male, æt. 71. Became deaf six or seven years before his death, after a cold. He requires speaking to in a loud voice; can hear the click of the fingernails with each ear. After coughing or sneezing, the left ear opens, and he hears better for ten minutes or a quarter of an hour, then it closes again: has sometimes singing in the ears.

572, 573. *Right ear.* The meatus contained cerumen. The membrana tympani is large, opaque, concave, and less tense than natural: the concavity is produced by the falling in of the central three-fourths of the membrane; the external fifth is flat, and on the usual plane. The stapes is rigid. *Left ear.* Membrana tympani very concave; the central part drawn in to the shape of a trumpet. Upon drawing the tensor tympani muscle, the membrana tympani moves, but less than usual, and the stapes is not in the least affected. The base of the stapes is firmly fixed to the fenestra ovalis, so that upon making a section, a portion of its base was removed with the wall of the vestibule. *History.*—Male, æt. 77. Deaf for twenty years; cause assigned, a cold; was worse during a cold. Could hear a loud voice with the right ear; on the left side required shouting into the ear.

574, 575. *Right ear.* The meatus contained hard cerumen. The stapes not so moveable as natural; the membrane around the base apparently rigid. *Left ear.* Meatus distended, and partially absorbed, by the presence of hard cerumen. The stapes was not so moveable as natural, although the membrana tympani and incus moved as freely as usual, the orbicular process moving over the head of the stapes without that bone participating in the motion. The anterior two-thirds of the base of the stapes on its vestibular aspect is surrounded, and partly concealed, by a narrow ring of bone, which has an appearance like ivory. *History.*—Male, æt. 80. Twenty years ago he became dull of hearing during a cold; had not become worse during the six years preceding

his death. He required to be spoken to in a loud voice near him; heard about equally well with each ear.

576. *Right ear.* The base of the stapes was so firmly fixed in the fenestra ovalis that it required considerable pressure to move it. The other parts of the organ were healthy. The left ear was in the same state. *History.*—Male, æt. 71. Became deaf in the left ear forty years ago, from cold. Can just hear the click of the finger-nails with it. Had been deaf in the right ear about fifteen years; could only just hear a shout. Was subject to a roaring noise in the head.

577, 578. *Right ear.* Membrana tympani opaque, especially in parts. The handle of the malleus was fixed, so that pressure upon it, by means a probe, scarcely moved it. The stapes was firmly ankylosed by bone to the fenestra ovalis: the central part of the base is of the natural appearance and thickness, but the portion at the circumference is as white as ivory, and projects into the vestibule further than natural. The inner surface of the vestibule, for the space of a quarter of a line around the base of the stapes, is also of an ivory whiteness. The membrane of the fenestra rotunda is rather thicker than natural. *Left ear.* Membrana tympani opaque, mottled; malleus nearly fixed. The base of the stapes is firmly ankylosed by bone to the fenestra ovalis. The surface of the bone looking towards the base is completely buried in a mass of ivory-like matter, which also extends a full line around it, and projects into the vestibule. The tensor tympani muscle was atrophied. The membranous labyrinth was atrophied. The nerve filaments on the surface of the lamina spiralis were not distinct, and appeared to be undergoing fatty degeneration. *History.*—Male, æt. 79. Had been deaf since being engaged in a naval action, thirty-two years before his death. He was entirely deaf for six weeks, recovering partially after that time. Two years before his death he required shouting into the right ear, and could hear nothing with the left.

580. From a man who was very deaf. *Left ear.* Stapes ankylosed. (See No. 711.)

581. *Right ear.* The posterior half of the membrana tympani is absent; the remaining portion is thick, white, and tense; at the centre of it there is a portion about half a line in diameter, in which the epidermoid, dermoid, and mucous laminae only remain: around the margin it is degenerated into earthy matter; the mucous membrane of the tympanum was not thicker than natural, nor was there any discharge. The long process of the incus is absent. The crura of the stapes are absent; the base is partially ankylosed and expanded. The membranous labyrinth was atrophied. The left ear was in a similar state. *History.*—Male, æt. 80. Had been absolutely deaf for sixteen years before his death. The cause assigned was thunder, on the coast of Guinea.
582. *Right ear.* Membrana tympani, the fibrous layers are cartilaginous at the external part. Bands of adhesion connect the body of the incus to the mastoid cells, and the stapes to the surrounding bone. The base of the stapes is more fixed than natural, being ankylosed apparently by thickening, and increased tenseness of the capsular ligament. The perilymph of the labyrinth and cochlea was turbid, and of a red colour. The mucous membrane of the faucial extremity of the eustachian tube was thick and congested. *History.*—Male, æt. 75. Became deaf during a cold, about seven years before his death, and was always much worse when he had a cold. Two years before his death he required to be spoken to in a loud voice; he could hear the click of the finger-nails with each ear. He was not subject to noises in the ears or head.
583. *Left ear.* Meatus distended by cotton wool. Membrana tympani tense. Malleus so fixed, that upon being touched it felt quite rigid. The stapes firmly ankylosed. The otoconic is very abundant, and besides it, there are crystals of carbonate of lime, which form almost a shell within the vestibule. The right ear was in a similar condition. *History.*—Male, æt. 64. Had been more or less deaf for fifty years. For eighteen months at least before his death he had been quite unable to distinguish a single word.

- 584, 585. *Right ear.* Stapes not so moveable as natural. *Left ear.* Stapes partially ankylosed; surrounded by membranous bands. Cochlea congested. *History.*—Male, æt. 68. Two years before his death he was able to hear a watch only upon contact with the ear. He had suffered from noises in the head, which were relieved by the removal of cerumen from each meatus. The affection of the ears was attributed to his having fallen overboard, while at sea, many years previously.
- 586, 587. From a man who was deaf. In each ear the stapes is ankylosed; a band of adhesion connects the handle of the malleus to the long process of the incus.
- 588, 589. From a woman, æt. 26, who died from acute tuberculosis: she was deaf. *Right ear.* The membrana tympani contains two patches of calcareous deposit. The stapes is firmly united to the fenestra ovalis by membranous ankylosis. Bands of adhesion connect the handle of the malleus to the head of the stapes, and the crura of the stapes to the promontory. *Left ear.* The base of the stapes is expanded, and firmly ankylosed. There is a deposit of calcareous matter at the superior and anterior part of the membrana tympani. The long process of the incus is connected to the malleus and the membrana tympani by a broad band of adhesion.
- 590, 591. The stapes is partially ankylosed in each ear. In the right ear the crura have been broken from the base. *History.*—Male, æt. 82. Had been deaf for six or seven years; had become so gradually after a cold: was worse during a cold. Had constant noises in the ears, and a rattling sound when he yawned or sneezed. Two years before his death, he required to be spoken to in a loud voice near him; he could hear the click of the nail with each ear; the right ear was the worst.
592. *Right ear.* The membrana tympani is fallen in, so that the long process of the malleus is in contact with the promontory: it is also connected to the promontory by bands of adhesion. There appears to have been ulceration of the fibrous laminæ, and the remaining fibres have fallen inwards.

The membrana tympani is thick and white, and contains a calcareous deposit anteriorly. The inferior extremity of the incus is in contact with it, and projects at the posterior part. The stapes is firmly ankylosed. The membrane of the fenestra rotunda is very thick. In the left ear the stapes was partially ankylosed, and the chain of bones rigid. *History*.—Male, æt. 67. Had been very deaf for fifteen years, since an attack of scarlatina. About a year before his death he could only distinguish the loudest voice close to either ear. Suffered from singing noise in the head.

- 593, 594. From a man, æt. 68, who was very deaf. *Right ear*. Membrana tympani very concave at the central part; it is also very thin and transparent, except at the circumference, which is occupied by a narrow white band of great thickness. The lower third of the handle of the malleus is separated from the membrana tympani. The mucous membrane of the tympanum was thick and red; the mastoid cells full of mucus. Stapes firmly ankylosed. *Left ear*. The larger part of the membrana tympani destroyed. Stapes ankylosed.
- 595, 596. *Right ear*. Membrana tympani large, concave, opaque, the incus and malleus partly ankylosed, drawn in, and pressing on the stapes, which is also partly ankylosed. *Left ear*. Membrana tympani thick and opaque: there is an orifice at the central part about the size of a pea. The incus and malleus are drawn in, and connected by bands of adhesion. The stapes is completely ankylosed. *History*.—Male, æt. 83. Had been deaf in the left ear since childhood; the deafness was at first accompanied with a discharge. For several years he had been deaf in the right ear also. About a year before his death he was only able to hear a loud voice close to either ear.
- 597, 598. *Right ear*. Membrana tympani large, white, and thin. Chain of bones rigid; the stapes firmly ankylosed by membrane. Bands of adhesion surround the stapes. Tensor tympani muscle atrophied. *Left ear*. The fibres of the membrana tympani are separated in parts, as if there had

been an orifice. In other respects, it presents the same condition as the right ear. *History*.—Male, æt. 78. He first became deaf after a cannonade at sea, at the age of 34. For six months he was quite unable to hear, but afterwards partly recovered. He was much worse during a cold. About three years before his death, he was able to hear a click of the finger-nails with the right ear, but not with the left.

599, 600. In each ear the membrana tympani is concave, and in parts opaque. The chain of bones is more rigid than natural; the stapes firmly fixed to the fenestra ovalis. In the right ear the ossicula are connected together by bands of adhesion. *History*.—Male, æt. 75. Had been deaf for ten or twelve years, after a bad cold in the head. He was confined to his bed for some time, and never heard with the right ear since. At the same time he became as deaf in the left ear as he was two years before his death, when he could only hear a shout close to the ear. He suffered from a buzzing in the head.

601, 602. In each ear the membrana tympani is opaque, and the stapes is firmly ankylosed to the fenestra ovalis, a result which seems to be caused by an expansion of the base. *History*.—Male, æt. 89. Had been growing gradually deaf for twenty-five years. The deafness was worse during a cold, but did not commence from one. He never had pain in the ears, but had ringing noises in them at times. Four years before his death he was able to hear the click of the finger-nails well with the right ear, and, on pressure, with the left.

603. Base of the stapes expanded. From the right ear of a man, æt. 80, who had been slowly growing deaf for about twenty-two years. He had a rumbling noise in the head. There was an orifice in the membrana tympani. He required to be spoken to loudly, and could just hear the click of the finger-nails.

604. Stapes surrounded by thickened membrane. It was more firmly fixed than natural, and there were bands of adhesion in the tympanum. From a man, æt. 66.

- 604 *a*. Stapes partially ankylosed to the fenestra ovalis by rigidity of the connecting membrane.
605. Stapes fixed more firmly than natural. The mucous membrane of the tympanum very thick.
606. A stapes, the base of which was adherent to the fenestra ovalis.
607. Stapes ankylosed: base completely hidden by thick bands of adhesion.
608. Stapes ankylosed.
609. Deaf and dumb. Stapes ankylosed.
- 610, 611. Stapes ankylosed by rigid membrane.
612. From a man, æt. 30, who died from injury to the spine. Partially deaf as long as he could remember. *Right ear*. The mucous membrane of the tympanum, and the membrana fenestra rotundæ are thickened. The stapes is connected to the tympanic walls by bands of adhesion; it extends further than usual into the vestibule, so that but small portions of its crura are visible. Its base is expanded, and adherent to the margin of the fenestra ovalis, with which there is a partial inter-ossification. The membrane lining the vestibule was much thickened. The superior semicircular canal was unusually prolonged, and ovate in form. The left ear was in a similar condition.
613. Stapes completely ankylosed. A large deposit of calcareous matter occupies the anterior portion of the membrana tympani.
- 614, 615. Stapes attached to fenestra ovalis more firmly than natural; the crura have separated from the base.
616. Ankylosis of the lower margin of the base of the stapes to the fenestra ovalis. The lower wall of the tympanum is translucent and perforated.
617. Stapes adherent by bands to the fossa fenestra ovalis.
- 618, 619. Stapes partially ankylosed to the fenestra ovalis: base denser than natural.
- 620, 621. Stapes ankylosed. Membrana tympani thick, and containing calcareous deposit. *History*.—Male, æt. 78. Had been becoming gradually deaf for six or seven years,

and had been very deaf, so as to require shouting to, for two or three years. Worse during a cold.

622. From a man, æt. 68. *Left ear.* Stapes fixed more firmly than natural. In the right ear the stapes was completely ankylosed.
623. From a man, æt. 67. Deaf; but only to a moderate degree. *Right ear.* Stapes partially ankylosed; the cartilage surrounding the base seemed to be expanded. Numerous bands of adhesion connected together various points of the tympanum. The malleus was very firmly fixed; the membrana tympani more concave than natural. The left ear was in a similar state.
624. From a woman who died of acute tuberculosis. *Right ear.* Stapes ankylosed. Membrana tympani slightly opaque and concave.
625. From a woman, æt. 68, who died from pericarditis. *Left ear.* Stapes partially ankylosed. In the vestibule the quantity of otoconie was much larger than natural. A band of adhesion connects the long process of the malleus to the incus. (See No. 723.) In the right ear the stapes was firmly ankylosed. The tympanum contained mucus.
- 626, 627. From a man, æt. 44. Deaf. The base of the stapes in each ear is expanded. The mucous membrane of the tympanum thick.
- 627 *a.* Stapes ankylosed.

B. DISEASES OF THE MALLEUS.

628. A small exostosis grows from the inner surface of the neck of the malleus, which is adherent to the internal wall of the tympanum. The fenestra rotunda is covered by bands of adhesion, which also almost entirely conceal the stapes.
- 628 *a.* Malleus and incus ankylosed together.
629. From a man, æt. 76. *Right ear.* The handle of the malleus more curved than natural. Sulcus lateralis rough. (*Left ear*, see No. 52.)
630. From a man, æt. 72. The membrana tympani is very con-

cave. Broad bands of adhesion, which completely cover the incus, connect all the ossicula to the inner wall of the tympanum. The inferior extremity of the malleus has been fractured, and is partially separated from the long process.

631. The handle of the malleus carious. From a youth, æt. 10. Effect of scarlatina.

632. Caries of malleus and incus, from scarlatina.

632 *a*. Two specimens of the malleus partly destroyed by caries.

C. DISEASES OF THE INCUS.

633. The short process of the incus and a portion of the mastoid cells carious.

634. Membrana tympani very thick, almost resembling bone. Incus partly absorbed: os orbiculare absent.

635. From a woman, æt. 50, blind and insane; deaf in the left ear. *Right ear*. The incus disconnected from the os orbiculare, the latter being attached to the stapes.

636. From a man, æt. 19, who died of apoplexy. He was deaf in the left ear. *Left ear*. The membrana tympani contains calcareous deposit. Both processes of the incus are partially absorbed. The mucous membrane of the tympanum was very thick. The right ear was healthy.

637. From a man, æt. 67. *Right ear*. The inferior extremity of the long process of the malleus has been absorbed, the os orbiculare being attached to the malleus.

638. Portion of the incus removed six months after an attack of scarlatina.

639. From a boy, æt. 5, who died from scarlatina. *Left ear*. The os orbiculare is separated from the incus, and attached to the stapes; which is fixed to the fenestra ovalis more firmly than natural. The tympanum contained mucus: lymph was also effused, and bands of adhesion between the membrana tympani and the inner wall of the tympanum were in process of formation. (*Right ear*. See Nos. 315 and 141.)

640, 641. From a boy, æt. $3\frac{1}{2}$, who died from dysentery. The

incus extended more posteriorly towards the mastoid cells than usual, and was disconnected from the stapes. The os orbiculare was absent. The neck of the stapes was covered by thick mucous membrane, and there was no appearance of an articular surface for the incus. The membrana tympani was of a dark leaden hue, and much flatter than natural. (See No. 305.)

642. The incus from the left ear of the preceding case. (See No. 654.)
643. The incus and stapes from the left ear of a man, æt. 79, who died from disease of the brain: he was dull of hearing. The stapes was firmly ankylosed to the incus. (See No. 120.)
644. Three specimens of the incus affected with caries: in one the larger part of the body of the bone is destroyed; in the other two the surface is roughened.

D. DISEASES OF THE STAPES.

645. The incus and stapes from the right ear of a man, æt. 65. The os orbiculare was disconnected from the incus and firmly ankylosed to the stapes.
646. From a man, æt. 60, who died from apoplexy: he was partially deaf in both ears. *Left ear.* The base of the stapes is expanded. The fibrous and mucous laminæ of the membrana tympani are thickened, and opaque. The mucous membrane of the tympanum was thick; the tympanum contained bands of adhesion, and caseous matter.
647. The stapes from the right ear of a woman, æt. 26, who died from pneumonia: slightly deaf at times. It is larger than natural.
648. Base of stapes enlarged.
- 649, 649 *a.* From a man, æt. 66. The base of the stapes in each ear is slightly expanded, so that they could not be easily withdrawn from the fenestræ ovales. The membrana tympani in each ear was thickened: the mucous membrane of the tympanum was healthy.

650. The stapes from each ear of a man, æt. 80, who had been deaf for twenty years, since a severe cold. He could hear the watch on contact with each ear: was worse during a cold. The base of each stapes is thicker than natural. *Right ear.* Bands of adhesion surrounded the stapes and incus, and the former was more fixed than natural to the fenestra ovalis: its crura were atrophied. *Left ear.* Stapes partially ankylosed; one of the crura was separated from the base in the attempt to detach it, which was not effected till the vestibule was laid open. Each meatus contained cerumen.
651. In each ear the base of the stapes is expanded, thick and dense, and adhered to the fenestra ovalis with considerable firmness. The fluid in each vestibule was deficient in quantity, and in the right ear large bloodvessels were observed to ramify in the periosteum. *History.*—Male, æt. 78. Had been deaf for about twelve years, occasioned by hammering in an iron foundry. He could hear the click of the fingernails: required to be spoken to in a loud voice; was worse during a cold. Had a ringing noise in the ears, especially the left when he shook his head.
652. Base of stapes hypertrophied.
653. Base of stapes hypertrophied.
654. Neck of stapes covered with thick mucous membrane, with no articulating surface for the incus. (See Nos. 641 and 642.)
655. The stapes of the right ear in the same case as the preceding, in a similar condition. (See No. 640.)
656. The crura of the stapes detached from the base which was left adhering to the fenestra ovalis.
657. Stapes from a tympanic cavity having carious walls. Crura hypertrophied.
658. A stapes surrounded by thickened mucous membrane, and by bands of adhesion.
659. Stapes: investing membrane thickened.
660. Mucous membrane of the tympanum thick, and attached to the stapes.
- 661, 662. Stapes resting upon, and adherent to, the promontory.

- 663. Stapes entirely surrounded by firm bands of adhesion.
- 664. Stapes ankylosed; the posterior extremity of the base projects more than natural into the vestibule.
- 665. A stapes greatly hypertrophied, the space between the crura being very much diminished.
- 666. A stapes smaller than natural. The base and crura are disproportionately thick, the neck partly carious.
- 667. A stapes, the crura connected by false membrane.

SERIES VII.—MASTOID CELLS.

A. HYPERTROPHIED.

- 680 to 683. Specimens of the mastoid cells remarkably large.
- 684. Mastoid cells very large, the external plate of the mastoid process so thin as to be translucent.

B. ATROPHIED.

- 685, 686. Mastoid process small and dense, presenting very little cellular structure.

C. CONTAINING CHOLESTERINE.

- 687. From a man, æt. 50. *Left ear.* The mastoid cells are separated from the tympanum by a broad false membrane, and the anterior portion is lined by a thick membrane of dark colour, the surface of which is covered by a shining metallic-looking substance, which under the microscope was found to consist of crystals of cholesterine. The membrana tympani is destroyed except a small semicircular portion at the upper and posterior part. Bands of adhesion connect the malleus and stapes to the inner wall of the tympanum.
- 688. Cholesterine from the foregoing case.
- 689, 690. From a man, æt. 64. *Right ear.* Membrana tympani very concave, white like parchment, and thick. The tympanum contained some muco-serous fluid, with numerous bands of adhesion: the mucous membrane was thick. The mastoid

cells were hollowed out, and contained muco-serous fluid of a dark-greenish colour, and containing crystals of cholesterine. Blood was effused around the auditory nerve at the floor of the internal meatus. The cochlea was also full of a dark coloured fluid. *Left ear.* In the same state, but the stapes was also ankylosed.

690 *a.* Cholesterine from the foregoing case.

D. MUCOUS MEMBRANE THICK.

691. From a woman, æt. 60, who died from fever. Not deaf. *Left ear.* A portion of very thick mucous membrane from the mastoid cells. The membrana tympani was perforated.

E. CONTAINING BANDS OF ADHESION.

692, 693. Firm bands of adhesion occupying the mastoid cells.

F. CARIOUS.

694. Two portions of carious bone from the mastoid cells.

695. Two large portions of carious bone from the mastoid process.

696. A small necrosed portion of the mastoid process, syringed from the ear of a boy, æt. 6, twelve months after scarlatina.

SERIES VIII.—CAROTID CANAL.

A. CONTINUOUS WITH THE EUSTACHIAN TUBE.

697. Showing the relations of the carotid canal to the tympanum.

697 *a.* The layer of bone between the carotid canal and the eustachian tube deficient, for a space of a line and a half horizontally, by a third of a line vertically.

B. CONTRACTED.

698, 698 *a.* *Right ear.* Osseous meatus dilated by cerumen, the lower wall partly absorbed. Membrana tympani very opaque, thick and more concave than natural. Superior

wall of tympanum partly deficient. The tympanum contained a little thin mucus and several bands of adhesion. Stapes much more firmly fixed than natural, though not entirely immovable: the entire chain of bones unnaturally rigid. The membranous vestibule was rather thick and opaque. *Left ear.* Osseous meatus also dilated by cerumen. Membrana tympani concave, covered with exceedingly thick epidermis; the fibrous laminæ are also thick. The roof of the tympanum was so thin as to be translucent, it was deficient in parts. Numerous bands of adhesion in the mastoid cells. The stapes was almost immovable from rigidity of its connecting membrane. In each ear the carotid canal is contracted.

698*b.* The internal carotid arteries from the preceding case. Each artery contains a calcareous deposit in its inner coat, and presents a puckered appearance about the middle of its course through the petrous bone. *History.*—Male, æt. 76. Had been dull of hearing for thirty years. For twenty years he could only hear a loud voice close to the right ear.

699. The internal carotid artery. It was less than half the size of that of the opposite ear. (See No. 98.)

699*a.* A large, sharp bony growth in the lateral sinus, and smaller growths of a similar character in the carotid canal.

700, 701. From a man, æt. 26, who died from a syphilitic disease of the cranial bones, pericranium and dura mater. He was deaf, especially in the right ear. The deafness was much increased during an attack of erysipelas. The whole surface of the cranium was rough. The carotid canal in each ear is greatly contracted, at the lower part, so as to present a shape nearly resembling that of a balloon. The contraction is caused by projection of the lateral walls and occupies the angle, and part of the horizontal portion of the canal. *Right ear.* Membrana tympani very soft, and opaque. Mucous membrane of tympanum thicker and more vascular than natural. A band of false membrane nearly half an inch in length and half a line in breadth, extends from the mastoid cells to the neck of the stapes. This band is soft and very

vascular. Bands of adhesion also connect the stapes with the walls of the tympanum. The entire petrous portion partakes of the disease with which the skull generally was affected. *Left ear.* Membrana tympani very thin and soft. The mucous membrane of the tympanum is very vascular and rather thick. Large vascular and soft bands of adhesion connected the membrana tympani and ossicula with the internal walls of the tympanum and with the stapes. The mastoid cells contained a quantity of mucus, and also some smooth portions of bone lying in the cavity, and attached to the mucous membrane.

701 *a. Left ear.* There is a small bony growth, about the size of a mustard seed, on the internal wall of the carotid canal, in the situation of the angle. The membrana tympani is fallen in, and adherent to the internal wall of the tympanum, throughout nearly its entire extent; the handle of the malleus and the neck of the stapes are seen as projections at the bottom of the meatus. The mucous membrane of the tympanum is much thickened around the heads of the malleus and incus, which are moveable. The base of the stapes is fixed. (*Right ear.* See No. 280 *a.*)

702, 703. Carotid canal contracted by bulging of the lateral walls. Membrana tympani containing a deposit of osseous matter.

704. From a man, æt. 40. The carotid canal slightly contracted.

705. The horizontal portion of the carotid canal is much contracted; the contraction being produced by the presence of a rounded protuberance of the bone at the inner and outer surface of the lower half of the canal. The membrana tympani thick, opaque, and more concave than natural.

706 to 710 *a.* Specimens showing contraction of the carotid canal. In each case the contraction is produced by more or less protuberance of the lower portion of the lateral walls in the angular and horizontal portions of the canal.

SERIES IX.—INTERNAL EAR.

A. VESTIBULE AND SEMICIRCULAR CANALS.

711. From a man who was very deaf. *Right ear.* The tympanum and vestibule were full of blood. (*Left ear.* See No. 580.)
- 712, 713. From a man, æt. 20. Subject to epilepsy. Exostoses of small size grow from the posterior surface of each petrous bone, and from the upper surface of each meatus internus. The meatus internus of the left ear is reduced to one half its natural size.
714. The fenestra ovalis is surrounded by an exostosis or additional deposit of bony matter, the margin being thickened and of a pearly white colour. The lower wall of the tympanum is deficient in nearly half its extent.
- 715, 716. An exostosis in each tympanic cavity, partially filling up the fenestra ovalis, so that it is no longer oval, but of a triangular shape, and its size is reduced by a full third.
- 717, 718. An exostosis in each tympanic cavity, partially filling up the fenestra ovalis.
- 718 *a.* Exostosis in the tympanic cavity, slightly diminishing the fenestra ovalis; the floor of the tympanum partly deficient.
719. Exostosis in the tympanic cavity surrounding and diminishing the fenestra ovalis. Floor of the tympanum deficient to a small extent.
720. Exostosis in the tympanic cavity diminishing the fenestra ovalis: the floor of the tympanum imperfect; the external meatus very large.
721. Exostosis in the tympanic cavity around the anterior part of the fenestra ovalis. The anterior wall of the external meatus diseased.
722. Fenestra ovalis diminished and rendered irregular in form by an exostosis in the tympanic cavity.
723. Otoconie more abundant than natural. (See No. 625.)
724. *Left ear.* A portion of the membranous vestibule thick-

- ened. The stapes was ankylosed, the mucous membrane of the tympanum thick, and the cochlearis muscle hypertrophied. Deaf. (See Nos. 512, 747, and 763.)
- 727, 728. The osseous superior semicircular canal deficient at its upper part, the cavity of the canal being open for an extent of about three lines.
729. From a man, æt. 64. *Right ear.* The upper wall of the tympanum, and of the superior semicircular canal imperfect. The left ear was well formed and healthy.
730. From a man, æt. 65. *Right ear.* The upper wall of the superior semicircular canal is deficient for the extent of about a line. (*Left ear.* See No. 535.)
- 731, 732. From a man, æt. 92. *Right ear.* The posterior semicircular canal is incomplete, its posterior wall being deficient for an extent of about three lines. Stapes ankylosed. *Left ear.* Stapes ankylosed. The membranous labyrinth and cochlea contained black pigment.
733. *Left ear.* Membranous semicircular canal atrophied. The membrana tympani was white and collapsed; the tensor tympani muscle atrophied. (See No. 506.)
734. Membranous semicircular canals from a man, æt. 74, who had been deaf some years. (See No. 150.)
735. The cochlea from the same case, containing pigment cells. (See Nos. 739, 740.)
736. Semicircular canal distended with otoconie. Deaf and dumb.
737. Portion of a semicircular canal with its ampulla hypertrophied.

B. COCHLEA.

738. Cochlea containing coagulated blood.
- 739, 740. *Left ear.* Portions of the cochlea containing pigment cells. (See Nos. 176, 734, and 735.)
741. Cochlea containing pigment. (See Nos. 145, and 296.)
743. Two specimens of the cochlea containing an excess of pigment cells.
744. Cochlea containing black pigment.

745. Cochlea containing black pigment.
746. A portion of the cochlearis muscle enlarged, from a man æt. 48. Deaf. (See No. 512.)
747. A portion of the cochlearis muscle enlarged, from the same case as the preceeding. (See No. 724.)
748. Cochlearis muscle enlarged, from the same case.
749. The scala vestibuli at and near its entrance into the cavity of the vestibule is much smaller than natural. The stapes is surrounded by bands of adhesion.
750. A large portion of the cochlea, necrosed. It was discharged during life from the ear of a man, æt. about 55. The disease of the ear appeared to originate in an attack of erysipelas of the head. There were no symptoms of affection of the brain.
- 751, 752. In each ear the cochlea was in a state of degeneration, the lamina spiralis presenting dark patches under the microscope as if from old effusion of blood. (See No. 753.) No deviation from the healthy state was observed in the vestibule. The membrana tympani thin, white, relaxed, concave at the central part; the margin for the width of three quarters of a line having its normal outline. The ossicula rather less mobile than natural. Numerous bands of adhesion occupy the mastoid cells. *History*.—Male, æt. 65. Thirty-three years before death he fell on his head (he was a sailor), and has been deaf ever since. His hearing power varied somewhat, being worse during a cold: he could never distinguish words, but could sometimes hear the sound of a loud voice. He suffered from headache and giddiness.
753. Microscopic preparations of the lamina spiralis from the foregoing case.

C. FENESTRA ROTUNDA.

755. The membrane of the fenestra rotunda thickened, from a woman, æt. 30, who died from fever; having been very deaf for five days previous to death. There was a considerable quantity of mucus in the tympanum; it was white and con-

sisted of circular cells covered by fine granules. The mucous membrane of the tympanum was so thick that the stapes and incus were entirely concealed; it was red and pulpy, and so firmly adherent to the membrane of the fenestra rotunda, that they could not be separated. (See No. 306.)

756. The membrane of the fenestra rotunda thick and dark coloured. The stapes was ankylosed. (See No. 541.)

757, 758. In each ear the membrana fenestræ rotundæ is thick and opaque. The ossicles are connected by bands of adhesion. *History*.—Male, æt. 73. Had been growing deaf for six or seven years: sometimes as during a cold had a humming noise in the ears, not in the head; also at times a pain running up in the left ear. He could hear the watch with pressure.

759, 760. *Right ear*. The membrane of the fenestra rotunda is ossified and covered in its cochlear aspect by a deposit of osseous matter. The vestibule and cochlea contained a sanguinous fluid, and their bloodvessels were greatly distended with blood. The base of the stapes is ankylosed to the fenestra ovalis, and projects farther into the vestibule than natural; a bony growth from the wall of the vestibule is attached to and fixes the base of the stapes. Mucous membrane of the tympanum thicker than natural. Membrana tympani opaque and concave. In the meatus externus, midway between the membrana tympani and the orifice, there is a bulging of the posterior osseous wall. *Left ear*. Vestibule and cochlea full of bloody serum. Membrane of the fenestra rotunda ossified, and covered with a deposit of osseous matter occupying the termination of the cochlea, and extending into the vestibule. The bone forming the floor of the internal auditory meatus atrophied. Portio mollis nerve not seen. Stapes ankylosed. The membrana tympani and mucous membrane of the tympanum thick and vascular. The posterior wall of the meatus externus presents an osseous bulging. *History*.—Male, æt. 56. Insane: so deaf that it was impossible to make him hear. Deafness hereditary and also insanity on both father's and mother's side. It is not

known whether he was born deaf, indeed it is said that he was able to read, but a sister was born deaf.

761. From a man, æt. 67, who died from gangrena senilis. *Right ear.* The fenestra rotunda is entirely concealed by a false membrane, which is firmly attached to the entire circumference of the fossa fenestræ rotundæ. (*Left ear*, see No. 340.)
762. *Left ear.* At the lower part of the tympanic cavity there is a false membrane, in length about a line and a half, which completely conceals the fenestra rotunda. The false membrane is firm, and of a white colour. Bands of adhesion connect the stapes to the tympanic walls. *History.*—From a woman, æt. 26, who died fourteen days after childbirth. She was very deaf in the right ear, and slightly so in the left. She had scarlatina when a child, and from that time had always a discharge from the right ear. The osseous walls of the right tympanum were diseased, and that portion which corresponds with the carotid canal was carious, and perforated with small holes. (*Right ear.* See No. 843.)
763. *Left ear.* A false membrane covering the fenestra rotunda. Stapes ankylosed. Deaf. (See No. 512.)
764. A false membrane completely covering the fenestra rotunda, being attached to the margin of its fossa. The stapes connected by bands of adhesion to the tympanic walls.
765. Mucous membrane of the tympanum thick, nearly burying the stapes. Fenestra rotunda entirely concealed.
766. Membrana fenestræ rotundæ adherent by bands to the fossa fenestræ rotundæ.
767. Membrana fenestræ rotundæ partially covered by a false membrane.
768. Membrana fenestræ rotundæ completely covered by a false membrane, which also connects the stapes to the walls of the tympanum.
769. Membrana fenestræ rotundæ entirely concealed by bands of adhesion.
770. A smooth, transparent false membrane covering the fossa fenestræ ovalis.

D. AUDITORY NERVE AND MEMBRANOUS LABYRINTH.

771. (See *Transactions of Pathological Society*, 1850-1, p. 49.)
Left ear. From a man, æt. 60, partially deaf. A tumour of white colour, and about the size of a small bean, occupies the internal auditory meatus, and projects about a line beyond its posterior border. It is of conical shape, the small end being at the anterior part of the meatus; its texture was firm posteriorly, and, upon being cut into, presented little but cellular tissue; anteriorly it was softer. It is attached to a portion of the nerve supplying the vestibule, the fibres of which pass through its anterior half. Under the microscope the tumour presented nerve tubes, parallel fibres, and nucleated cells. The right ear was healthy.
- 772, 773. From a woman who died from serous apoplexy, with aneurism of the basilar artery. She was quite deaf. Each auditory nerve atrophied. Dr. Van der Byl, under whose care the patient was, states, "there was no pressure on the root of the nerve, but it seems probable that one of the small branches of the basilar artery, to supply the internal ear, was pressed upon, and in this way the nutrition of the organ may have been interfered with."
- 776, 777. From a woman, æt. 70: had been hard of hearing during many years. Latterly it was with the greatest difficulty that the voice could be heard through a speaking-trumpet. Each petrous bone was of a dark plum-colour, and somewhat expanded. Upon making a section, each portion, instead of possessing the usual hard and rock-like properties of this bone was so soft that its exterior could be cut with a strong knife. The only part that retained the aspect and density of the healthy petrous bone was that portion which directly surrounds the vestibule, cochlea, and semicircular canals. *Right ear.* Membrana tympani thicker and whiter than natural; the surface of the incus is rough, parts of its outer layer having been absorbed; the stapes partly

ankylosed. The auditory nerve atrophied, and less white than natural; the membranous labyrinth atrophied.

778, 779. From a man, aged 73. Deaf for fourteen years. Right ear entirely useless. Left ear required shouting into the ear. Suffered from noises in the head. In each ear the membranous labyrinth was atrophied. Stapes partially ankylosed. Membrana tympani thickened and opaque.

780, 781. From a man, aged 74, who had been deaf for twenty years, occasioned by falling into the sea. For fourteen years he had only been able to hear a shout. In each ear the vestibule was full of its aqueous fluid, but the membranous labyrinth was atrophied. Membrana tympani rather opaque; mucous membrane of tympanum rather thicker than natural; bands of adhesion surround the ossicula.

782, 783. From a man, æt. 97, who had become gradually deaf many years ago. He was entirely deaf on the left side; could hear a loud voice close to the right ear. In each ear the membranous labyrinth appeared to be atrophied. *Right ear.* Pus was effused among the muscles surrounding the styloid process, and some was contained in the meatus externus, the tissues of which, however, were themselves healthy. Membrana tympani thickened and opaque. Stapes more rigid than natural. Bands of adhesion in mastoid cells. *Left ear.* Meatus externus large. Bands in mastoid cells.

784, 785. From a man, aged 62, who had been deaf for twenty years. He required speaking to in a loud voice close to the head. Was worse during a cold. *Right ear.* Membrana tympani healthy, except a slight thickening at the point to which the extremity of the long process of the malleus is attached. Stapes ankylosed by thickening of the connecting membrane. Membranous vestibule much atrophied; there was no vestige of otoconie. *Left ear.* Membrana tympani quite red, arising from the effusion of serum of a dark red colour in the tympanum; it is very concave, the handle of the malleus being almost in contact with the promontory.

Stapes partially ankylosed. The membranous labyrinth was so much atrophied that its presence was scarcely to be detected, it having become one with the periosteal lamina. The otoconie was absent. On the tympanic surface of the lamina spiralis of the cochlea, external to the denticulate processes, are dark granules, which are aggregated into a thick band beyond them. Beyond this thick band are transparent cells. The nerves distributed over the lamina spiralis appeared to be diseased, as they did not present any traces of the fine tubercles, but in their place were granules of various sizes.

E. MEATUS INTERNUS.

787. The basilar process of the occipital bone, and the inner surface of the petrous bone, present numerous depressions, with sharp margins, as if the bone had been ulcerated. The roof of the tympanum is imperfect; the meatus internus larger than natural. (See No. 234.)
- 788, 789. The meatus internus very large.
790. The meatus internus very large.
791. A large exostosis, with a rough protuberance, surrounding the upper part of the orifice of the meatus internus. Also a rough triangular exostosis on the upper part of the petrous bone near its junction with the squamous portion.
792. An exostosis, surrounding and diminishing the size of the meatus internus.
- 793, 794. The inner and posterior portion of each petrous bone, especially of the right, absorbed by the pressure of a tumour, arising from the cerebellum. Each meatus externus rough.

SERIES X.—DISEASE EXTENDING FROM THE
EAR TO THE BRAIN.

A. EXTERNAL MEATUS.

798. Caries of the external meatus extending to the middle cerebral cavity and lateral sinus: upper wall of the tympanum healthy.
799. From a man, aged 71. *Right ear.* The lining membrane of the meatus externus, at the posterior and upper part, presented a depression, about two lines long and a line and a half broad; this depression covered an orifice in the bone of the same size, which opened into the upper part of the mastoid cells; the latter contained a dark-coloured fluid. The internal extremity of the meatus, to the circumference of which the membrana tympani is attached, is contracted antero-posteriorly, but longer than natural from above downwards. The membrana tympani is flat, and of an oval shape; white and thick at the lower part; dark-coloured and soft above. The bone, to which it is attached above by means of a false membrane, has been partially removed by absorption; the tympanic cavity is full of dark matter, similar to that in the mastoid cells. (*Left ear.* See No. 96.)
800. From a woman, æt. 16, who had had pain and discharge in the left ear for seven months, and died three days after the accession of acute cerebral symptoms. *Left ear.* The dura mater forming the posterior wall of the lateral sinus, where it is situated in the temporal bone, was of a dark colour, and soft; the sinus contained, at its upper part, a firm coagulum of dark-coloured fibrine; at its lower part it was filled by dark pus. The anterior wall of the sinus was but loosely attached to the sulcus lateralis. The tympanic cavity contained a considerable quantity of scrofulous matter, which,

by its pressure on the posterior wall of the meatus, had produced a carious orifice in the bone. The membrana tympani was thick and soft, and on its outer surface were two dark-coloured polypi. (See *Pathological Society's Transactions*, vol. v., 1853-4, p. 273.)

801. There is a small orifice, about half a line in diameter, between the anterior wall of the meatus externus, near its outlet, and the cranial cavity. On the internal surface the bone, about the junction of the anterior wall of the petrous portion with the squamous portion of the temporal bone, is deeply excavated, over a space the size of a horsebean; for half this extent, there remains only the thin and translucent external plate.
802. The meatus externus is rough, and the cancellous texture partially exposed, especially at the posterior and inferior walls. The lateral sinus is also rough, and presents, in a portion of its extent, a deep, branching fissure.
- 802 *a*. The external surface of the temporal bone has been destroyed, apparently by malignant disease, over a space extending from the root of the zygoma to the articulations of the parietal and occipital bones; the cranial cavity is exposed in nearly the entire course of the lateral sinus. The ulceration extends deeply into the petrous bone, forming a large cavity, bounded internally at the lower part by the internal wall of the tympanum; the promontory, stapes, and fossa of the fenestra rotunda remaining unaffected by the disease.
- 802 *b*. From a girl, æt. three years and a half. *History*.—From the age of five months an offensive creamy discharge had issued from the left ear. The child complained of itching but not of pain. About six weeks before death the discharge ceased, violent pain came on in the ear, and an abscess formed behind the ear, at the bottom of which the surface of the squamous and mastoid bone was felt to be carious. She was delirious and very restless. *Left Ear*. The lateral ventricles contained about half an ounce of perfectly clear serum, the cerebrum was otherwise healthy, as was also the

dura mater covering the upper part of the petrous bone. Upon the removal of the tentorium, the left hemisphere of the cerebellum was observed to be much softer than natural, and the portion in contact with the posterior surface of the pars petrosa was dark-coloured and very soft, and upon gently drawing it backwards, it was found to be applied against two orifices in the posterior part of the lateral sinus, and it was separated from the cavity of the sinus by the thickened arachnoid and pia mater. A considerable vessel in the pia mater opposite the orifice, was distended by a firm and dark coagulum, half an inch in length. The anterior membranous wall of the lateral sinus was absent; the bone forming the sulcus lateralis in the mastoid process was carious, and the sinus full of a dark-coloured coagulum and purulent matter: pus was also found in the jugular vein. *The ear.* The dermis lining the whole of the external meatus was soft, tumefied, and of a dark colour; its surface was denuded of epidermis; beneath it posteriorly was purulent matter which separated it from the carious bone. The membrana tympani was absent, but there was no more appearance of disease in the tympanic cavity than might have been produced by the affection of the meatus. The bone was carious anteriorly, as far as the root of the zygoma; posteriorly and superiorly the caries extended nearly to the margin of the parietal bone, in some parts the external table only was affected; in others it extended to the diploe, and thence to the external table. Upon holding the bone up to the light, small orifices may be observed through the bone, so that its external surface, viz., that part which was covered by the membranous meatus, was directly continuous with the lateral sinus.

B. TYMPANIC CAVITY.

803, 803*a*. From a youth, æt. 19, who died from scarlet fever after an illness of five weeks. In each ear the membrana tympani had lost all its central portion by ulceration. The

mucous membrane of the tympanum was thick and ulcerated ; a sero-purulent matter pervaded both it and the mastoid cells. The ossicula were rough. The dura mater was not adherent to the upper and posterior parts of the petrous bone, the coats of the internal carotid artery were very much thickened and dark-coloured, and the walls of the jugular vein corresponding to the floor of the tympanum are thin, soft, and easily detached from the bone.

804. Superior wall of the tympanum absorbed. Mucous membrane of the tympanum thick.

805. *Left ear.* From a woman, æt. 62, who died from gangrene ; deaf in the left ear. Membrana tympani white and very concave : around the point of attachment of the malleus the blood-vessels are enlarged and distended with blood. The tympanum is three-parts filled with a thick tenacious white mucus, which was partly the cause of the white appearance of the membrana tympani. The mucous membrane of the tympanum was thick and very vascular, and that portion of it which covers the body of the incus was red, the vessels being greatly distended with blood. The upper wall of the tympanum is very thin and almost transparent ; the blood-vessels contained in it are distended with blood, and are continuous with the vascular mucous lining of the tympanum and the dura mater, which latter was also more vascular than natural. The tensor tympani muscle was atrophied, and no effect was produced on the membrana tympani by pulling it. (*Right ear.* See No. 291.)

806. *Left ear.* Membrana tympani destroyed by ulceration, except a small band at its posterior and superior region, to which the malleus is attached. Mucous membrane of tympanum very thick and diseased, and the bone, forming the upper wall of the tympanum, is also diseased in its entire thickness, the cranial surface of the bone being rough and very vascular. The dura mater which covers this part is in some places very thin, and in others presents large orifices. *History.*—Male, æt. 22 : died from phthisis : he was deaf in the left ear, and, when a child, had a scrofulous

affection of that ear, with discharge. In the right ear there was incipient calcareous degeneration of the membrana tympani, thickened mucous membrane of the tympanum, with bands of adhesion and partial ankylosis of the stapes.

807. *Left ear.* The dura mater covering the upper surface of the petrous bone was more vascular than natural, and on its free surface was a patch of blood. The upper wall of the tympanum was of a dark colour, and the thick mucous membrane was seen beneath it. The tympanic mucous membrane was very thick and of a dark purple colour, its vessels being distended. The upper part of the tympanum was filled by this thick membrane, so that serofulous matter and pus were retained in the tympanic cavity by it. The stapes was disarticulated from the incus; the ossicles were concealed by the thick mucous membrane. The lower osseous wall is also thin and of a red colour: it presented an orifice which allowed a communication between the tympanum and the jugular fossa. Membrana tympani destroyed *History.*—Boy, æt. 4. Had suffered from discharge in the left ear since his first year; the ear was tender, but pain had not been complained of. Convulsions and hemiplegia occurred two months before death. There was a large deposit of tubercles surrounded by pulpy matter, in the left cerebral hemisphere. (See *Medical Times and Gazette*, 1855, vol. xxxi., p. 107.)

808, 809. *Right ear.* The lower half of the membrana tympani is destroyed, and the inferior half of the upper part is attached to the promontory, so that the upper portion of the cavity of the tympanum, and that of the mastoid cells, was closed, and the matter there secreted had no exit. The tympanic mucous membrane was thick and ulcerated in parts. The mastoid cells presented a large cavity full of pus. On this side the dura mater was much congested. In the sulcus lateralis was a portion of necrosed bone about three-quarters of an inch long and half an inch broad. Between this and the dura mater was a considerable quantity of pus, which communicated with superficial abscesses behind

the ear. An abscess was found in the substance of the middle lobe of the cerebrum. In the left ear the lower two-thirds of the membrana tympani were absent, but the upper part was not adherent to the promontory, so that there was ample room for the egress of discharge from the tympanum. The tympanic mucous membrane was thick, but not otherwise diseased: the bone was healthy. *History*.—From a youth, æt. 12, who had an attack of scarlatina two years before death, since which he had a discharge from each ear. Acute symptoms, affecting the left ear, supervened on 13th February, 1854, and he died on March 16th. (See *Medical Times and Gazette*, 1855, p. 306.)

810. From a girl, æt. 10 years, who died with acute cerebral symptoms of short duration. She had formerly had a discharge from the right ear, but that had ceased, though deafness remained. *Right ear*. The whole of the petrous bone, and of the dura mater covering it, was of a deep red colour from the distension of the vessels. The upper wall of the tympanum was of a black colour and very thin: the tympanic cavity was full of scrofulous matter, dark in parts and in others white. The malleus was drawn inwards so as to touch the promontory, and shut off the upper part of the tympanum from the lower, and to confine the matter. (See *Medical Times and Gazette*, 1855, p. 52.)

811. *Right ear*. The whole of the upper wall of the tympanum destroyed by caries, the tympanic cavity communicating with that of the cerebrum by an aperture measuring three-quarters of an inch in length, and a third of an inch in breadth. The mastoid cells contain scrofulous matter. The periosteum was detached from the exterior, and the dura mater from the interior of the squamous bone, and separated by dark-coloured pus. The dura mater on the right side was gangrenous over a large surface, the middle lobe of the cerebrum was in a state of suppuration. *History*.—Female, æt. 18, of scrofulous diathesis. She had been deaf in the right ear for two years; the deafness was preceded by discharge. She died after nine days illness, death being pre-

ceded by epileptic fits. There was a very fœtid odour about the ear, but no discharge. (See *Medical Times and Gazette*, 1855, p. 106.)

812. *Right ear.* External meatus: dermis extremely congested, and of a light pink colour. Membrana tympani of a dark, red colour, and thick: it presents two perforations of small size, one at the anterior and upper part, and a second smaller, not larger than a pin's head, at the anterior and lower part. The tympanum contained pus and blood, the pus being chiefly at the upper part, the blood at the lower. There is an ulcerated orifice, about a line and a half in length by a line in breadth, in the plate of bone that separates the tympanum from the fossa jugularis. There is an irregular oval orifice, about two lines in length, in the posterior osseous wall of the fossa jugularis, by which it communicates with the cavity of the cranium. The walls of the jugular fossa are stained with blood. *History.*—From a soldier, who returned from the Crimea after fever in November 1855. At that time he had an abscess in the right side of the neck, with discharge from the ear: both became well, but he then became slightly jaundiced, vomited, and had a sharp attack of fever. He died on 12th December, 1855, having been delirious for some hours. The day before and night just preceding his death, there was a good deal of bleeding from the ear, amounting to about three or four ounces. He was deaf after the fever in the Crimea. All the viscera, except the spleen, which was large, were normal.
813. The upper part of the membranous meatus externus, near the point of attachment of the membrana tympani, was thick, red, and soft: the membrana tympani was absent, the whole of it having been destroyed by ulceration, with the exception of a small portion of the upper part to which the ossicula are attached. The tympanum contained a considerable quantity of thick caseous matter, consisting of granules, epithelium, and oil globules. The mucous membrane of the tympanum is very thick, soft, and of a deep, red colour; the lower wall of the tympanum is rough and

carious, and there are several small orifices in this wall, which allow of a communication between this cavity and that of the jugular fossa. The handle of the malleus has been destroyed by caries, the long process of the incus is rough and carious, and part of its substance has been destroyed; the portion which remains is adherent to the stapes. The dura mater was disconnected from that part of the surface of the petrous bone, which forms the upper wall of the tympanum; the superior surface of this portion of the dura mater was adherent to the arachnoid membrane. Serum was effused beneath the arachnoid and in the lateral ventricles. *History.*—From a boy, æt. 3, who died during hooping-cough. There was discharge from the left ear for eighteen months previously: it came on slowly without pain, but now and then it ceased, when there was great pain in the ear, which disappeared on the return of the discharge. The discharge was usually thick and white.

814. There is a large aperture in the squamous bone, and the petrous and mastoid bones are converted into a white cheesy-looking mass. The basilar process of the occipital and sphenoid, and the whole of the malar bone, were in a similar condition. A cavity was found in front of the ear, and another beneath the temporal muscles; both contained a soft cheesy substance. The ventricles contained three ounces of bloody serum; the arachnoid was much injected, and between it and the pia mater was a layer of yellow pus extending along the base of the brain. In the middle lobe of the brain was an abscess, containing upwards of an ounce of very fetid, greenish pus, and a second abscess existed in the middle of the posterior lobe. The softened bone consisted of cells of various forms, some few only having distinct nuclei; there was also interspersed among the cells granular matter. *History.*—Male, æt. 25. Subject for five years to a discharge from the right ear with occasional pain. A year before his death an abscess broke behind the ear, and discharged at times. About a fortnight before his death he suffered from severe pain in the head and vomiting, and had

paralysis of the right portio dura nerve. (See *Medical Times and Gazette*, 1855, p. 589.)

815. From a youth, æt. 19. Strumous. About nineteen months before his death he was knocked down and struck on the right side of his head. Deafness and pain soon supervened, followed by swelling, with sloughing and ulceration, to such an extent that a large chasm formed around the ear, leaving that organ completely isolated. No brain symptoms occurred. The brain appeared perfectly healthy, except at the lower part of the right hemisphere, which was pulpy and very soft. The softening was caused by the upward pressure of a soft scrofulous-looking mass, springing from the dura mater covering the petrous bone. This mass pressed upon the bone below, and appeared as though inclined to force its way downwards through the temporal bone at the junction of the squamous with the petrous portion, a great part of the latter being completely absorbed. Some new bone had formed at the inner side, and the whole of the exterior was occupied by a sloughy mass and carious bone, the surrounding parts being very hypertrophied. No vestige of meatus or mastoid cells could be discovered; the lateral sinus was filled by a coagulum. (See *Medical Times and Gazette*, 1855, p. 588.)

816. From a woman, æt. 35. *History*.—After a severe cold a year previously, pain began in the right ear accompanied by tumefaction of the right side of the face. Six months ago a red growth (supposed to be a polypus) was removed from the meatus. Since then there has been at times considerable bleeding from the ear. After this the pain in the ear increased, a red tumour occupied the meatus, and the parts surrounding the ear were swollen. The left portio dura nerve was paralysed. She died in about three months with symptoms of cerebral congestion. A large mass of reddish white colour extended from the posterior part of the mastoid process to the body of the malar bone. It was of different degrees of consistence, anteriorly it was hard and firm like the pancreas; posteriorly it was softer, and deeper towards the

styloid process, it contained a white creamy fluid; it contained also spiculæ of bone. The mastoid process was involved in the disease, and consisted of some detached masses of bone in the middle of a portion of the tumour. The osseous meatus had wholly disappeared, the remains of the membranous meatus could scarcely be distinguished. The only remains of the tympanic cavity were some portions of the mucous membrane having a dark livid hue: its blood-vessels were distended, and small red growths were attached to parts of it. There was no remnant of the bony tympanic cavity. The whole of the squamous bone, from an inch below the squamous suture, and the whole of the outer part of the petrous bone had been destroyed, so that the apex of the petrous bone had no connection with the squamous. The tumour had advanced inwards to the cavities of the cerebrum and cerebellum, through the aperture formed by the destruction of the squamous and petrous bones. In the middle cerebral fossa was a reddish white tumour, about the size of a small pear; it consisted of two portions, one of which was continuous with the external tumour, while the upper portion seemed to be an independent growth from the free surface of the dura mater. It was adherent to the lower surface of the posterior cerebral lobe, which was softened to the extent of half an inch. The harder portions of the tumour consisted of very delicate fibres and nucleated cells, while the softer parts and the creamy fluid were almost wholly composed of nucleated cells; some being circular, others fusiform, and others angular. (See *Medical Times and Gazette*, 1855, p. 587.)

817. Upper wall of the tympanum diseased: orifice.

817*a*. Caries of the upper and inner walls of the tympanum.

C. MASTOID CELLS.

818, 819. From a girl, æt. ten months, subject to scrofulous glands. *History*.—When first seen there was a considerable abscess behind the left ear, and discharge from the meatus.

The membrana tympani was absent, the mucous membrane of the tympanum thick and red. At the bottom of the abscess, dead bone could be felt. There had been a discharge from the right ear at the age of three months ; this lasted six or seven weeks and then disappeared. At five months of age, discharge took place from the left ear, and after it had continued for a month, an abscess formed behind the ear. She had frequently suffered from great pain in the left side of the head. The symptoms of cerebral irritation increased, and she died in a few days. *Left Ear.* The bone above and posterior to the meatus externus over the space of a sixpence was denuded ; it was rough, black, and soft, the external table had been removed. Upon making a vertical section of the bone through the horizontal portion of the cells, the walls of the latter were observed in a state of disease, and the cavity contained purulent matter. The outer wall of this portion of the cells was carious throughout. The membrana tympani had been wholly removed by ulceration, as also were parts of the tympanic mucous membrane ; the small portions remaining were thick, soft, and of a livid colour. The long process of the malleus had disappeared, the remnant was partially disconnected from the incus, as was the incus from the stapes. The inner surface of the carious bone is of a dark colour, and is itself carious ; it presents numerous small depressions. The dura mater thick, soft, and red, was separated from the carious bone by a transparent fluid. *Right Ear.* Affected by the same disease, but in an incipient state, the meatus was soft and red, the membrana tympani thick, white, and concave. The mucous membrane lining the tympanum and mastoid cells was thick and red, and there was a collection of mucus. (See *Medical Times and Gazette*, 1855, p. 154.)

821. From a man who died in St. George's Hospital in 1847. Disease of the mucous membrane of the tympanum and mastoid cells ; caries of its inner wall : suppuration in the lateral sinus produced by the inflammation of the mastoid cells. Secondary abscess. The case is recorded in the

Register of St. George's Hospital for 1847, No. 289. Post-mortem Book, No. 42.

822. From a man, æt. 50: deaf in the left ear. When young, he had scrofulous disease of the left mastoid process, followed by caries. *Left ear.* A fossa exists at the upper and anterior part of the mastoid process, near to the external meatus; it is nearly large enough to admit a horsebean. This fossa was lined by the integuments which adhered firmly to it. The lower half of the membrana tympani was absent, having apparently been destroyed by ulceration; the upper half is directed very obliquely inwards, and is adherent to the promontory. The ossicles remain, but the incus and stapes are disconnected. Attached to the anterior part of the long process of the malleus, near its inferior extremity, is an exostosis, measuring three-quarters of a line in length, which passes outwards, and somewhat backwards and downwards. The lamina of bone which forms the sulcus lateralis, is much thickened. The right ear was healthy.
823. From a girl, æt. 12, who died twenty-two days after receiving a violent blow on the head. An abscess formed beneath the temporal muscle, discharge took place from the left ear, and coma supervened upon symptoms of cerebral irritation. *Left ear.* The pericranium was separated from the squamous bone by purulent matter; the dura mater lining the squamous bone and covering the upper wall of the tympanum was thicker than natural, and but slightly adherent to the bone; the arachnoid and a portion of the cerebral matter were attached to this part of the dura mater. In the middle cerebral lobe was an abscess, containing four ounces of pus. The petrous bone was diseased. The membranous meatus was thicker than natural; its free surface was smooth, and presented no signs of ulceration. The superior and posterior walls of the osseous meatus were rough; this rough appearance was produced by a deposit of new bone, which was also found to extend on the outer surface of the squamous bone above the meatus for a space measuring half an inch in its vertical, and an inch in

its antero-posterior diameter. The posterior two-thirds of the membrana tympani were absent; the mucous membrane of the tympanum was healthy, but in the passage to the mastoid cells there was a collection of pus and scrofulous matter, which had not been freely discharged, on account of the small size of the aperture leading into the tympanum, contracted as it was by the thick mucous membrane. The upper wall of the tympanum was in a diseased state; the surface next to the dura mater was composed of a very fine scale of dead bone, about six lines long, and four broad; this was perforated by small orifices, and posteriorly it was eaten away in parts. Beneath this portion of dead bone, was a layer of new bone, which formed the upper wall of the tympanum, and it was continued upwards and outwards on the inner surface of the squamous bone to its upper margin; the old bone underneath and adjacent to this new bone was worm-eaten, and had been the seat of the disease, being about half an inch in breadth. In this case, there can be no doubt that disease in the horizontal portion of the mastoid cells commenced in early childhood, the squamous bone and dura mater being affected, but not to such an extent as to endanger life. As the bone was developed, new bone was deposited on each side of the diseased squamous bone, and it is probable the patient might have lived many years if the disease had not been re-excited by the blow. (See *Medical Times and Gazette*, 1855, p. 155.)

823a. Portion of brain and dura mater from the inner surface of the squamous bone, from the preceding case.

824. From a boy, æt. 13, who died after six weeks' illness, with symptoms of cerebral disease, pain in the right temporal region, with discharge and impaired hearing in the right ear. *Autopsy.* The ventricles of the brain were enormously distended with transparent serous fluid, amounting to at least half a pint. The venæ galeni were flattened, and contained no blood, having been obstructed by the pressure of the underlying disease. A few transparent and very minute granulations were scattered over the arachnoid at the base of

the brain. The inferior surface of the right lobe of the cerebellum was attached to the dura mater by slight adhesions. This lobe was the seat of three distinct abscesses, and the central part of it was almost entirely converted into pus. The left lobe and other parts of the cerebellum were free from disease. On examining the interior of the skull, a yellow spot about the size of a pea, was discovered over the petrous portion of the right temporal bone. The dura mater was here separated from the bone, by a thin layer of pus lying upon the carious bone, but there was no trace of inflammation or other disease in the cerebral aspect of the membrane. Over this space the bone was destroyed in its whole thickness, so that on lightly scraping it with a scalpel, the cavity of the tympanum was brought into view. This cavity was filled with opaque lymph of a reddish yellow colour, but on removing this, the bones and muscular apparatus of the ear were seen to be still in place. The membrana tympani was slightly thickened and opaque. (See *Medical Times and Gazette*, 1855, p. 405)

- S25. From a child, æt. 13 months. *History*.—At the age of six weeks, a discharge was observed to flow from the right ear, which continued, with short intermissions. About two months before her death, an abscess formed at the back of the ear, which discharged into the meatus. She died in convulsions, after febrile symptoms of a fortnight's duration. *Autopsy*.—The part of the sterno mastoid muscle attached to the mastoid process, was discoloured. The membranous meatus was much thickened, and of a dark purple colour. The posterior part of the osseous meatus was carious, and the bone continuous with and above it, for a space the size of a fourpenny piece was also carious, this being the portion of bone which bounds externally the horizontal mastoid space. The periosteum covering this carious bone, was thick and soft in parts, and ulcerated in others; internally, there is also a portion of necrosed bone, about one-half the size of that externally; and upon a section, the inner surface is found to be part of the necrosed portion of bone which is seen

externally, where it covers the tympanic cavity, and extends above it. The outer surface of the dura mater, which was in contact with the dead bone, was soft, spongy, and of a dark colour, and partly filled the superficial cavity formed by the necrosed bone; in immediate contact with the bone, however, was a soft, pulpy tissue. The membrana tympani was absent, the mucous membrane of the tympanum ulcerated, and the ossicles carious.

- 826, 827. From a man, æt. 73, who had been deaf some years. Could only hear a loud voice near to the left ear. *Right ear.* Membrana tympani in parts transparent, in parts thick and white like cartilage. The chain of bones fixed, the head of the malleus being ankylosed to the upper wall of the tympanum; when it was freed, the ossicles moved freely. *Left ear.* Membrana tympani: all the laminæ perforated except the epidermis, adherent to stapes and incus. In each ear the cancellous bone entering into the formation of the mastoid process was soft and dark-coloured.
828. Osseous wall of the lateral sinus carious, and perforated by numerous orifices, which communicated with the mastoid cells. The surrounding bone was thick, rough, and vascular. The mucous membrane of the tympanum was very thick, and in contact with the membrana tympani, which was white and thick.
829. From a man, æt. 29. *History.*—Had been subject to diabetes. The fatal illness commenced with a pain in the head, chiefly referred to the right mastoid process. The pain increased, and was attended with a purulent discharge from the ear. Drowsiness, giddiness and stupor supervened. Six weeks previous to death, an abscess was opened behind the right ear, from which a large quantity of pus was discharged. *Right ear.* The external meatus contained muco-purulent discharge, it was inflamed and tumified. The membrana tympani was entire, but of a dull leaden hue, and much softer than natural. The tympanum contained much purulent matter, and its lining membrane was vascular, thick and flacculent. The incus had disappeared: the stapes was

in situ, but was surrounded by bands of adhesion. The osseous walls of the tympanum were healthy. The mastoid cells were full of purulent matter; the bony laminæ dividing the cells were externally carious, large portions of them having been destroyed. The whole of the posterior wall of the mastoid cells, usually forming the sulcus lateralis, is destroyed, and in its place is an orifice measuring an inch and a quarter from above downwards, and more than half an inch in breadth. This orifice, in reality, corresponds exactly with the sulcus lateralis, as situated in the temporal bone, with the exception of half an inch before it reaches the fossa jugularis. A circular orifice about the size of a pea existed at the posterior part of the mastoid process, which communicated with the aperture just mentioned on one hand, and with the abscess behind the ear on the other. The membranous lateral sinus was much attenuated, and beneath it was a large quantity of pus.

830. From a woman, æt. 31, who died comatose four weeks after an attack of scarlatina, since which there had been a discharge from the left ear. *Autopsy*.—An abscess was found in the left lobe of the cerebellum, of the size of a walnut. It reached to the surface, and thus came in contact with a large quantity of pus, bounded by the diseased and distended walls of the lateral sinus: the latter contained pus and blood. There was an opening through the membrana tympani, which had a regular shape, and its size was one-third of the whole diameter of the membrane. The upper wall of the tympanum was healthy, and not even discoloured. The portion of the mastoid cells posterior to the incus contained some pus and blood, mixed together; this extended down as far as the mastoid process. The portion of the lateral sulcus, about an inch long, and half an inch broad, which forms the posterior boundary of this part of the mastoid cells, was of a dark, leaden colour. The canals in this portion of the bone were also distended with black matter. The bloodvessels between the lateral sinus and the mastoid cells were distended with dark pus and blood.

831. The right petrous bone of a child, who died with discharge from the ear after scarlatina. The mastoid cells are inflamed, and the plate of bone forming their external boundary is carious.
832. A portion of carious bone, about the size of a hazel-nut, from the mastoid cells.
833. Mastoid cells distended with serofulous matter ; upper wall of tympanum diseased ; dura mater greatly thickened.
834. Serofulous matter from the preceding case.
835. From a woman, aged 20, who was deaf in the left ear, and had long been subject to intense ear-ache, with occasional foetid discharge from the meatus. About a month before death, an abscess formed just above the left collar-bone, which continued to discharge large quantities of matter. She suffered from great disturbance of the heart's action, delirium, erysipelas, and coma. *Autopsy*.—A large abscess existed at the root of the neck on the left side, communicating with and extending through the whole of the carotid sheath ; the internal jugular vein was full of matter, and a clot containing pus globules extended into the vena cava. The lungs contained purulent infiltration. The cerebrum was healthy ; the arachnoid, near the tentorium, was smeared over with pus. The tentorium, covering the left lobe of the cerebellum, was much inflamed, thickened, and had matter between it and the arachnoid covering that lobe of the cerebellum ; and immediately beneath this, on cutting into the cerebellum, a circumscribed abscess, about the size of a walnut, was discovered. The part of the cerebellum in contact with the cranial bones was healthy. *Petrous bone*.—The external meatus contained pus. The glandular and periosteal portions of the membranous meatus were much softer than natural, and they adhered but slightly to the surface of the bone. The bone, forming the upper and outer half of the tube, was found to present numerous foramina, for the transmission of bloodvessels ; they were much larger than natural, and some of them were surrounded by delicate layers of new bone. The lateral sinus was of a dark-brown colour ; the dura mater

forming its posterior wall was entire. The sinus was full of coagulated blood, mixed with purulent matter. The dura mater, constituting its anterior wall, and which was in contact with the surface of bone forming the sulcus lateralis, was very thick and soft; portions of it were destroyed by ulceration, and the bone was exposed. The bone forming the sulcus lateralis was of a dark colour, and covered by masses of lymph and pus; its surface was rough, presenting throughout numerous orifices and tortuous grooves; this appearance being produced by the almost complete disappearance of the internal table of the skull, which, excepting two scales, each measuring about two lines in diameter, had been destroyed by caries. A carious orifice exists between the cavity of the cerebellum and the mastoid cells. The bone forming the jugular fossa is also carious. There is an orifice in the posterior part of the membrana tympani. The tympanic mucous membrane was much thicker than natural, and in the upper osseous wall was a carious orifice, that would allow the passage of a small pin. The mastoid cells at their upper part formed a cavity about the size of a horsebean; it contained pus. This cavity communicated posteriorly with the lateral sulcus by means of an orifice three lines in diameter; anteriorly the orifice into the tympanic cavity was not more than two lines in diameter, and it was placed above the level of the floor of the cavity containing the pus. (See *Medical Times and Gazette*, 1855, p. 228.)

836. Bony wall of the lateral sinus rough, and covered with a thin irregular deposit of new bone.
837. Lateral sinus distended with dark coagulum: the dura mater around it inflamed and thickened.
838. From a child, æt. eleven months, subject to much privation, and very weakly. *History*.—There had been a discharge from the right ear since birth. At the age of three months there were redness and swelling of the ear, with purulent discharge, and tenderness over the mastoid process. At the age of seven months, paralysis occurred on the left side of the face, the soft parts around the ear became sloughy, and

the mastoid process offered no resistance on pressure. *Autopsy.*—The dura mater was very thin; the convex surface of the brain was greatly congested; patches of dark-coloured blood were scattered over its hemispheres, especially on its right side, where, in one or two places, they extended to the depth of three or four lines into the substance of the brain. The cerebral veins were distended by coagula. At the surface of the posterior part of the middle lobe, on the right side, was a small abscess, the size of a pea. The dura mater, covering the petrous portion of the right temporal bone was separated from it by pus, and it was very much thickened. *Temporal Bone.*—The part of the squamous portion, between the root of the zygomatic process and the mastoid process, has been entirely destroyed, and the larger part of the mastoid process has also disappeared: an aperture, an inch in length, and three-quarters of an inch in depth, has thus been formed. The petrous portion is detached, and it is carious, both on its superior and posterior surfaces. The small remaining part of the mastoid cells contained serofulous matter. (See *Medical Times and Gazette*, 1855, p. 154.)

D. THE LABYRINTH.

840. From a man, aged 26. *History.*—For five years had suffered from pain in the left ear, with discharge. Twelve days before death he was seized with a severe pain in the head, extending to the back of the neck, followed by paralysis of the right facial nerve, and afterwards of the right side of the body, with delirium and coma. *Autopsy.*—The arachnoidal surface of the dura mater, covering the superior and mastoid surfaces of the right petrous bone, was in a healthy state; upon removing it from the bone, it was found, over two small portions of both surfaces, softer than natural, and the softer portions covered apertures in the diseased bone. Purulent matter was deposited at the base of the brain from the roots of the olfactory bulbs anteriorly to the medulla

oblongata posteriorly. The principal seat of the disease was the right side of the pons varolii, the substance of which was ulcerated, to a depth of a line and a half, over a surface as large as a sixpence. All the nerves, at their origins, were surrounded by pus, and the substance of the facial and auditory nerves of the right side was so soft as to be scarcely distinguishable from purulent matter. *Temporal bone.*—The dura mater around the orifice of the meatus auditorius internus was observed to be softened, and detached from the bone, which was denuded. The portions of the auditory and facial nerves within the meatus were in a state of suppuration. The external meatus contained two polypi, one of which, as large as a small pea, was attached by a broad base to the posterior wall of the meatus, about its middle; a smaller polypus, about the size of a grape-seed, was also attached to the meatus, near the former. Upon separating the membranous meatus from the bone, an orifice between two and three lines in diameter was observed in the bone, so that a communication existed between the meatus and the mastoid cells; there was, however, no orifice in the membranous meatus, so that the discharge from the ear did not come from the mastoid cells, but from the surface of the meatus only. The membrana tympani was perfect, but it was white and thickened. The tympanum contained much foetid pus; its lining membrane ulcerated. In the tympanum there were two portions of carious bone, one of which projected towards the cavity of the cerebrum, and was in contact with the outer surface of the dura mater; the other looked towards the cavity of the cerebellum, and was also in contact with the dura mater; this membrane, as stated above, being at these points thick and soft. The chain of bones was natural. The vestibule was full of a dark-coloured pus, having a foetid odour; the semicircular canals were also full of matter, having similar characters; and the osseous wall of the superior canal was carious at two or three points. This purulent matter extended from the vestibule and cochlea to the meatus auditorius internus. In the external semicircular

canal, where it makes a bulging in the tympanum, there is a minute carious aperture, not larger than a small pin's-head. This aperture contained foetid pus, and was the only medium whereby disease could have been communicated from the tympanic cavity to the labyrinth.

841. A portion of necrosed bone from the vestibule, in the preceding case.

SERIES XI.—DISEASE EXTENDING FROM THE EAR TO THE CAROTID CANAL.

843. From a woman, æt. 26, who died fourteen days after childbirth. She was very deaf in the right ear, and slightly so in the left. She had scarlatina when a child, and from that time had always a discharge from the right ear. *Right ear.* Membrana tympani destroyed: the tendon of the tensor tympani muscle had disappeared. The malleus and incus were in contact, and the connecting ligaments were soft, and so relaxed as scarcely to hold the bones together. The incus and the stapes were disconnected. The mucous membrane of the tympanum was thick, white, and soft, and in several places ulcerated; a thick discharge was diffused over it. The stapes was nearly concealed. The osseous walls of the tympanum were diseased, and that portion which corresponded with the carotid canal was carious and perforated with small holes, through which the external surface of the carotid artery was covered with purulent matter from the tympanum. The coat of the artery was thick and red, and there was a slight contraction of the carotid canal. (*Left ear.* See No. 762.)
844. Portion of the internal carotid artery from a woman, æt. 80, who had, during many years, been subject to a very offensive discharge from the left ear, and complete deafness on that side. The artery is contracted and diseased, from disease of the carotid canal. The osseous walls of the meatus externus were somewhat thickened. The carotid canal was

diminished in size, by thickening of its external and inferior wall, which is directly continuous with the anterior wall of the meatus externus. The superior wall of the tympanum was imperfect. (*Left ear.* See No. 74.)

VARIOUS SPECIMENS.

846. From a man, æt. 46, who died from a malignant disease of the central region of the left middle lobe of the brain. A tumour attached to the dura mater pressed upon the brain at the point indicated. *Left ear.* The upper surface of the petrous portion of the temporal bone is dark-coloured and roughened, presenting slight elevations. The mastoid cells are diseased, and the mucous membrane of the tympanic cavity was thickened, partaking of the disease of the bone.
847. Partial absorption of the upper surface of the petrous bone from the pressure of the tumour of the cerebrum.
- 848, 849. From a woman, æt. 26, of scrofulous diathesis, who had been subject to a discharge from the right ear since an attack of measles when a child. For twelve or sixteen months she had suffered from headaches and attacks of giddiness. Twenty-three days before death acute pain came on in the ear, and she died comatose. *Autopsy.*—An abscess occupied the whole of the upper part of the right cerebral hemisphere. The substance of the surrounding brain was healthy. Lymph was effused on the dura mater covering the petrous bone, and a portion of it was detached from the bone. The membrana tympani was absent; the tympanic mucous membrane and that of the mastoid cells was thick and soft, and it was covered by a large quantity of caseous scrofulous matter. The upper tympanic wall was of a dark colour, extremely thin, and perforated by numerous blood-vessels. The dura mater covering the upper part of the petrous bone, and lining the squamous bone, was very thick and detached from the bone, and a large quantity of puru-

lent matter was deposited between the dura mater and the arachnoid. The arachnoid was highly congested. In some parts the pus had passed through the dura mater and was in contact with the bone. The outer surface of the dura mater forming the lateral sinus is rough, where it is in contact with the inflamed bone; the internal surface of the sinus had portions of fibrine adhering to it.

850. The surface of the bone forming the wall of the lateral sinus is rough, and as if slightly worm-eaten. The membrana tympani is fallen inwards and is in contact with the promontory. The mastoid cells contain scrofulous matter.
851. From a man, æt. 35, subject to severe pain in the right ear for many years. Five weeks before his death a large polypus was removed from the external meatus. He died comatose, having suffered from great pain in the back of the head and neck, and loss of control over the limbs. *Autopsy.*—There was an abscess in the right lobe of the cerebellum large enough to hold a pigeon's egg. The contents were very fœtid; the walls were firm, and lined with false membrane, but were very thin where the cerebellum rested on the aquæductus vestibuli of the temporal bone. At this spot there was a small ulcerated opening in the dura mater communicating with a carious portion of the temporal bone. *Temporal bone.*—The membrana tympani was very much thickened: it presented an orifice at its anterior part, and had two small polypi attached to its superior and inner part. Upon separating the membranous from the osseous meatus, the latter, near to the membrana tympani, was darker and rougher than natural, and had evidently been subject to inflammation, which had penetrated into the mastoid cells and thence to the sulcus lateralis, which bounds them internally. The upper part of the sulcus lateralis is carious over a space about three lines in diameter, and there are orifices which were filled by coagulated fibrine. The dura mater in this locality was softened, but the disease had not penetrated to the cavity of the lateral sinus. The dura mater adjacent to the fossa jugularis was soft and partially destroyed by ulcera-

tion; the bone beneath it was found to be carious, and to form part of the posterior wall of the inner extremity of the mastoid cells. (See *Transactions of the Pathological Society*, 1850-1, vol. iii., p. 179.)

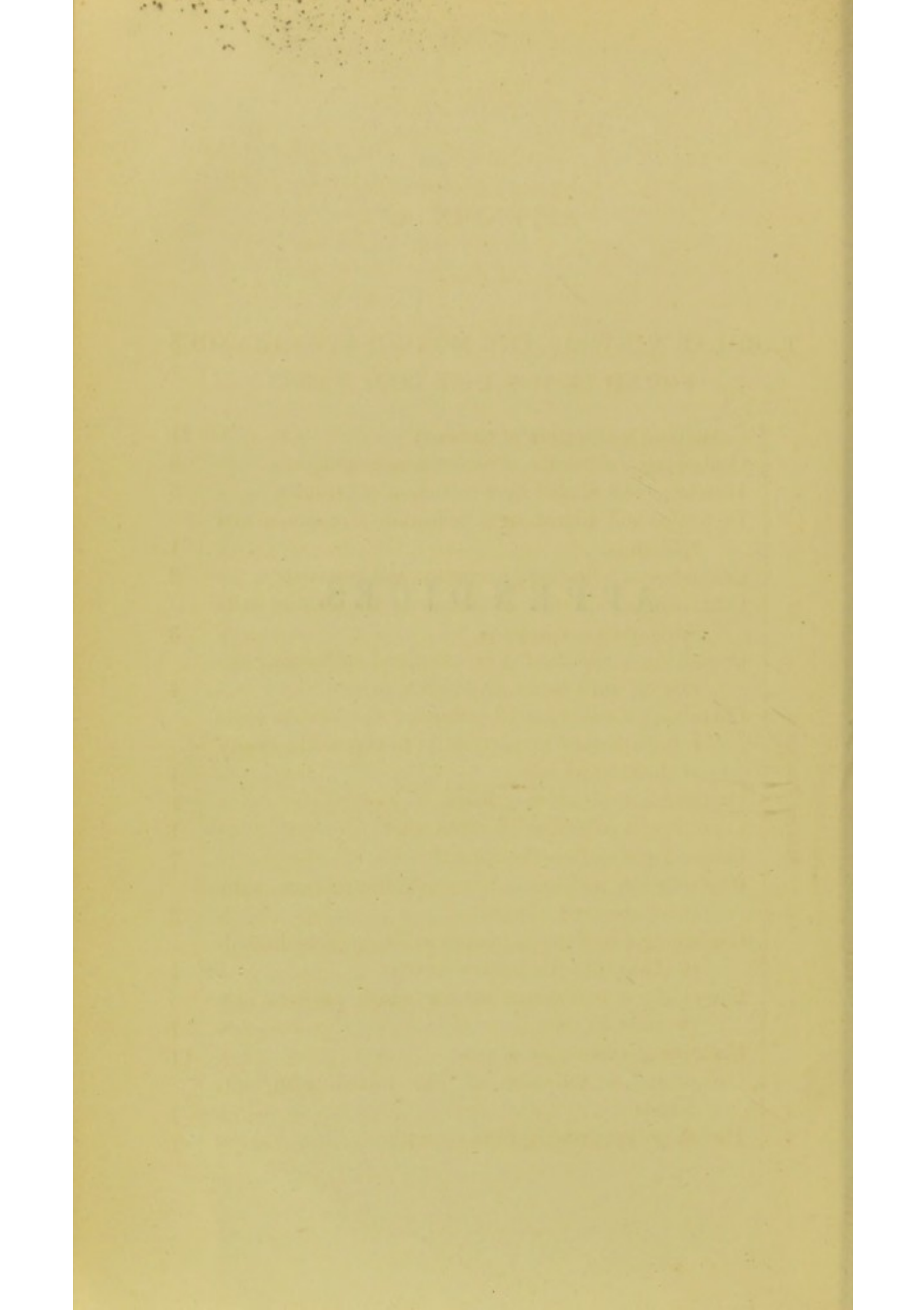
- 852, 853. From a woman, æt. 33, who died after an illness of several years' duration, of which the symptoms were violent pain in the head, followed by delirium and loss of power in the limbs, chiefly of the right side, but varying very greatly in amount. She was able at times to rise from her bed until within a few days of her death. There was discharge from the left ear, which was sometimes very profuse, as much as a tablespoonful escaping in the course of a few minutes, sometimes very slight or absent. The discharge generally relieved the severity of the symptoms. *Autopsy*.—Dura mater healthy. Vessels of pia mater, especially the veins, very full of blood. The brain seemed firmly compressed by the dura mater. On removing it from the skull, pus exuded from the external portion of left middle lobe; and, on careful examination, it was found that the substance of the brain was adherent, together with the dura mater, and other membranes, to the bone, over a space about the size of a sixpence, constituting the roof of the mastoid cells on the left side. The bone was carious at this part, and allowed a communication between the mastoid cells and the cavity of the cranium; but the substance of the brain having given way during its removal, owing to its adhesion to this portion of the bone, it is not possible to say, whether there was an actual communication between the ear and the abscess within the brain. A large part of the middle and posterior lobes of the cerebrum, on the left side, were occupied by an abscess, containing about two ounces of green-coloured pus, contained in a firm membranous sac, which was easily torn out from the surrounding cerebral tissue. The brain substance around the abscess was softened and broken down for the extent of two or three lines, in all directions; but, internally, the softening extended farther, and involved the whole of the left corpus striatum, which was entirely disin-

tegrated. The left lateral ventricle contained no excessive amount of fluid, but the right lateral ventricle was distended with about three ounces of clear pale serum. The substance of the brain, on both sides, was firmer than natural, and presented many bloody points, most numerous on the right side. The anterior boundary of the abscess was situated about two inches behind the fissure of sylvius, and the posterior boundary about one inch and a-half in front of the termination of the posterior lobes. The cerebellum and pons varolii were healthy. *Left ear.*—The superior bony wall of the tympanum is much thickened; and internally, opposite the horizontal portion of the mastoid cells, is an orifice about one-third of an inch in diameter. This orifice allowed of a communication between the middle cerebral cavity and that of the tympanum. There is a large aperture in the membrana tympani. From the large quantity of matter which sometimes escaped from the external meatus, it may be supposed that the contents of an abscess in the cerebrum situated above the aperture in the bone passed through the tympanic cavity. *Right ear* healthy, with the exception of an excess of pigment in the cochlea.

- 855, 856. From a man, æt. 77. Deaf. *Right ear.*—The meatus contained a small quantity of cerumen. Membrana tympani somewhat opaque, concave, its inner surface nearly touching the promontory; the mucous membrane of the tympanum is thick, and the cavity contains a quantity of fibro-cellular tissue, which occupies the whole of the upper part, and connects the body of the malleus to the inner wall of the tympanum, concealing the stapes. A membranous band connects the malleus to the promontory. The stapes is firmly ankylosed to the fenestra ovalis. The membranous vestibule is much atrophied, and the vestibular portion of the auditory nerve is shrivelled to half its usual size. The cochlear nerve is healthy. *Left ear.*—Meatus externus full of hard cerumen; membrana tympani hazy. The tympanic cavity is of its natural size, but it contains fibrinous matter. The stapes is completely ankylosed.
-

The first part of the history of the United States of America is the period from the discovery of the continent by Christopher Columbus in 1492 to the establishment of the first permanent settlements. This period is characterized by the exploration of the continent by Spanish, French, and English explorers, and the establishment of the first permanent settlements by the English in 1607. The second part of the history is the period from the establishment of the first permanent settlements to the American Revolution in 1776. This period is characterized by the growth of the colonies, the struggle for independence, and the establishment of the United States as a new nation. The third part of the history is the period from the American Revolution to the present. This period is characterized by the development of the United States as a major world power, the expansion of its territory, and the growth of its population. The fourth part of the history is the period from the present to the future. This period is characterized by the continued development of the United States as a major world power, the expansion of its territory, and the growth of its population.

APPENDICES.



APPENDIX A.

TABULAR VIEW OF THE MORBID APPEARANCES FOUND IN 1149 DISEASED EARS.

MEATUS EXTERNUS.	Containing a collection of cerumen - - -	71
	Containing a collection of cerumen and epidermis -	9
	Distended and dilated by a collection of cerumen -	5
	Distended and dilated by a collection of cerumen and epidermis - - - - -	1
	Containing a collection of cerumen and rye-seeds -	2
	Containing a collection of cerumen; the osseous walls being absorbed in parts - - - -	3
	Containing a collection of cerumen and epidermis; the osseous walls being absorbed in parts - -	4
	Containing a collection of cerumen; the osseous walls being absorbed in parts so as to expose the cavity of the mastoid cells - - - -	1
	Containing a collection of hairs - - -	1
	Containing a collection of cotton wool - -	1
	Containing a molluscous tumour - - -	7
	Containing a molluscous tumour; the osseous walls being absorbed in parts - - - -	3
	Containing a molluscous tumour which projects through the bone into the cerebral cavity - -	1
	Containing a molluscous tumour which projects into the mastoid cells - - - -	1
	Containing a collection of pus - - -	11
	Containing a collection of pus mixed with epi- dermis - - - - -	1
	Having polypi growing from its walls - - -	1

MEATUS EXTERNUS.

Having polypi growing from its walls, the bone being carious - - - - -	1
The dermoid layer so much atrophied as to leave the bone denuded - - - - -	2
The dermoid layer hypertrophied - - - - -	2
The dermoid layer congested - - - - -	7
The dermoid layer soft - - - - -	1
The dermoid layer soft and red - - - - -	2
The dermoid layer soft and detached from the bone - - -	2
The dermoid layer soft and thick, the bone being carious - - - - -	1
The dermoid layer ulcerated, the bone being carious - -	1
Osseous walls rough - - - - -	1
Osseous walls carious - - - - -	7
Osseous walls absorbed in parts - - - - -	2
Osseous walls presented an orifice superiorly - - - -	4
Osseous walls presented an orifice inferiorly - - - -	1
Osseous canal much contracted - - - - -	3
Having bony growths from the osseous walls; canal much contracted - - - - -	15

MEMBRANA TYMPANI.

Opaque - - - - -	15
Vascular - - - - -	7
Vascular and thick - - - - -	3
Relaxed - - - - -	4
Ruptured - - - - -	2
Tense - - - - -	10
Tense and atrophied - - - - -	2
Inner surface connected to the promontory by bands of membrane - - - - -	32
Inner surface adherent to the incus - - - - -	9
Inner surface adherent to the stapes - - - - -	4
Inner surface adherent to the stapes by membranous bands - - - - -	11
Inner surface adherent to the incus - - - - -	1
Inner surface adherent to all the ossicles - - - - -	2

Inner surface adherent to all the ossicles and the promontory by bands	-	-	-	-	6
Outer surface more concave than natural	-	-	-	-	37
Outer surface more concave than natural, and thick	-	-	-	-	4
Outer surface more concave than natural, and opaque	-	-	-	-	2
Outer surface more concave than natural, and thick and opaque	-	-	-	-	2
Outer surface more concave than natural, and soft	-	-	-	-	1
Outer surface more concave than natural, and tense	-	-	-	-	3
Very concave externally, and the inner surface in contact with the promontory	-	-	-	-	11
Very concave externally, and the inner surface connected to the promontory by bands	-	-	-	-	13
Very concave externally, and the whole of the inner surface in contact with the inner wall of the tympanum; the tympanic cavity being obliterated	-	-	-	-	7
Very concave externally, and thick, and adherent to the promontory	-	-	-	-	3
Thicker than natural	-	-	-	-	66
Thick and unyielding	-	-	-	-	5
Thick and white	-	-	-	-	12
Thick and soft	-	-	-	-	2
Thick and tense	-	-	-	-	5
Thick, and attached to the incus by membranous bands	-	-	-	-	1
Thick and vascular, and connected to the incus by bands	-	-	-	-	1
Thick and opaque	-	-	-	-	4
Thick, tense, and congested	-	-	-	-	2
Containing deposits of calcareous matter	-	-	-	-	16
Containing spots of cartilage	-	-	-	-	2
Flat externally	-	-	-	-	6
Flat, thick, and white	-	-	-	-	4
Epidermoid lamina thick	-	-	-	-	8
Epidermoid lamina absent	-	-	-	-	5
Dermoid lamina very vascular	-	-	-	-	1

Dermoid lamina very thick - - -	4
Dermoid lamina very thick and vascular - -	3
Dermoid lamina detached from the fibrous laminæ -	1
Having a polypus attached to it - - -	1
Radiate fibrous lamina absent, entirely destroyed by ulceration - - -	3
Radiate fibrous lamina absent in parts - -	2
Dermoid and fibrous laminæ absent in parts, apparently from ulceration - - -	3
Radiate and circular fibrous laminæ destroyed by ulceration in parts - - -	6
Radiate and circular fibrous laminæ entirely destroyed by ulceration - - -	4
Radiate and circular fibrous laminæ entirely destroyed by ulceration; the mucous lamina being attached to the promontory - - -	2
Radiate and circular fibrous laminæ containing pigment-cells - - -	3
Mucous lamina thick - - -	2
All the laminæ destroyed by ulceration except the epidermoid - - -	3
All the laminæ destroyed by ulceration except the mucous - - -	2
All the laminæ perforated - - -	51
All the laminæ absent, apparently from ulceration -	22
All the laminæ perforated; the remaining portion of the membrane being adherent to the promontory - - -	9
All the laminæ perforated and very thick - -	1
All the laminæ perforated, very thick and concave, and adherent internally to the promontory - -	2
All the laminæ perforated by molluscous tumours -	2
Upper part of all the laminæ detached from the bone - - -	2
The circular cartilage exposed - - -	2

CAVITAS TYMPANI.	Contents.	Mucus	-	-	-	-	-	67
		Blood	-	-	-	-	-	7
		Blood and mucus	-	-	-	-	-	1
		Blood and pus	-	-	-	-	-	1
		Blood, mucus, and lymph	-	-	-	-	-	1
		Serum	-	-	-	-	-	10
		Serum and mucus	-	-	-	-	-	3
		Serum and lymph	-	-	-	-	-	1
		Lymph	-	-	-	-	-	6
		Epithelium	-	-	-	-	-	2
		Epithelium and oil	-	-	-	-	-	1
		Scrofulous matter	-	-	-	-	-	20
		Calcareous matter	-	-	-	-	-	8
		Cerumen	-	-	-	-	-	1
		Cholesterine	-	-	-	-	-	1
		Cholesterine and mucus	-	-	-	-	-	5
		Cellular tissue	-	-	-	-	-	3
		Oily matter	-	-	-	-	-	1
		Pus	-	-	-	-	-	18
	State of the Mucous Membrane.	More vascular than natural	-	-	-	-	-	76
		Thicker than natural	-	-	-	-	-	214
		Thick and very vascular	-	-	-	-	-	16
		So thick as to conceal the stapes	-	-	-	-	-	27
		So thick as to fill the tympanic cavity	-	-	-	-	-	6
		Ulcerated	-	-	-	-	-	24
		Pulpy	-	-	-	-	-	5
		Containing black pigment-cells	-	-	-	-	-	2
		Having serum beneath it	-	-	-	-	-	1
	Membranous bands between	Malleus and promontory	-	-	-	-	-	6
		Malleus, incus, and promontory	-	-	-	-	-	1
		Malleus and stapes	-	-	-	-	-	1
		Malleus, stapes, and promontory	-	-	-	-	-	6
		Incus and promontory	-	-	-	-	-	5
		Incus, stapes, and promontory	-	-	-	-	-	3
		Incus and malleus	-	-	-	-	-	1

<i>Membranous bands between</i>	Stapes and promontory, the mucous membrane being healthy - - - - -	80
	Stapes and promontory, the mucous membrane being thick - - - - -	49
	Stapes and promontory, the mucous membrane being vascular - - - - -	6
	Stapes, promontory, and pyramid - - - - -	1
	All the ossicles - - - - -	30
	All the ossicles and the promontory - - - - -	9
	Tensor tympani muscle (the tendon) and the stapes - - - - -	3
	Chorda tympani nerve, incus, stapes, and promontory - - - - -	2
	Chorda tympani nerve and upper wall of tympanum - - - - -	1
<i>CAVITAS TYMPANI.</i>		
	Adherent to the promontory - - - - -	1
	Absent, apparently from caries or ulceration - - - - -	4
	Partly removed by caries - - - - -	1
	Malleus and incus lying in the mastoid cells - - - - -	1
	Fixed by ligamentous ankylosis to the upper wall of the tympanum - - - - -	3
	Fixed by osseous ankylosis to the upper wall of the tympanum - - - - -	2
	The body ankylosed to the incus - - - - -	3
	The long process detached from the membrana tympani - - - - -	3
	The long process fractured - - - - -	1
	The long process in contact with the promontory - - - - -	3
	The long process adherent to the incus - - - - -	1
	The long process detached from the body - - - - -	1
	The long process absent - - - - -	2
	The long process carious - - - - -	3
	The long process exostosed - - - - -	1

CAVITAS TYMPANI.	<i>Incus.</i>	Absent - - - - -	4
		Long process absent - - - - -	2
		Partly removed by caries - - - - -	8
		Disconnected from stapes - - - - -	14
		Disconnected from stapes and malleus - - - - -	1
		Fixed by membranous ankylosis to the orifice of the mastoid cells - - - - -	2
		Adherent to membrana tympani - - - - -	1
	<i>Stapes.</i>	The base ankylosed by bone to the fenestra ovalis - - - - -	62
		The base ankylosed by bone to the fenestra ovalis, the base being expanded - - - - -	10
		The base ankylosed by membrane to the margin of the fenestra ovalis - - - - -	43
		The base ankylosed by membrane to the margin of the fenestra ovalis, the base being expanded - - - - -	7
		The base ankylosed by membrane to the margin of the fenestra ovalis, an exostosis surrounding the fenestra - - - - -	3
		The base of the stapes attached to the fenestra ovalis more rigidly than natural - - - - -	82
		The base projecting into the cavity of the vestibule - - - - -	5
		The base expanded and more fixed than natural - - - - -	7
		The base expanded and projecting into the vestibule - - - - -	2
		Detached from incus and attached to the membrana tympani - - - - -	1
		Ankylosed to incus - - - - -	2
		Detached from the fenestra ovalis and the incus - - - - -	2
		Disconnected from the fenestra ovalis - - - - -	1
		Partially absorbed - - - - -	1
		Atrophied - - - - -	1
		Absent, apparently from ulceration - - - - -	2

INTERNAL EAR.	CAVITAS TYMPANI.	<i>All the Ossicles.</i>	Less moveable than natural	-	-	-	6
			Absent, apparently from ulceration	-	-	-	2
			Disconnected from each other	-	-	-	1
		<i>Osseous Walls.</i>	Carious	-	-	-	2
			Ankylosed	-	-	-	1
			Thickened	-	-	-	1
			Carious	-	-	-	6
			Upper wall partly deficient	-	-	-	54
			Lower wall partly deficient	-	-	-	25
			Osseous lamina between mastoid cells and lateral sinus incomplete	-	-	-	2
			Osseous lamina between mastoid cells and cavitas cerebelli incomplete	-	-	-	1
			Canal for portio dura nerve incomplete	-	-	-	2
			Carotid canal contracted	-	-	-	7
		<i>EUSTACHIAN TUBE.</i>	Containing mucus	-	-	-	10
			Containing mucus, and the lining membrane congested	-	-	-	1
			Containing mucus, and the lining membrane thick	-	-	-	2
			Mucous membrane congested	-	-	-	5
			Mucous membrane of faucial portion red and soft	-	-	-	2
			The walls connected by bands of adhesion	-	-	-	3
			A bony stricture in the osseous part	-	-	-	4
			A stricture in the cartilaginous part	-	-	-	2
			Very large	-	-	-	2
		<i>Tensor Tympani Muscle.</i>	Atrophied	-	-	-	14
			Attached to stapes by a membranous band	-	-	-	1
				-	-	-	
	<i>Auditory Nerve.</i>		Absent	-	-	-	1
			Atrophied	-	-	-	7
			Atrophied and congested	-	-	-	2
			Vestibular portion atrophied	-	-	-	1
			In a state of suppuration	-	-	-	1
			Having a tumour attached to it	-	-	-	1
			Having blood effused around it	-	-	-	2
				-	-	-	
				-	-	-	

INTERNAL EAR	Vestibule.	Membranous labyrinth thicker than natural	-	11
		Membranous labyrinth atrophied -	-	22
		Membranous labyrinth congested -	-	2
		Membranous labyrinth containing blood -	-	1
		Membranous labyrinth containing pus -	-	2
		Membranous labyrinth containing red serum -	-	3
		Membranous labyrinth containing an opaque fluid -	-	3
		Otoconie absent -	-	3
		Otoconie more abundant than natural -	-	10
		Endolymph deficient in quantity -	-	10
		A membranous band dividing the vestibule -	-	2
		An exostosis growing from its walls -	-	3
		Black pigment-cells more abundant than natural -	-	1
	Cochlea.	Blood-vessels distended -	-	3
		Cochlearis muscle (Todd and Bowman) red -	-	1
		Cochlearis muscle hypertrophied -	-	4
		Black pigment very abundant -	-	4
		Fluid opaque -	-	2
		Fluid of a dark colour -	-	2
		Fluid of a red colour -	-	7
		Fluid deficient in quantity -	-	8
		Lamina spiralis thick -	-	1
		Containing pus -	-	1
	Semicircular Canals.	Superior osseous wall of the superior semicircular canal incomplete -	-	2
		Posterior osseous wall of the posterior semicircular canal incomplete -	-	1
		Obstructed by otoconie -	-	2
		Otoconie more abundant than natural -	-	2
		Containing pus -	-	1
		Containing calcareous matter -	-	2
		Containing blood -	-	1
		A carious orifice from the tympanum into the superior canal -	-	1

INTERNAL EAR.	{	<i>Membrana Fenestræ Rotundæ.</i>	Thick	-	-	-	-	-	4
			Thick and tense	-	-	-	-	-	1
			Thick, tense, and opaque	-	-	-	-	-	2
			Red and pulpy	-	-	-	-	-	1
			Having bands of membrane covering its outer surface	-	-	-	-	-	4
			Ossified	-	-	-	-	-	2

APPENDIX B.

ON THE MODE OF REMOVING THE EARS FOR INVESTIGATION AND THEIR DISSECTION.

THE simplest method of removing the ears for the sake of dissection is, in the first place, to saw off the calvaria in the usual way, and then to take out both the petrous bones together, by means of two transverse vertical sections, one in front of each petrous bone and the other posterior to it. The anterior of these sections should pass in a line a little anterior to the anterior clinoid processes, and the posterior in a line through the posterior third of each mastoid process. By means of these two sections the trumpet-shaped extremity of each Eustachian tube, a portion of the mucous membrane of the fauces, and the whole of each petrous bone, together with the mastoid process, can be taken out. The disadvantage of this procedure is the disfigurement which is apt to ensue from the falling in of the face. To avoid this disadvantage another mode of removing the ears may be resorted to: this consists in taking out each petrous bone separately in the following manner:—The calvaria having been sawn off, an anterior section is to be made on each side on the same line as in the above plan, but extending only as far as the outer part of the body of the sphenoid bone; a posterior section on each side is then to be made, as in the first plan, but not extending further inwards than the basilar process of the occipital bone. These two sections are to be made with a saw, or with a chisel

and hammer; the apex of each petrous bone is then to be separated from the sphenoid and occipital bones, and each petrous bone, the outer ear and integument being detached and reflected downwards, is to be drawn outwards, taking care, by inserting the scalpel deeply, to remove as much of the soft parts as possible. With this second plan there is a difficulty in removing the whole of the guttural portion of the Eustachian tube; with care, however, this portion may be removed, especially if the final sections separating the petrous bone from the occipital and sphenoid be made to pass obliquely from above, downwards and inwards. The organ of hearing having been removed, the dissection may be conducted in the following manner:—The auditory nerve in the meatus should be first carefully examined, premising that a previous inspection has been made of the portion of the brain to which the portio mollis and portio dura nerves are attached. The size of the external meatus having been ascertained by allowing a strong light to fall into it, its anterior wall is to be removed by the cutting forceps, made by Messrs. Ash, of Broad Street, Golden Square; the state of the epidermis, the ceruminous glands, and secretion, the dermis, the periosteum, and bone, are to be noticed. The outer surface of the membrana tympani is then to be examined; also the state of its epidermoid and dermoid laminæ, its degree of tension, and the amount of motion possessed by the malleus when pressed upon by a fine point. The next step is to ascertain the condition of the guttural portion of the Eustachian tube, to lay open the cartilaginous tube with the scissors, and then to expose the cavity of the osseous portion by means of the cutting forceps. In doing this, the tensor tympani muscle is exposed; its structure should be examined, and, if it has not a healthy appearance, portions of it should be submitted to microscopic inspection. The upper wall of the tympanum is next to be cut away, by means of the cutting forceps; in doing this, great care must be taken not to disturb or disconnect the malleus and incus, which lie immediately beneath it. After the tympanic cavity has been exposed, the first step is to draw the tensor tympani muscle, and to ascertain how far it causes a movement of the membrana tympani and ossicles. The

incus and stapes are now to be touched with a fine point, so as to ascertain their degree of mobility; the tendon of the stapedius muscle is also to be pressed upon. The condition of the mucous membrane of the tympanum, and of the mastoid cells, is then to be ascertained, and any peculiarity of the cavity, the existence of bands of adhesion &c., to be noted. The most delicate part of the dissection, viz., that of the internal ear, must now be undertaken. The cavities of the vestibule and cochlea are to be exposed, by removing a small portion of the upper wall of each. Before reaching the vestibule, the superior semicircular canal will be cut through and removed; the membranous canal should be drawn out and inspected. As the cavities of the vestibule and cochlea are laid bare, it is desirable to see that the quantity of perilymph is natural, as well as its colour and consistence. The outer surface of the membranous labyrinth having been observed, it should be opened so as to expose the endolymph and otoconia, portions of all which parts should be removed for microscopic inspection. This having been effected, the remaining membranous semicircular canals are to be exposed, and the connexion of the base of the stapes to the fenestra ovalis carefully examined. The last stage of the dissection consists in removing parts of the lamina spiralis, in examining them microscopically, and in exposing from within, by following the course of the scala tympani, the membrane of the fenestra rotunda. The only organ which now remains unexamined is the stapedius muscle: in order to expose it, the course of the aquæductus Fallopii, beginning at the stylo-mastoid foramen, should be followed until the base of the pyramidal eminence, containing the muscle, is reached.

APPENDIX C.

LIST OF PUBLISHED PAPERS ON THE STRUCTURE, FUNCTIONS, AND DISEASES OF THE EAR.

- On the structure of the membrana tympani in the human ear,
with numerous engravings. Philosophical Transactions, 1851.
Part I.
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