**A treatise of the organ of hearing, containing the structure, the uses and diseases of all the parts of the ear / Translated from the French [by John Marshall].**

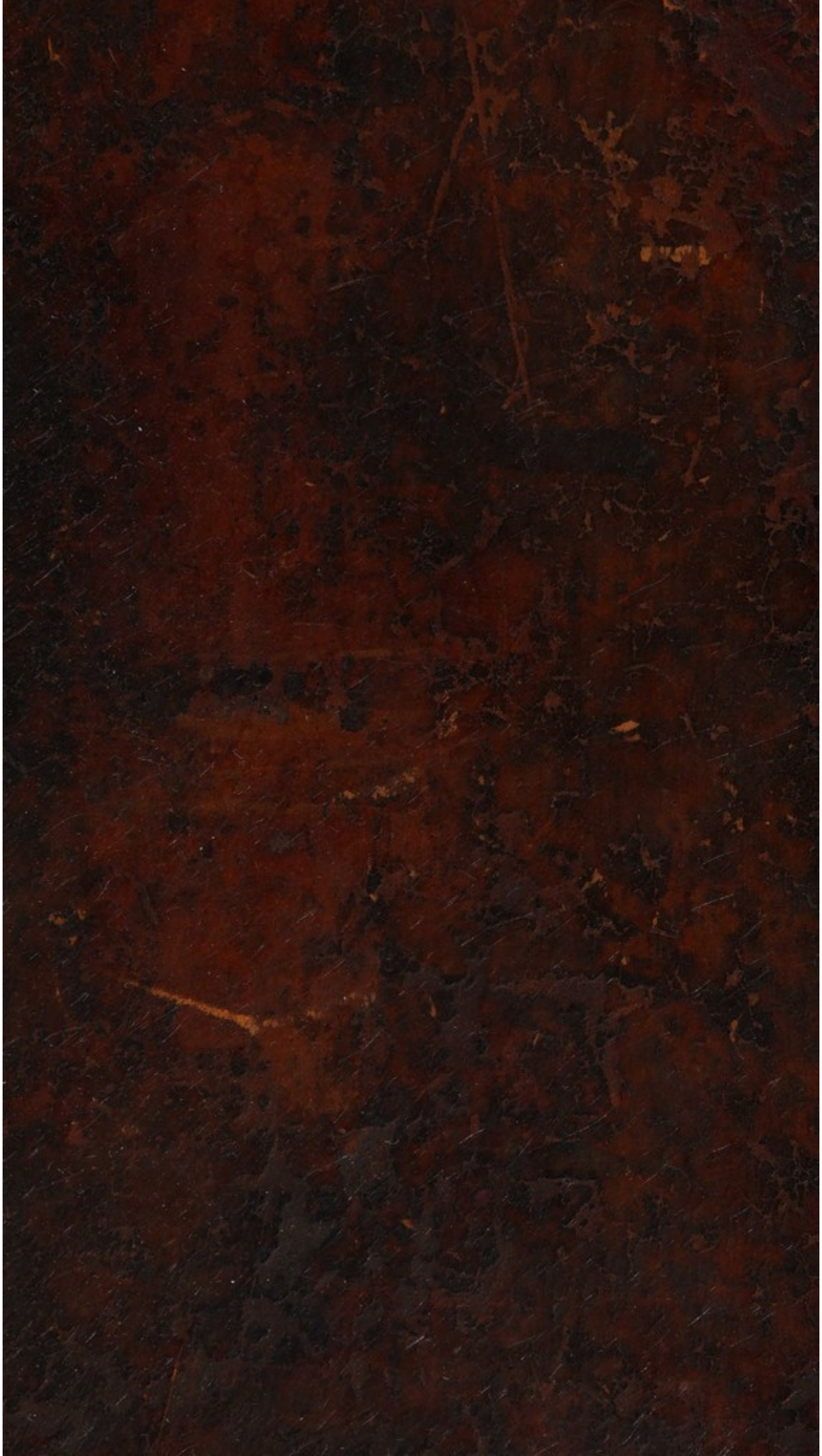

Plate 12 Missing

DUVERNEY, Joseph Guichard [1648-1730]

A

# TREATISE

OF THE

# *Organ of Hearing:*

CONTAINING

## The STRUCTURE, the USES,

AND

## The DISEASES of all the Parts of the EAR.

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Tranſlated from the *French* of the late

MONSIEUR *DU VERNEY*,

Of the Royal Academy of SCIENCES, Counſellor Phyſician in Ordinary to the late King of *France*,

And Profeſſor of *Anatomy* and *Surgery* in the ROYAL PHYSICK-GARDEN at *Paris*.

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*Adorn'd with Sixteen Curious Copper-Plates.*

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*LONDON:*

Printed for SAMUEL BAKER, at the *Angel* and *Crown* in *Ruſſel-Street*, *Covent-Garden*. MDCCXXXVII.

TO

Mr. FREKE, Mr. PHILLIPS, Mr. BIGG — Surgeons to St. *Bartholomew's* Hoſpital.

GENTLEMEN,

WHATEVER tends to the Benefit of Mankind in general, has no need of an Apology to introduce it to the World; and the more exenſive the Benefit is, the more valuable the Work muſt be. Now as there is no Art or Science but what in ſome manner conduces to this End, ſo that particularly

cularly which frees us from Pain and Sickneſs, muſt certainly be of the moſt univerſal Advantage, and conſequently merit the greateſt Encouragement. Anatomy and Surgery are of this kind; the one may be ſaid to be the Theory, the other the Practice, which like two neighbour Stars mutually reflect Light upon each other. The Knowledge therefore of our own Bodies, and an inquiſitive Search into the Organs of our Senſes, is not (as ſome idly imagine) a Matter meerly of Curioſity and Speculation. 'Tis this Knowledge, Gentlemen, which has ſo particularly diſtinguiſh'd you, and plac'd you in the Rank of the moſt Eminent in the Profeſſion. I might here, like moſt Dedicators, though with infinitely more Truth and Juſtice, enlarge abundantly upon your great Abilities, and other ſhining Virtues which ſerve to dignify your Characters; but that there is no need of a Pen to teſtify what is ſo loudly proclaim'd by the Tongues of Thouſands

ſands of poor Wretches, who owe their Lives as well as their Eaſe to that Skilfulneſs, Care and Humanity, the happy Influence of which they daily experience, and which I my ſelf am frequently an Eye-Witneſs of. 'Tis upon this account, Gentlemen, and not upon any Preſumption of my own Merit, that I am embolden'd to prefix your Names to this Tranſlation; not only as a means of recommending it to the World, but as an acknowledgment of that Reſpect and Duty, which I ſhall always retain a grateful Senſe of, and particularly of the many Favours and Obligations which are continually conferr'd upon me, by my worthy Maſter Mr. *Phillips*.

Nothing need be ſaid in praiſe of the Author, this Treatiſe has gain'd him ſufficient Applauſe from the moſt accurate Anatomiſts: But as for this Tranſlation (which I have endeavour'd to render as literal as poſſible) I ſubmit it entirely

ly to your candid Judgments, hoping you'll excuſe thoſe Errors that may have eſcap'd me: And beg leave to ſubſcribe my ſelf,

Gentlemen,

*Your Oblig'd*

*Humble Servant,*

JOHN MARSHALL.

THE

# THE

## AUTHOR's *Advertiſement.*

OF all the Organs aſſign'd to the Uſe of Animals, we have the leaſt Knowledge of thoſe of the Senſes; but there is none more obſcure than that of Hearing: the Minuteneſs and Delicacy of the Parts which compoſe it, being inclos'd by other Parts, (which by reaſon of their Hardneſs, are ſcarcely penetrable) render the Enquiries into them more difficult, and their Structure ſomething ſo intricate, that there is as much Trouble in explaining, as there was in diſcovering them. It is eaſy to judge

judge how little known they were to the Ancients, by what they have wrote upon this Head: And amongſt the Moderns, Mr. *Perrault*, who in his *Phyſical Eſſays* has treated it with more Exactneſs and Perſpicuity than any one yet, nevertheleſs has omitted many things on this Subject, applying himſelf to thoſe particular Parts which ſerve for the better Explanation of the Nature of Sound, by the Organs of that Senſe of which it is the Object. And this is what has induced me to write upon this Matter.

Altho' I don't pretend that this Work is entirely perfect, yet I am in hopes there may ſomething more be found in it, at leaſt, than hath been deſcrib'd before; for I have endeavour'd (by all the neceſſary Precautions I cou'd take, to avoid the Obſcurity which is to be met with in moſt Authors, that I have read upon this Subject,) not only to give an exact and compleat Deſcription of all the Parts belonging to the Ear,

Ear, but alſo to make that Deſcription as plain and intelligible, as much as poſſible: To attain which, I have ſpar'd no Pains, but have ſearch'd with all the Care and Patience imaginable, into the moſt minute Parts, examining their Subſtance, and their Figure, with a continual Apprehenſion of forgetting ſome Things, or miſtaking one for the other.

For to make this Treatiſe more intelligible, I have been very careful and exact in the Figures, which are particularly neceſſary to render theſe ſort of Deſcriptions neat: And becauſe it is not enough that theſe Figures ſhould be true and faithfully delineated, if they were not beſides order'd and diſpos'd in ſuch a manner, that they may leave no room for Ambiguity; I have repreſented the Parts of the right Ear always in their natural Situation, to preſerve the firſt Ideas that they imprint upon the Mind, that they may not bé confus'd nor deſtroy'd

by one another. And becauſe it often happens, that in ſeeing the ſame Parts in various Views, we miſtake them for different Parts; I have left certain remarkable Parts, which are eaſily known again, ſuch as the *Proceſſus Zygomaticus*, *Mammillaris*, and *Styloides*, and the bony Paſſage of the Ear, to ſerve as an Index to the Reader, and which will be his ſureſt Guide in his Enquiry into the Part which he examines. In ſhort, that I might not omit any thing which I thought belong'd to the Subject which I treated of, I have added the Deſcription of the Ear of a *Fœtus* to that of the Ear of an *Adult*, wherein I have taken notice of all the Difference I ever met with between the one and the other.

As for the uſe of ſome Parts of this Organ, I muſt confeſs that every thing that I have ſaid of them does not entirely ſatisfy me, no more than what others have wrote upon this Subject; I don't equally

aſſert

aſſert the Truth of thoſe particular Things which were diſcover'd before me: As for thoſe I have found out my ſelf, they are things which I maintain to be true, which I have many times experienc'd upon a great Number of Subjects, and which I promiſe to demonſtrate plainly to all thoſe who ſhall have the Curioſity to inform themſelves.

As I have reſolv'd to give a Deſcription of all the Organs of Senſe, and ſince it is abſolutely neceſſary to determine what is the Origin of their Nerves; I have been obliged to make a new Plate of the Baſis of the Brain, not being able to make uſe of any of the Figures that have hitherto appear'd, not even thoſe of Mr. *Willis*. I have ſaid nothing of the Senſes, nor of Senſation in general, becauſe I thought it neceſſary to know firſt the Structure of their Organs. I ſhall defer ſpeaking of them, till I have finiſh'd a particular Deſcription of all the Senſes, and

in

in the Interim I ſhall give you their anatomical Uſe.

I finiſh this Volume with a little Treatiſe of the Diſtempers of the Ear and their Cure, which muſt be look upon as an Eſſay, I ſhall endeavour to perfect it by the different Obſervation, which I may have an opportunity of making.

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ERRATA.

Pag. 22. Line 6. for Plate IX. Fig. 11. read Plate IX. Fig. 1. Pag. id. Line 15. for *Feneſtræ* read *Feneſtra*. Pag. 26. Line 6. after *ſide*, read *next to the Aqueduct*. Pag. 27. Lin. 12. for *Incus* read *Stapes*. Pag. 32. Lin. 10. for *dedcrib'd* read *deſcrib'd*. Pag. 41. Lin. 12. for *there* read *theſe*. Pag. 54. Lin. 5. after *no* read *other*. Pag. 57. Lin. the laſt, for *upper* read *under*. Pag. 61. Lin. 6. after *fix'd* add *in Adults*. Pag. 62. Lin. 4. for *Inferior* read *Superior*. Pag. 106. Lin. 2. for *Yolk* read *Oil*. Pag. 109. Lin. 15. after *Ears* read *as alſo the Blood which comes out of 'em from Wounds in the Head*. Pag. idem. Lin 27. after *Blood* read *which are at the* Baſis *of the* Cranium. Pag. 110. for *I do find*, read *I don't find*. Pag. 118. Lin. 7. after *conſiſts in* read *Extracting*. Pag. 139. Lin. 27. after *Particles* read *mov'd*.

# OF THE ORGAN OF HEARING.

## PART I.

### *Containing the Structure of the* Organ *of* Hearing.

THE Ear itſelf without being diſſected is divided into two Parts, that which appears externally from the Head, and is properly called the Ear; and that which is ſunk into the Head, and is call'd the Hole of the Ear, or the Auditory Paſſage.

*The External Part of the Organ of Hearing, called only the Ear.*

*Is compos'd* The Ear is form'd of a pretty thick Cartilage, which is cover'd with a thin tender Skin, ſtor'd, eſpecially in young Subjects, with a little Fat; under which is found another Nervous Covering, which ſtrictly adheres to all the Cartilage.

*Of a Cartilage,* This Cartilage commonly conſiſts of many Foldings, which are continued and terminate in a Cavity call'd the *Concha*, from its Reſemblance to the Entrance of a Snail-ſhell. The Windings or Folds of this Cartilage are more diſtinct in Adults, and their Figure is often varied. Beſides the Skin, the Cartilage, the Nervous Membrane, and the Fat, the Ear is furniſhed with ſome Muſcles, and adorn'd with Arteries, Veins, and Nerves.

*Of Skin, of Fat, of a nervous Membrane,*

*Of two Muſcles.* It has two Muſcles, the firſt conſiſts of fleſhy Fibres, which are fix'd to that part of the Skull which the *Muſculus Temporalis* covers; they deſcend in a ſtraight Line, and are inſerted into the ſuperior Part of the ſecond Fold of the Ear: The ſecond is alſo compoſed of five or ſix fleſhy Fibres, which take their Origin from the ſuperior and anterior Part of the *Proceſſus Mammillaris*, they deſcend obliquely about the Length of an Inch, and are inſerted into the Middle of the *Concha*. See *Plate* I. *Fig.* I. and II.

Expla-

to Face page .3

Plate I.

Fig. I.


Fig. II.


B. Cole. Sculp.

## Explanation of Plate I.

Fig. I. *repreſents the Ear in its natural Situation.* A B C D, *the Ear.* A B C, *its three Folds.* D, *the End of the Ear.* E, *the* Concha, *near* E *the Orifice of the Auditory Paſſage is ſeen.* F, *the Scituation of the* Tympanum. *The two dotted Lines ſhew the Length of the Paſſage.* G G, *the ſcaly Part of the Temporal Bone ſhewn bare.* H, *the firſt Muſcle, which is here repreſented as lying upon the ſcaly Part of the* Os Temporale, *becauſe it is diveſted of the Temporal Muſcle, upon which the Muſcle belonging to the Ear is naturally ſcituated.* I, *the* Proceſſus Zygomaticus. K, *the* Proceſſus Styloides.

Fig. II. *repreſents the Ear revers'd, to ſhew its ſecond Muſcle and its Integuments.* A, *the Ear revers'd.* B, *the ſecond Muſcle of the Ear, whoſe Fibres have been diveſted of their Membranes, to render their Origins and Inſertions the more diſtinct.* C, *the Place where the ſecond Muſcle is inſerted, ſtript of the Skin.* D, *the Skin of the Ear, ſtor'd in the lower Part with a little Fat.* E, *the Nervous Membrane.* F, *the Scaly Part.* G, *the* Proceſſus Mammillaris.

*Of Arteries.* The Arteries are Branches of the external Carotid, which after part of them being diſtributed to the *Larynx*, and to many Parts of the Face, are divided near the Articulation of the *Maxilla* into two other Branches; one of which paſſes over the fore-part of the Ear, and the other over the back-part. That Branch which paſſes behind the Ear, ſends off many little Ramifications, and is diſpers'd all over the back Part of the Ear: One of the moſt conſiderable of theſe Ramifications enters the Ear near the Auditory Paſſage, and is afterwards diſtributed into a great Number of ſmall Branches, which are expanded over the Skin, which lines the Inſide of the *Concha*.

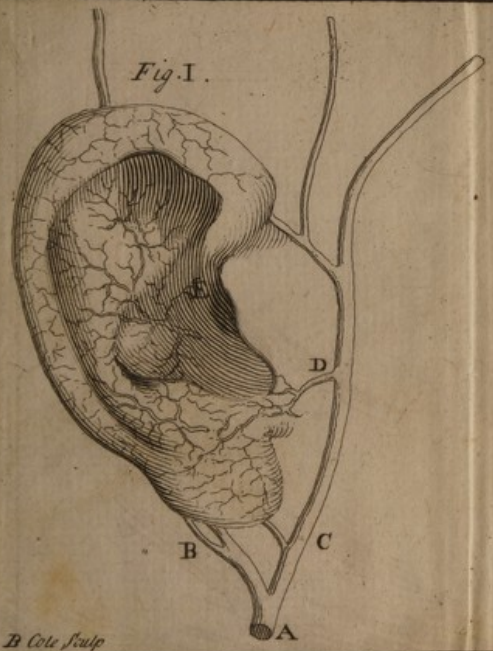
That Branch which paſſes over the fore-part of the Ear, is that which is perceiv'd to beat at the Temples, and which is commonly open'd for great Pains in the Head. In paſſing it is divided into many leſſer Branches, which ſprinkle the Cartilaginous Paſſage; and continuing its Courſe, it is again ramified, and ſends forth in this place Branches, which are ſpread over the fore-part and back-part of the Ear.

The

Plate II.

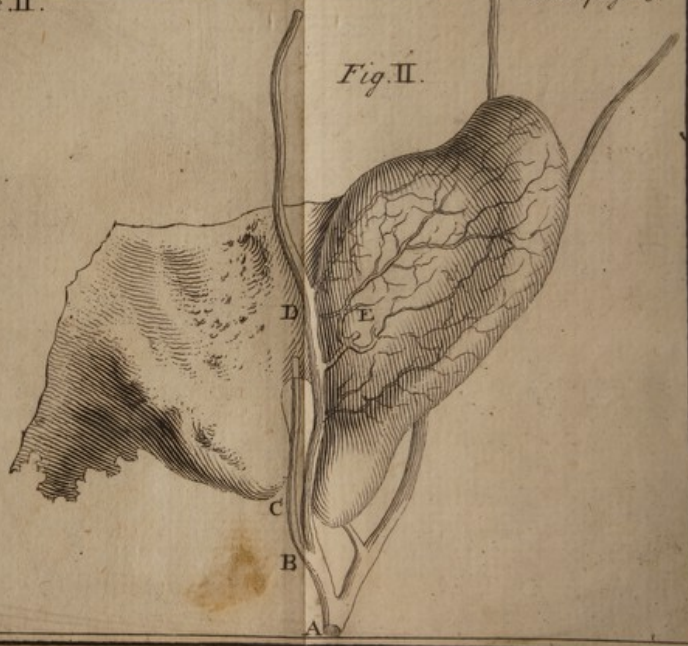
to Face page 5

Fig. I.




B Cole Sculp

Fig. II.



*Of Veins.*

The Veins are Ramifications of the External Jugular, which follow the Distribution of the Arteries. *See* Plate II. Fig. II.

## Explanation of Plate II.

Fig. I. *represents the Arteries, which are distributed upon the fore-part of the Ear.* A, *the external Carotid, cut off above the Angle of the Jaw.* B, *the Branch which passes behind the Ear.* C, *the Branch which passes to the fore-part.* D, *the Ramification of this Branch, which is distributed to the Lobe of the Ear.* E, *a Branch of an Artery, which passes through the Cartilage from the back-part to the fore-part, and is distributed to the Inside of the* Concha.

Fig. II. *represents the back-part of the Ear, to shew the Arteries which are behind the Ear.* A, *the same Trunk of the Carotid.* B D, *the Branch which passes behind the Ear, and which as it passes furnishes it with many Ramifications.* C, *a Branch which is distributed to the* Cavernulæ *of the* Processus Mammillaris. E, *the Branch which passes through the Cartilage, to be distributed to the Inside of the* Concha.

*Of Nerves.* As for the Nerves, we ſhall treat them when we come to deſcribe all thoſe which belong to the Organ of Hearing.

*The Hole of the Ear is divided into two Parts.* That which is called the Hole of the Ear, is a Paſſage, of which the *Concha* is as the *Veſtibulum* or Entry, and which leads to a Membrane, called the Drum.

*1. The Cartilaginous Part.* This Paſſage is partly Cartilaginous, and partly Bony. The Cartilaginous Part is formed by the Contraction of the *Concha*; this Part is about four or five Lines in length; the Cartilage which forms it is continued in itſelf, but it is broke off and ſeparated in many Places, as by ſo many Cuts which are not join'd together again but by the Skin which covers the Inſide of the Paſſage. This Cartilaginous Part covers but half the Auditory Paſſage, almoſt all the upper Part being only enclos'd by the Skin, which lines its Inſide. See *Plate* III. *Fig.* I. and II.

*Which is broke off in many Places.*

## Explanation of Plate III.

Fig. I. *repreſents the Cartilage of the Ear, and the cartilaginous Paſſage diveſted of all their Integuments.* A, *the Cartilage of the Ear, with its Folds.* B, *the cartilaginous Paſſage growing ſomething flat.*

C,

to Face page 7

Plate. III.

Fig. I.


Fig. III.

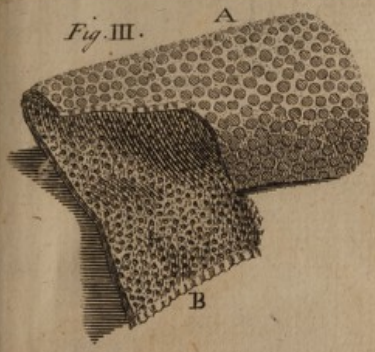
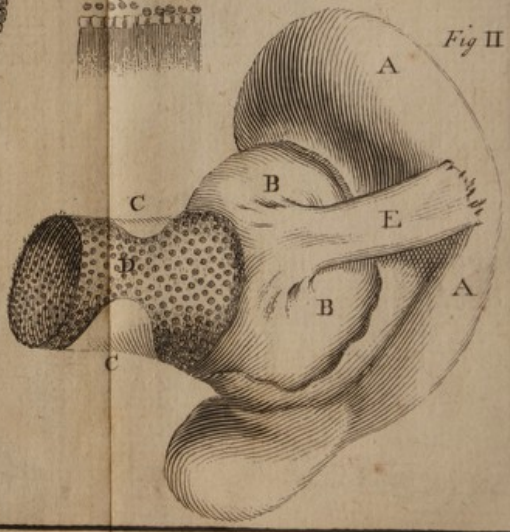



Fig. IV.



Fig II




B Cole. Sculp.

C, *the Part of the Cartilage which forms the Entrance of the Paſſage, and which makes a little Tongue at the forepart of the* Concha. 1, 2, 3, *The three Interruptions of the cartilaginous Paſſage.*

Fig. II. *repreſents the back Part of the Ear, and the upper Part of the cartilaginous Paſſage, with the Ligament, which ties the* Concha *to the temporal Bone.* A, A, *the back part of the Ear,* B, B, *the back part of the* Concha, *diveſted of the Skin.* C, C, *the Appendixes which terminate the Cartilage in the upper Part.* D, *the ſuperior Part of the Paſſage, which is form'd of nothing but of a glandular Membrane.* E, *the Ligament of the Ear revers'd.*

Fig. III. *repreſents the glandular Membrane, which inveſts the cartilaginous Paſſage; it appears in this place three times larger than Nature, for the better diſtinguiſhing all the Parts.* A, *the exterior Part of the glandular Membrane.* B, *the Paſſage open'd, in which the ſmall Hairs and the Orifices of the excretory Ducts of the Glands are viſible.*

Fig. IV. *repreſents the Diameter of the Part of the Paſſage, to ſhew how the Glands are half buried in the Thickneſs of the Membrane: Some of them are drawn out, to ſhew more plainly how deep they are buried.*

*And cover'd with a Skin.* This Skin, which is a Continuation of that which is in the fore-part of the *Concha*, is ſtrew'd with an infinite Number of ſmall Glands of a yellowiſh Colour, and a little inclining to an oval Figure, which lie under this Skin, and are ſomewhat depreſs'd in its Thickneſs. Each Gland has a ſmall Duct, which opens into the Cavity of the Paſſage among the little Hairs with which it is ſtor'd: And theſe are the ſmall Ducts which emit that thick glutinous and yellow Matter, which is commonly found in the auditory Paſſage. This cartilaginous Paſſage ends by adhering to many Inequalities, which are at the entrance of the bony Canal; which is only a Continuation of that which is Cartilaginous. Theſe Inequalities are pretty conſiderable on that ſide of the Entrance next the Face, to which the Cartilage ſtrictly adheres. And as there are but few of theſe Inequalities at the oppoſite Side, next to the back part of the Head, the Cartilage is connected in this place to the Bone by a ſtrong Ligament; which coming from the Extremities of the *Concha*, paſſes along the membranous Part of the cartilaginous Paſſage, and is inſerted into a ſmall Cavity in the *Os Temporale*,

*Adorn'd with many little Glands.*

*And is connected to the* Os Temporum *by a Ligament.*

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Fig. I.

Plate. IV.


Fig. II.

B. Cole. Sculp.

*Temporale*, at the Entrance of this bony Canal. See *Plate* III. *Fig.* II, III, IV. and *Plate* IV. *Fig.* I.

## Explanation of Plate IV.

Fig. I. *repreſents the* Os Temporale *bare.* A, *the ſcaly Part of this Bone.* BB, *the* Proceſſus Zygomaticus. C, *the little Cavity, into which the Ligament of the Ear is inſerted.* D, *the Entrance of the bony Paſſage of the Ear.* E, *the Inequalities which are on that Side of this Entrance next the Face.* F, *the* Membrana Tympani, *in its Scituation.* G, *the* Proceſſus Mammillaris. H, *the* Proceſſus Styloides. I, *the Tube, which incloſes the internal Carotid.* K, *a ſmall* Sinus, *which is between the bony Paſſage and the ſcaly Part of the* Os Temporale, *through which the external Muſcle of the* Malleus *penetrates into the* Tympanum. L, *the Extremity of the bony Paſſage, which forms part of the Paſſage which goes from the Ear to the Palate.* M, *the Cavity, into which the Condyloide Proceſs of the lower Jaw is inſerted.*

Fig. II. *repreſents the bony Paſſage, taken off from the temporal Bone.*

*2dly. The bony Part.*

This bony Part of the Auditory Paſſage, appears as if it was join'd to the *Os Temporale*. This Paſſage is, as it was ſaid before, the Continuation, or rather the Foundation of the cartilaginous Paſſage: Its Bore is a little Oval at the Beginning, but the more it advances towards the Extremity, it grows flat.

*The cartilaginous and bony Parts form the auditory Paſſage.*

That which is called the Auditory Paſſage, is form'd of a cartilaginous and bony Canal, placed one at the End of the other; this Canal runs obliquely and grows curv'd. For its Courſe, which at firſt aſcends and proceeds from the hind part to the fore-part, as far as its Middle, turns aſide afterwards, and deſcends again, always proceeding forwards as far as the *Membrana Tympani*. *See* Plate IV. Fig. I, II.

*The external Part of the Organ of Hearing, is ſeparated from the internal, by the* Membrana Tympani.

At the End of this Paſſage we find the *Membrana Tympani*, which ſeparates the above deſcrib'd external Ear from the Internal, and exactly cloſes up the Extremity of the Paſſage, as before taken notice of. This Partition is compos'd of a thin, dry, firm, tranſparent Membrane, almoſt round, and connected into a hollow Groove in the Circumference, at the end of the bony Paſſage. This Groove lies nearer the Inſide of the Head at its Bottom

Plate V

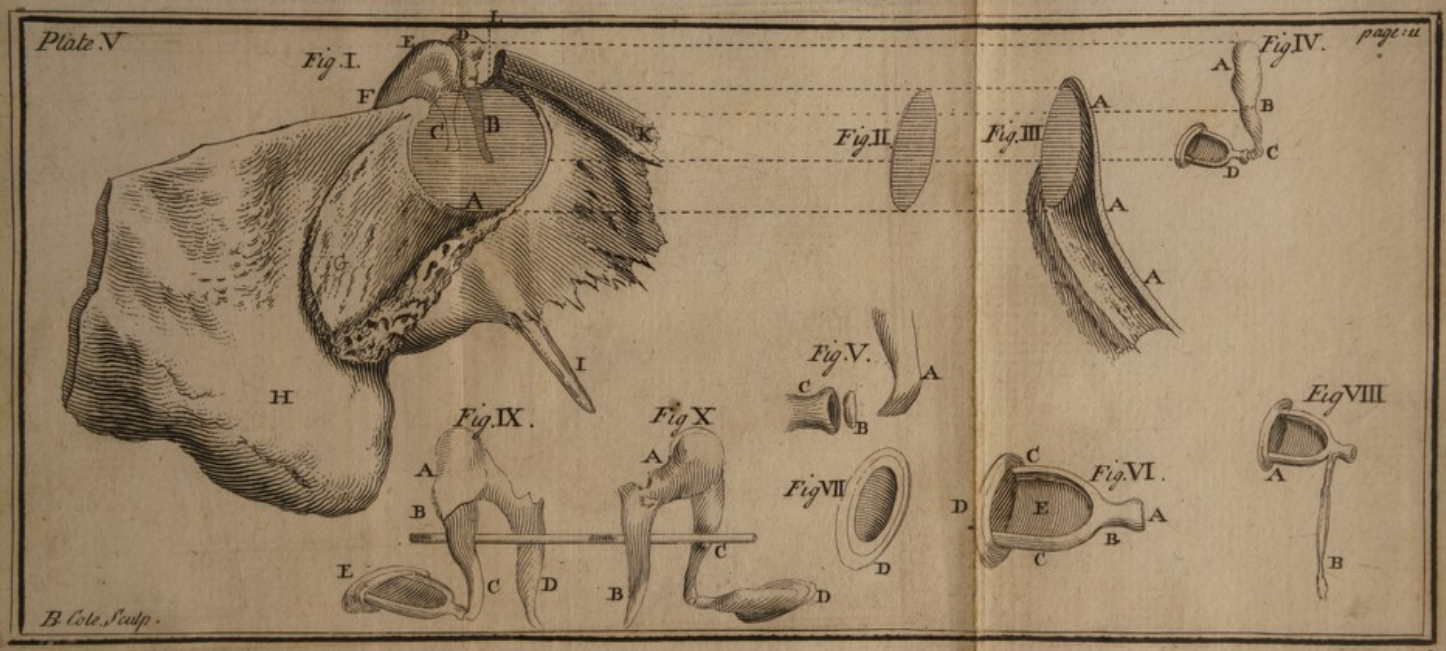


Fig. I.
Fig. II.
Fig. III.
Fig. IV.
Fig. V.
Fig. VI.
Fig VII
Fig VIII
Fig. IX.
Fig X
B. Cole Sculp.

tom than at its Top; it does not make a compleat Circle, but ends at the upper parts of its Circumference. Although this Membrane be extended, yet it does not make a plain Superficies; but it is indented inwards, by being fixed to the Handle of the Malleus. *See* Plate V. Fig. I, II, III. and Plate VII. Fig. I, II.

## Explanation of Plate V.

Fig. I. *represents the temporal Bone twice as large as Nature, in which all the scaly Part is cut off, and but as much of the bony Passage taken away, as was necessary to shew the* Membrana Tympani *bare.* A, *the* Membrana Tympani *in its Situation, and seen in the Front.* B, *the Handle of the* Malleus, *which is join'd to the back part of this Membrane.* C, *the long Branch of the* Incus, *which appears cross this Membrane, though it is a little way remov'd from it.* D, *the Head of the* Malleus. E, *the massy Part of the* Incus, *with its short Branch.* F, *which in this Section appears plainly.* G, *the bony Passage, half of which is cut off.* H, *the* Processus Mammillaris. I, *the* Styloides. K, *the external Muscle of the* Malleus *in its Situation.* L, *a punctur'd Line, which shews*

*the thin Proceſs of the* Malleus, *into which this Muſcle is inſerted.*

Fig. II. *repreſents the* Membrana Tympani *ſeen ſideways, to ſhew the better how it inclines.*

Fig. III. *repreſents the* Membrana Tympani *in the ſame View, and fix'd in the Extremity of the bony Paſſage; it alſo ſhews in what manner the Side of this Paſſage next the Face recedes, at the lower part from the* Membrana Tympani, *and how it approaches inſenſibly nearer to it as it aſcends.* AAA, *the Side of the bony Paſſage next the Face.*

Fig. IV. *repreſents the* Incus, *and the* Stapes *in their Scituation ſideways.* A, *the maſſy Part of the* Incus. B, *the ſhort Branch of the* Incus, *which in this Scituation appears exactly in the Front.* C, *its long Branch.* D, *the Head of the* Stapes, *which is joined with the long Branch of the* Incus, *by the Intervention of a fourth little Bone.*

Fig. V. *repreſents the Beak of the long Branch of the* Incus, *the fourth little Bone and the Head of the* Stapes *with its Cavity; all of them being four times larger than Nature.* A, *the Beak of the long Branch of the* Incus. B, *the fourth little Bone.* C, *the Head of the* Stapes *with its Cavity.*

Fig.

Fig. VI. *repreſents the* Stapes *five times larger than Nature.* A, *the Head of the* Stapes. B, *its* Collum *or Neck.* C C, *its Branches, which are hollow like a Gutter.* D, *its Baſis.* E, *the Membrane of the* Stapes.

Fig. VII. *repreſents the Baſis of the* Stapes *ſeen in the ſame Senſe, to ſhew that it is hollow like a Gutter.* D, *the Baſis of the* Stapes.

Fig. VIII. *repreſents the* Stapes *with its Muſcle in its natural Scituation.* A, *the* Stapes. B, *its Muſcle, the whole being repreſented twice as large as Nature.*

Fig. IX. *repreſents the* Officulæ *ſeen in the Scituation they would be in, if the Eye was placed in that Paſſage which penetrates into the* Proceſſus Mammillaris. A, *the maſſy Part of the* Incus. B, *its ſhort Branch ſeen in the Front.* C, *its long Branch.* D, *the back part of the Handle of the* Malleus. E, *the upper part of the* Stapes.

Fig. X. *repreſents the* Officulæ *in their Scituation, view'd from the oppoſite Side, the Eye being placed in the Paſſage which paſſes from the Ear to the Palate.* A, *the Head of the* Malleus, *which covers the maſſy Part of the* Incus, *and its ſhort Branch.* B, *the Handle of the* Malleus. C, *the long*

*long Branch of the* Incus. D, *the* Stapes *seen ſideways: The Stick which croſſes the* Officulæ *is placed here, to diſtinguiſh which are placed before and which behind, in theſe different Views.*

## Explanation of Plate VII.

Fig I. *repreſents the back part of the temporal Bone, with as much of it cut off as was neceſſary to ſhow the* Membrana Tympani, *upon which the back part of the* Malleus *and* Incus *is ſhewn, with the ſmall Branch of a Nerve, called the* Chorda Tympani, *and the Tendon of the external Muſcle of the* Malleus, *beſides the Cavity, upon which the Head of the* Malleus *and the maſſy Part of the* Incus *reſts, all in their natural Scituation.* A, *the back part of the ſcaly part of the temporal Bone.* B, *The* Proceſſus Mammillaris, *in the ſame View.* C C, *the* Os Petroſum *cut off.* D, *the* Membrana Tympani. E, *the* Malleus. F, *the* Incus *with its ſhort Branch, reſting upon the Entrance of the Paſſage, which penetrates into the* Cavernulæ *of the* Proceſſus Mammillaris. G, *the* Foramen *of the auditory Nerve.* 1. *The Tendon of the external Muſcle of the* Malleus. 2, 3. *The* Chorda Tympani.

Fig.

*to Face page. 14*

*Plate VII.*

*Fig. I.*


*Fig. II.*


*B. Cole. Sculp.*

Fig. II. *likewiſe repreſents the back part of the* Os Temporale *twice as large as Nature, all the ſcaly Part of which is taken away, and is ſaw'd from the Top to the Bottom, according to the Plan of the* Groove, *in ſuch a manner, that it is divided through the Middle of the* Proceſſus Mammillaris: *By this is ſhewn the* Groove *which receives the* Membrana Tympani *into it, and the Place where this* Groove *is wanting; it alſo ſhews how the Side of the bony Paſſage, next the Face grows flat near its Bottom, and covers a Part of the* Membrana Tympani; *and laſtly, it diſcovers all the* Cavernulæ *of the* Proceſſus Mammillaris. AA, *the* Groove. a a, *the Place where it is wanting.* B, *the Side of the bony Paſſage next the Face, which grows flat in this Place.* C, *the* Malleus. D, *the* Chorda Tympani *which is drawn inwards, to ſhow how it paſſes over the external Muſcle.* 2, 3. *The ſmall Sinus which is excavated out of the Bone above the* Groove, *and which ſerves as a Pulley to the Muſcle.* E, *the external Muſcle, which is alſo drawn inwards.* F F, *the bony Part of the Paſſage, which goes to the Palate.* G, *the Paſſage which leads into the* Proceſſus Mammillaris. H, H, *the* Cavernulæ *of the ſame Proceſs.*

Behind

*The first Cavity in the internal Ear, called the* Tympanum, *or Drum.*

Behind this Membrane is a Cavity called the *Tympanum*, from a sort of Resemblance it bears to the Box of a Drum, being on every Side surrounded with Bones, enclos'd before by the above-mention'd Membrane, and behind by the Surface of the *Os Petrosum*. This *Tympanum* is two or three Lines deep, and six broad; there are two Passages in its Sides, one of which is scituated in the fore-part, and is called the Aqueduct, and opens into the Palate. The other is scituated on the opposite Part, and in the Top of the Cavity opens into the *Cavernulæ* or Sinuositys of the *Processus Mammillaris*: At the Top of this *Tympanum* there is a small Cavity, in which the Heads of the *Ossicula*, (which we shall describe in the sequel) are placed. The Cavity of the *Tympanum* is rugged, unequal, and furnish'd with a Membrane, which is strew'd with a great Number of Vessels, some of which are Ramifications of the carotid Artery, which are distributed to the *Dura Mater*: The *Foramina* through which they pass are placed in the superior Part of the *Tympanum*, and very nigh the *Foramen*, through which this Artery belonging to the *Dura Mater* enters the *Cranium*.

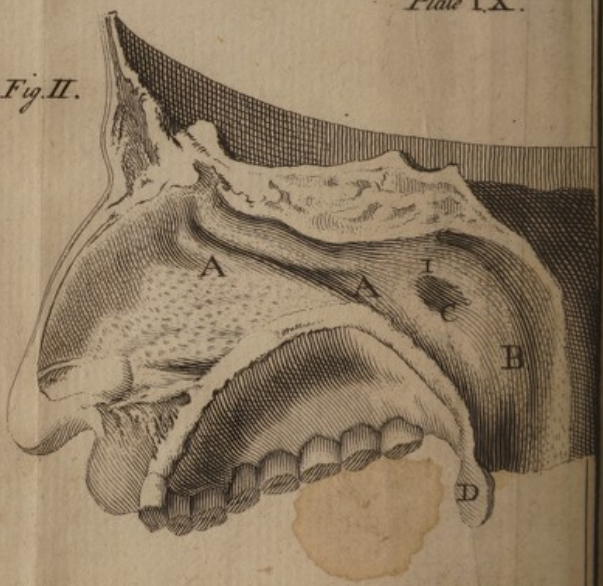
to Face page 17

Plate IX.

Fig. I.


B. Cole Sculp.

Fig. II.



*ium*. The others are Ramifications of hoſe that furniſh the Membranes, which over the *Cavernulæ* of the *Proceſſus Mamillaris*. *See* Plate IX. Fig. I.

## Explanation of Plate IX.

Fig. I. *repreſents the temporal Bone wice as large as Nature, all the ſcaly Part eing taken off, and being ſaw'd perpendicuır down a little diſtance before the Groove, o ſhew the Depth of the* Tympanum *and he* Cavernulæ *of the* Proceſſus Mammillaris, *to diſcover their Veſſels, and thoſe hich are ſpread upon the Membrane, which nes the* Tympanum. A, *a conſiderable rtery, which is a Ramification from that f the* Dura Mater. B, *a Vein which is ent off at the Entrance of the internal Juular, which is at the bottom of the* Tympanum. C, *the Veſſels which are ſent off rom the* Cavernulæ *of the* Proceſſus Mamillaris, *to be diſtributed to the* Tympanum.

Fig. II. *repreſents half a Head one third eſs than Nature, all the upper Part of the* Cranium *of which is taken off, and the reſt ut perpendicular through the Middle of the Noſe, to ſhew the Orifice of the Paſſage which goes from the Ear to the Palate.* A A, *the Cavity of the Noſe, with its*

Laminæ.

Laminæ. B, *the* Fundus *of the Palate.* C, *the Orifice of the Paſſage which leads from the Ear to the Palate.* 1. *Its cartilaginous Side, which forms a Border in the ſhape of a Creſcent.* D, *the* Uvula *cut through the middle.*

*Has five remarkable Things in it.*

There are five remarkable Things to be taken notice of in the whole *Tympanum*, *viz.* Two Paſſages, two *Feneſtræ*, four ſmall Bones, three Muſcles, and a Branch of a Nerve.

1. *Two Paſſages, one of which paſſes into the Palate.*

The Paſſage which paſſes from the Ear into the Palate, is called Aqueduct, not only becauſe it is like a Canal, but alſo becauſe it can make room for the Filth and other extraneous Humours, which are often gathered in the Inſide of the *Tympanum*, not being provided with any ſmall Valve to hinder their Egreſs. This Paſſage is bony as it comes from the *Tympanum*, and its Inſide is lin'd with the ſame Membrane which covers the *Tympanum*. It is ſcituated in the fore-part of the bony Canal, which encloſes the internal carotid Artery, and afterwards proceeding about three Lines in length, it terminates by many Unevenneſſes, which form Gaps, to which another Tube partly membranous and partly cartilaginous

is

is fix'd, which compoſes the reſt of the Paſſage. The membranous Side of this Paſſage faces the Hole of the Ear, and the cartilaginous Part the back-part of the Head. This Tube runs obliquely backwards as far as the Root of the Noſe, at the Extremity of the Palate, a little above the *Uvula*, and proceeding about the length of an Inch, it ends near the Middle of the interior Part of the internal Side of the Proceſſes, which are called *Pterigoidei*. This Paſſage is much larger than that which is bony; it is cover'd on the Outſide by one of the Muſcles, which ſerve to dilate the *Pharynx*, and on the Inſide by a glandulous Skin, which is a Continuation of that which lines the Inſide of the Noſe. The cartilaginous Part of this Paſſage grows thick towards its End, and forms a Border in the ſhape of a Creſcent. The Inſertion of the Aqueduct is ſo diſpos'd, that the Air which is receiv'd into the Mouth through the Noſtrils, is neceſſarily drawn into it. For the Horns of the Creſcent, particularly the lower one, extend in ſuch a manner into the Inſide of the Noſtrils, that it is impoſſible but that the Air muſt ſtrike againſt theſe Horns as it paſſes along; and that a great Part of this Air being ſtop'd, and as it

were

were intercepted in the Paſſage, muſt enter into the Aqueduct; otherwiſe all the Air would paſs through the great Apertions of the Noſtrils, directly into the Cavity of the Thorax. Mr. *Louver* has obſerv'd a like Piece of Mechaniſm in the Inſertion, or Opening of the axillary and carotid Arteries into the *Aorta*. For this Veſſel which paſſes out of the left Ventricle of the Heart, growing curv'd as it deſcends, would carry almoſt all the Blood which is ſent out of the Heart into its deſcending Trunk, if the axillary and carotid Arteries, which ariſe from the Middle of the Curve of the *Aorta*, were not diſpos'd, in ſuch a manner, that that Side of every Orifice which is the fartheſt from the Heart, being more elongated than the other, they ſtop a great part of the Blood as it paſſes before their Orifices. *See* Plate VIII. Fig. I, II. and Plate IX. Fig. II.

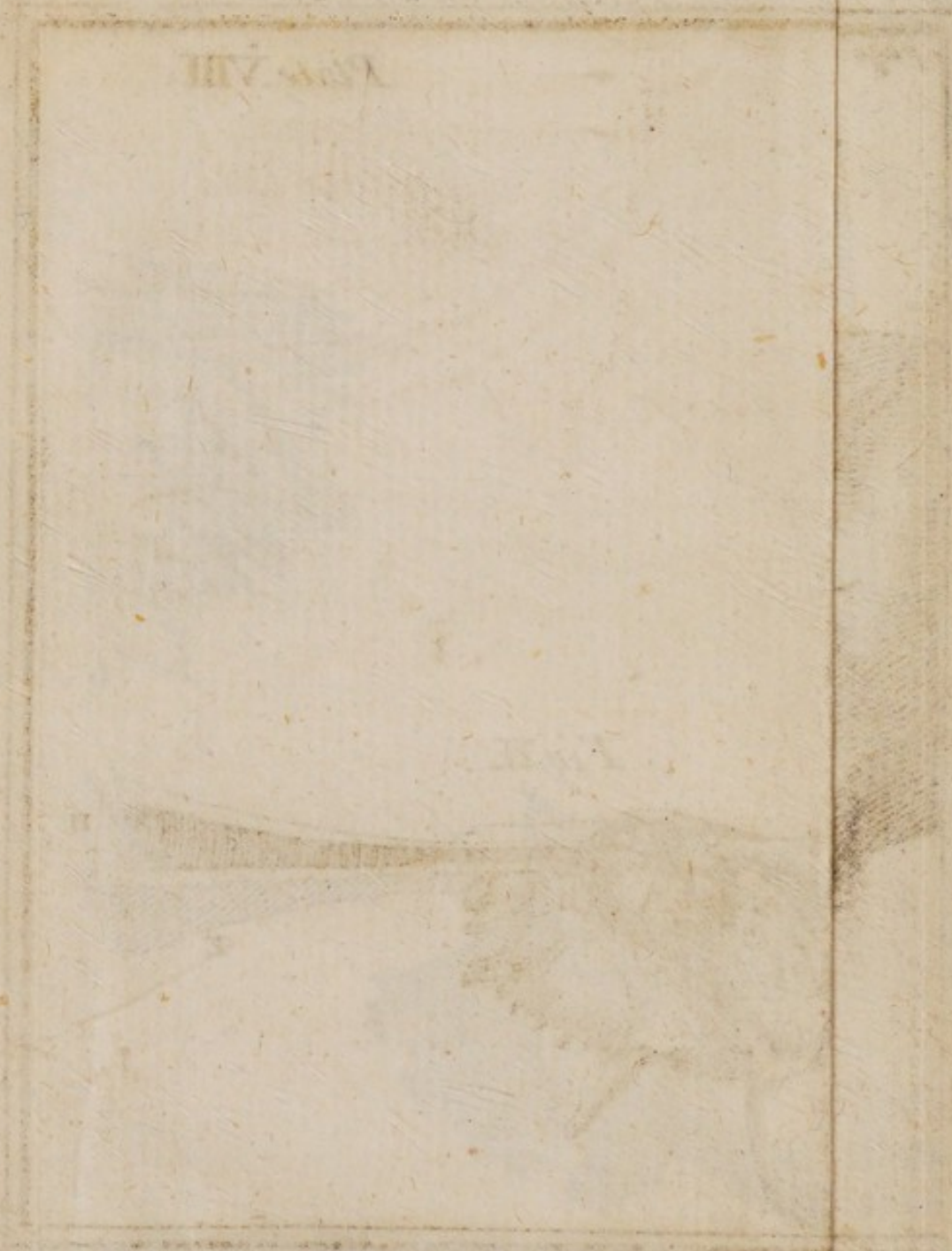
## Explanation of Plate VIII.

Fig. I. *repreſents the temporal Bone twice as large as Nature, the ſcaly Part being taken off, and part of the bony Paſſage taken away, and in general all the Parts of the* Tympanum, *which might hinder the View of the Surface of the* Os Petroſum, *which*

*Plate.* VIII.

*Fig.* I.


*Fig.* II.



*which makes one of the* Parietes *of the* Tympanum. A, *Part of the bony Paſſage.* B, *the Protuberance which is in the Surface of the* Os Petroſum, *and which covers the* Lamina Spiralis. C, *the* Feneſtra Ovalis. D, *the* Feneſtra Rotunda. E, *the bony Canal which encloſes the Muſcle of the* Stapes, *from which the Tendon is ſhown extruded, to be inſerted into the Head of the* Stapes. F, *the Canal which encloſes the* Portio Dura *of the auditory Nerve.* G, *a punctur'd Line to ſhew the Circumference which the* Membrana Tympani *takes up, and how large the* Tympanum *is.* H I, *the Semi-Canal, which encloſes the internal Muſcle of the* Malleus. H, *that Part of this Semi-Canal, which is extruded from the* Tympanum. I, *the Part which is in the* Tympanum. K, *half of the bony Paſſage, which leads from the Ear to the Palate.*

Fig. II. *repreſents the temporal Bone, pretty nigh in the ſame View as the preceeding Figure, but only as large as Nature, to ſhew the* Stapes *in its Situation, and the Canal which leads from the Ear to the Palate in its natural Direction.* A, *the* Stapes *in its Scituation.* B C, *the bony Part of the Canal.* D, *its cartilaginous Part, which grows thicker and larger at its Extremity.* E, *its membranous Part turn'd back.*

The

*The other into the* Cavernulæ *of the* Proceſſus Mammillaris.

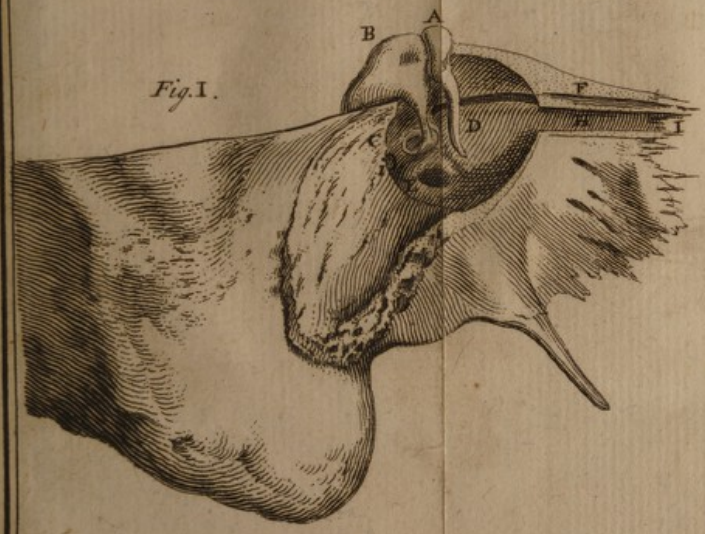
The other Paſſage, which is ſcituatte on the Top of the *Tympanum* is broadee but much ſhorter than the Aqueduct, an penetrates, as before mentioned, into th *Cavernulæ* of the *Proceſſus Mammiformi See* Plate VII. Fig. II. Plate IX. Fig. II

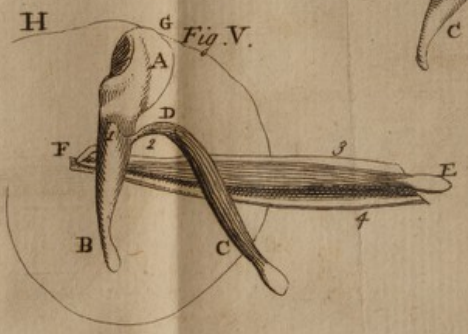
2dly, *Two Apertures, or* Feneſtræ.

The two Apertures, or *Feneſtræ* of th Tympanum, are placed in the Surface the *Os Petroſum*, which lies directly op poſite to the *Membrana Tympani*. The *Petroſum* being about the thickneſs of Line where they pierce, is the Reaſo why each of theſe *Feneſtra* forms a ſort a ſmall Paſſage, the Thickneſs of a Lin The firſt *Feneſtræ* is called Oval from i Figure, and is ſcituated a little higher tha the other. At the end of its Paſſage has a ſmall Border in the form of Foliag upon which the Baſis of one of the ſma Bones, term'd *Stapes*, is placed. Th other *Feneſtra*, which is call'd *Rotunda* Round, though it is like the other of a Oval Figure, has a Groove in the mid dle of its Paſſage, for the Inſertion of dry, thin, and almoſt tranſparent Mem brane, very like that of the *Tympanum See* Plate VI. Fig. I. Plate VIII. Fig. II. and Pate IX. Fig. I.

Expla

Plate VI







B Cole Sculp

Explanation of Plate VI.

Fig. I. *repreſents the ſame Bone, cut* *the ſame manner as* Fig. I. *of* Plate V. *he whole being alſo twice as large as Na-* *re, only the* Membrana Tympani *is taken* *f, to ſhew the* Officulæ *in their Scituation,* *nd the Inſide of the* Tympanum *with its* *ntain'd Parts.* A, *the* Malleus. B, *the* *icus.* C, *the* Stapes *ſeen in the Front,* *s Head being cover'd by the Beak of the* *ng Branch of the* Incus; *its Baſis ſtopping* *o the* Feneſtra Ovalis. D, *the* Fundus *of* *e* Tympanum, *which is the Surface of the* *s* Petroſum. E, *The* Feneſtra Ovalis. , G, *the Semi-Canal, which incloſes the in-* *rnal Muſcle of the* Malleus. F, *that Part* *the Semi-Canal which is ſituated out of the* *ympanum.* G, *the part which is in the In-* *de of the* Tympanum. H I, *the bony Part* *the Paſſage, which goes from the Ear* *the Palate, half of it being cut off to* *ew its Cavity.* i, *the End of the Tube,* *hich encloſes the Muſcle of the* Stapes.

Fig. II. *repreſents the* Incus, *on that* *de where it is articulated with the* Malleus. , *the maſſy Part of the* Incus. B, *the* *ort Branch, placed almoſt in the Front.* C, *e long Branch.* 1, *The firſt Cavity.* 2, *the* *econd.* 3, *The Eminence betwixt the other* *vo Cavities, mark'd by a punctur'd Line.*

Fig.

Fig. III. *repreſents the* Malleus *on the Side where it is articulated, to ſhew its Eminences and Cavity, which ſerve for its Articulation.* A, *its Head.* B, *its Handle.* C, *the large Proceſs.* 1. *The firſt Eminence*; 2. *The ſecond Eminence*; 3. *The Cavity which is between them, mark'd by a punctur'd Line.*

Fig. IV. *repreſents the* Malleus *with its two Muſcles, the Eye being plac'd in the Aqueduct, to ſhew the Compaſs of the two Muſcles, particularly that of the Internal which croſſes the* Tympanum *in its Progreſs to be join'd to the* Malleus. A, B, *the* Malleus. C, *the external Muſcle.* D *the internal Muſcle.*

Fig. V. *repreſents the Circumference of the* Tympanum, *and the fore-part of the* Malleus, *with its Muſcles in their Situation.* A, *the Head of the* Malleus. B, *the Handle.* C, *the external Muſcle of the* Malleus. D, *its Inſertion.* E, *the internal Muſcle.* F, *the Place where it bends to be inſerted in the Handle of the* Malleus *below the external Muſcle.* G H, *the Circumference of the* Tympanum; 1. *The large Proceſs of the* Malleus *ſeen in Front*; 2 *The thin Proceſs, into which the external Muſcle is inſerted*; 3, 4. *The nervous Coat of the internal Muſcle, open'd to ſhow the Muſcle.*

*The*

*This Figure ſerves to explain the Man-*
*ner in which the two Muſcles of the* Mal-
leus *act, in the Contraction and Relaxation*
*of the* Membrana Tympani: *For their In-*
*ſertions make it eaſily be conceiv'd, that when*
*the external Muſcle* C D, *acts alone, the Ex-*
*tremity of the Handle mark'd* B *is drawn*
*outwards, becauſe the Head of the* Malleus
*reſts againſt the* Tympanum *at the Place* G;
*but when the two Muſcles act together, the*
*Extremity of the* Malleus *being drawn in-*
*wards by the internal Muſcle* E F, *cauſes*
*a Tenſion in the* Membrana Tympani;
*becauſe the external Muſcle* C D, *draws,*
*or at leaſt ſupports the Head of the* Malleus,
*which does not reſt againſt the* Tympanum
*at* H, *as it does at* G.

The firſt among the little Bones contain- *3dly, Four lit-*
ed in the *Tympanum*, which preſents itſelf *tle Bones.*
to View, is called the *Malleus*, becauſe it is *The* Malleus.
thicker at one of its Extremities, call'd the
Head, and ſlenderer at the other, which is
called the Handle. The Head of this Bone
is fix'd in the above-deſcrib'd Cavity,
which is in the Top of the *Tympanum*: At
the Side and a little towards the back-part
of the Head of this Bone are two Protube-
rances, and a Cavity for its Articulation
with the *Incus*. The other Part of the

Bone, which is thinner, ſlenderer, a
more elongated, call'd the Handle,
encreas'd in Bulk by two *Proceſſes*, t
largeſt of which is outermoſt, and is fix
to the *Membrana Tympani*: The othe
which is on one Side, is ſlenderer a
ſmaller, and receives the Tendon of
Muſcle. This Handle leans upon, a
is fix'd a little obliquely to the *Membra*
*Tympani*, and growing flat at its Extr
mity, is more firmly connected to it in th
Place: This little Bone is common
about the Length of four Lines, and t
Diameter of its Head is the Third of
whole Length.

*The* Incus. The ſecond little Bone is called *Incu*
or *Anvil*, becauſe of its Figure. The
are three Parts to be taken notice of
this Bone, *viz.* Its maſſy Part, whi
makes up the Body of the Bone, and
two Branches which are *Proceſſes*, a
ſeem like Legs to it: The maſſy Pa
has two Cavities and one Protuberanc
to anſwer the two Protuberances, and o
Cavity of the Head of the *Malleus*,
be join'd to it by that ſort of Articulati
which is call'd *Ginglymus*, and which M
chanicks term Hinges. Almoſt all th
maſſy Part lies conceal'd in the aforeſa
Cavity, in the Top of the *Tympanu*

Th

he ſhorteſt of theſe Branches is placed
the Entrance of the Paſſage, which
es into the *Proceſſus Mammillaris*, and
Extremity is conceal'd and fix'd by a
gament in a ſmall Cavity, which is at
e Entrance of this Paſſage. The other
anch, which is the longeſt, deſcends per-
ndicular into the *Tympanum*, and grow-
g curved within, on that Side oppoſite
e *Membrana Tympani*, it forms a little
ak which is articulated, by the Help
a fourth Bone, to the *Incus* which is
third Bone.

The *Stapes*, or Stirrop, is ſo call'd from *The* Stapes.
exact Reſemblance to a Stirrop, having
o Branches plac'd upon a flat and
l Baſis, pretty like that part of the
rop upon which we lean our Foot;
at the Top it has a ſmall Head,
ch is like that Part through which
Stirrop is tied. It is in this Part
there is found a little Cavity, to re-
e the fourth little Bone. The *Stapes*
uated in ſuch a manner, that its Head
g ſeen in the Front, almoſt hides its
s; all the interior Part of the Branches
Baſis of the *Stapes*, is form'd hol-
like a Gutter. This ſmall Bone is
'd almoſt horizontal in this Cavity;
two Branches and its Baſis make a

kind of a Frame, to the Bottom of whi
is fix'd and join'd a Membrane, in t
ſame manner as oil'd Paper is fix'd to
Window-Frame. This Membrane is
a fine Texture, and ſtrewed with a gr
Number of Veſſels. The Baſis of t
*Stapes* is ſunk into the *Feneſtra Ova*
which it exactly cloſes up: It is fix'd
that Border which is made in the Form
Foliage, and which has been deſcrib
before, by the Help of a Membra
which connects it to it ſo exactly, tha
can't poſſibly by any Means be fu
down into the Cavity, which is at t
Bottom, nor lifted up to the Top of t
*Feneſtra*, without breaking the Membra

*The fourth little Bone.*

The fourth little Bone is of a very
conſiderable Thickneſs, it is a little co
vex on the Side next to the Head of t
*Stapes*, and as much, though but a litt
concave on the Side, which is articula
with the Beak of the *Incus*.

Theſe ſmall Bones are cover'd wit
*Perioſteum*, and there is no Cartilage fou
at the Places of their Articulation; b
they are firmly connected together o
by Ligaments which ariſe from their E
tremities.

The *Malleus* and *Incus* are of a v
compact and ſolid Subſtance; they o

e pierced by ſome *Foraminula*, which ford an Entrance for the Veſſels which ouriſh them. The *Stapes* on the contra- is of a very light and porous Sub- ance. *See* Plate V. Fig. I, IV, V. VI. II, IX, *and* X. Plate VI. Fig. I, III, *nd* IV; *and* Plate VII. Fig. I, *and* II.

Two of the three Muſcles which are the *Tympanum* belong to the *Malleus*, e third belongs to the *Stapes*: The irſt of thoſe which belong to the *Malleus*, may be called External, be- auſe it is ſituated upon the exterior Side f the bony Canal, which paſſes from the ar to the Palate, and continuing its ourſe upwards and ſomewhat backwards, enters the *Tympanum*, lying concealed a very oblique *Sulcus*, which is exca- ated directly above the Bone which has at Groove in it, into which the *Mem- rana Tympani* is inſerted. This *Sulcus* is at which is ſeen in the upper part of e bony Circle of the *Fœtus*, which we all treat of in the Sequel. This Muſ- le after it enters into the *Tympanum* is mediately inſerted into the thin Proceſs f the *Malleus*, which has already been eſcribed. *See* Plate V. Fig. I. Plate VI. ig. IV, *and* V; *and* Plate VII. Fig. I, *nd* II.

4thly, *Three Muſcles, two of which belong to the* Malleus, *viz. The External.*

*And the Internal Muſcle.* The ſecond Muſcle may be called II ternal, becauſe it is hid in a bony Sem Canal, ſituated in the *Os Petroſum*, whii Bone makes one of the *Parietes Tympan* One Part of this Semi-Canal is witho the *Tympanum*, and is contained in tl Top of the Paſſage, which goes fro the Ear to the Palate: The other Pai which is within the *Tympanum*, advances far as the *Feneſtra Ovalis*, and forms this Place a little Ridge, upon which tl Tendon of the Muſcle runs, as upon a Pu ley, paſſing from one Side of the *Tymp num* to the other, and is inſerted into tl poſterior Part of the Handle of the *Ma leus*, a little below the Inſertion of the ex ternal Muſcle, to draw it towards the C *Petroſum*. The Origin of this Muſcle exactly at the Place where the bony Pa of the Aqueduct ends; it is cover'd with nervous Coat, which forms a Sheath, whic accompanies it in all its Courſe, and firm ly connects it to the Semi-Canal. *Se* Plate VI. Fig. I, IV, *and* V.

*And one to the* Stapes. The Muſcle of the *Stapes* is hid in bony Tube, which is formed out of th *Os Petroſum*, almoſt at the Bottom of th *Tympanum*, from whence this Muſcle take its Origin: It has a large fleſhy Belly which ends ſuddenly in a very ſmall Ten

don

on, which is inſerted into the Head of ne *Stapes*. The Tube which encloſes the elly of this Muſcle is about two Lines ong, and is much larger at its End, where ne Tendon of the Muſcle paſſes through . *See* Plate V. Fig. VIII. *and* Plate III. Fig. I.

The laſt Part to be taken notice of in he *Tympanum*, is the ſmall Branch of a Nerve which paſſes behind the *Membrana Tympani*, which ſome have miſtook for he Tendon of one of the Muſcles which belong to the *Malleus*; but which is a Branch of the fifth Pair of Nerves, which hall afterwards be deſcribed. *A Branch of a Nerve.*

The above-mention'd two *Feneſtræ*, have each of them an opening into a Cavity, which is excavated out of the *Os Petroſum*, which is call'd *Labyrinthus*, from ts being very intricate, becauſe of its many Windings: This Cavity is divided into three Parts; The Firſt is that which may be called the *Veſtibulum*, or Entry of he Labyrinth, becauſe it leads to the two others; The Second Part contains three round Canals, which being curv'd in the Half Circle, I ſhall in the Sequel call them he three *Canales Semi-Circulares*; they are placed on that Side the *Veſtibulum*, towards the back-part of the Head: the *The ſecond Cavity of the internal Ear called the Labyrinth, is divided into three Parts.*

Third Part is the *Cochlea*, which is situated on the contrary Side.

*1ſt. The* Veſtibulum.

The *Veſtibulum* is a Cavity almoſt round, formed out of the *Os Petroſum*, and about a Line and a half in Diameter: It is ſituated behind the *Feneſtra Ovalis*, and covered on the Inſide by a Membrane, furniſh'd with a great many Veſſels. There

*Which has nine* Foramina.

are nine *Foramina* in it, of which one has been already described, *viz.* the *Feneſtra Ovalis*, which forms an Entrance from the *Tympanum* into the *Veſtibulum*; the other eight are in the Cavity of the *Veſtibulum*: The firſt leading into the upper Range or *Scala* of the *Cochlea*; there are five more which afford an Entrance into the three Semi-circular Canals, and the two laſt through which two Branches of the *Portio Mollis* of the auditory Nerve paſs.

*2dly, The three* Canales Semi-circulares, *viz.*

I ſhall give Names to the three *Canales Semi-circulares* to diſtinguiſh them, and ſhall take thoſe Names from their Situation: The firſt I call *Superior*, becauſe it takes up the upper Part of the Arch of the *Veſtibulum*; the ſecond *Inferior*, becauſe it ſurrounds its lower Part; and the third, which is placed more towards the Outſide, and is ſituated betwixt the other two, *Medius*.

The

The *Canalis Semi-circularis Superior* passing out of the *Vestibulum*, runs from the fore-part to the back-part, afterwards growing curv'd turns a little from the back to the fore-part, proceeding as far as the Middle of the posterior Part of the *Os Petrosum*, making a little more than a Half-Circle, and there it unites with the *Canalis Inferior*. Canalis Semi-circularis *Superior*.

The other which I call *Canalis Inferior*, comes from the inferior Part of the *Vestibulum*, and forms also a little more than a Semi-Circle, and joins itself to the superior Canal, as has been before described. These two Canals being joined together form but one, which advancing forwards a little obliquely, opens into the Middle of the *Vestibulum*. *Inferior*.

The third, which I call *Medius*, has its two separate Orifices, and forms no more than its Semi-Circle. The Bore of these Canals is sometimes round and sometimes oval, and is enlarg'd towards their Extremities, like the broad End of a Trumpet. Medius.

The six Extremities of these three *Canales Semi-circulares*, form only five Orifices into the *Vestibulum*, since there is one of these Orifices common to both the Extremities of the superior and inferior

Canals, as aforesaid. These Orifices are disposed in such a Manner, that there are two at the Top, two at the Bottom, and one in the Middle of the *Vestibulum*.

The first, to begin from the Top to the Bottom, is the Orifice of the *Canalis Semicircularis Superior*, the other is one of the Orifices of the *Canalis Medius*: These two Orifices are separated near their Entrance into the *Vestibulum*, only by a small bony Ridge, which ends insensibly as it enters into the *Vestibulum*.

As for the two Orifices which are at the lower Part of the *Vestibulum*; the first, reckoning from the Top to the Bottom, is that of the *Canalis Inferior*, and that which is situated above it is the other Orifice of the *Canalis Medius*.

The Orifice which is in the Middle of the *Vestibulum*, and which is the largest of them all, is that which is common to the superior and inferior Canals. *See* Plate X. Fig. I, IX.

## Explanation of Plate X.

Fig. I. *represents the temporal Bone twice as large as Nature; it is prepar'd in such a manner that it shews the* Cochlea, *and the Semi-circular Canals in their natural Situation.*

Plate X.

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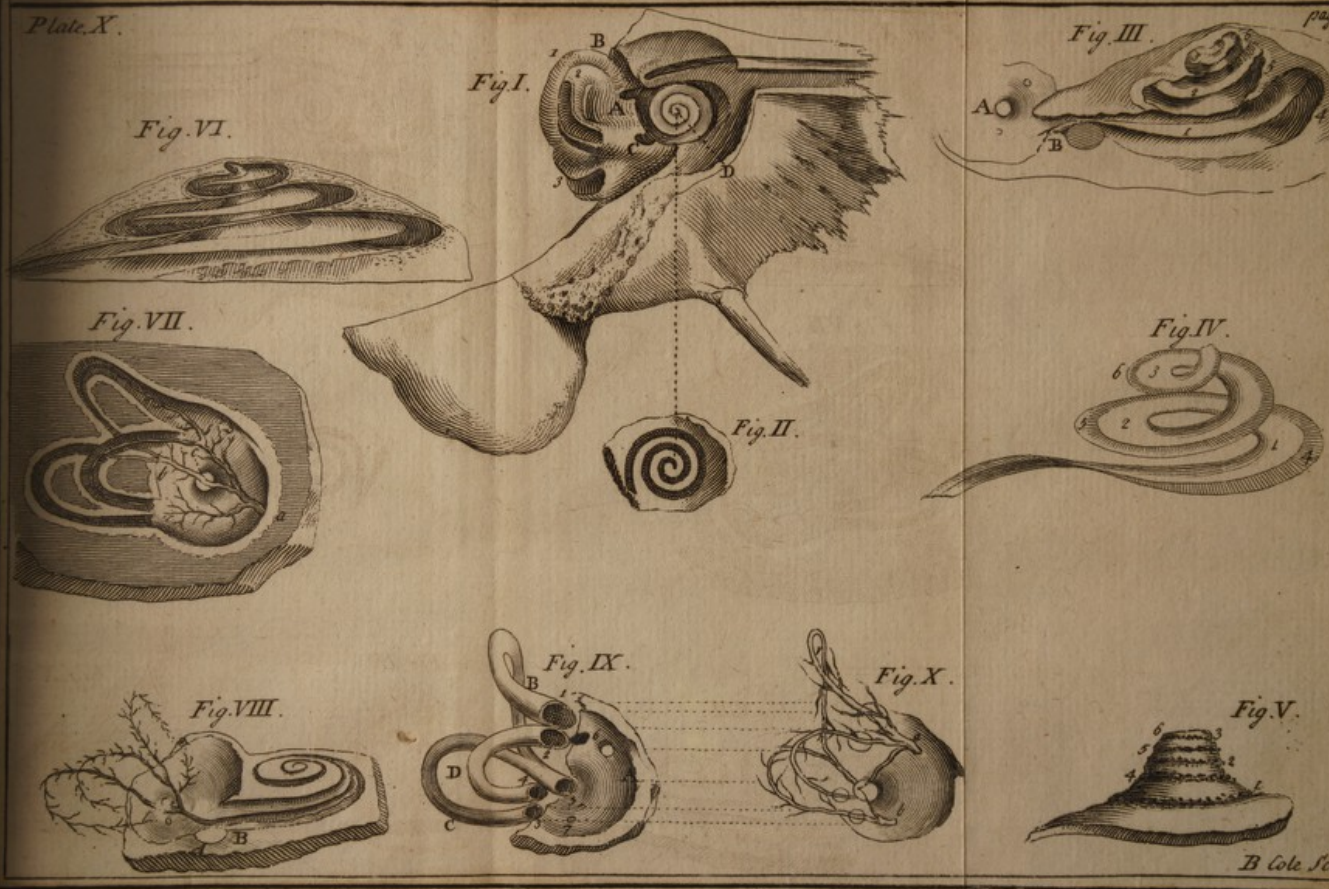

*ation.* A, *the Vault of the* Veſtibulum. B, *the* Feneſtra Ovalis, *mark'd by a punctur'd Line.* C, *the* Feneſtra Rotunda *open.* D, *the* Lamina Spiralis *mark'd by a punctur'd Line, diveſted of the ſpiral Canal which covers it, and of the Membrane which connects it to the Surface of this Canal.* 1, 2, 3, *the three Semi-circular Canals in their natural Situation.* 1. *the Superior.* 2, *the Middle.* 3. *the Inferior. The Middle, and the Inferior are open, to ſhew that they are hollow.*

Fig. II. *repreſents the Inſide of the Covering of the* Cochlea *taken off, to ſhew the Semi-oval Spiral Canal.*

Fig. III. *repreſents the Height of the* Cochlea *much larger than Nature, to ſhow it thus, The fore-part of its Covering only is taken off by a perpendicular Section: This ſhews how the* Lamina *makes two Turns and a Half round the Axis, how it is fix'd to the Surface of the Canal which ſerves as an Arch to it, and how the Sides of this Canal, which are connected to the Axis, become as thin as the* Lamina. A, *the inferior Portion of the* Veſtibulum, *which is cut into this Figure, and only left to ſhew how the* Lamina Spiralis *proceeds out of its Cavity, and paſſes before the* Feneſtra Rotunda. B, *the* Feneſtra Rotunda *clos'd up*

*by a thin Membrane, like the* Membranaa Tympani. 1, 2, 3. *The two Circumvolutions and a half of the* Lamina Spiralis *round the Axis.* 4, 5, 6, *The two Turns and a half of the Spiral Canal.*

Fig. IV. *represents the* Lamina Spiralis *in the Air much larger than Nature, with the Membrane which connects it to the Surface of the Canal.* 1, 2, 3, *The* Lamina Spiralis. 4, 5, 6, *The Membrane which is fix'd to it, and which is distinguish'd from it by a Line, which is drawn between both.*

Fig. V. *represents the Axis much larger than Nature, upon which the Traces of the Circumvolutions of the* Lamina Spiralis, *and of the Spiral Canal are remarkable.* 1, 2, 3. *The Traces of the Windings of the* Lamina Spiralis, *which are perforated by a great many* Foraminula, *which afford a Passage to the Filaments of the auditory Nerve.* 4, 5, 6. *The Traces of the Side of the Spiral Canal.*

Fig. VI. *represents the* Cochlea *standing, and half of it cut perpendicularly off, much like* Fig. III. *except that all the Bone is here taken away: This Figure is made for the better comprehending that third Figure, and for its Explanation it is sufficient to remark, that the* Lamina *appears here disengag'd from the Surface of the Canal, that it may shew the Inside of this same Canal, and how*

its

its Sides are elongated to be connected to the Axis.

Fig. VII. represents the Veſtibulum and the three Semi-circular Canals open, to ſhew the Diſtribution of their Veſſels. a, the Branch of an Artery which enters into the Veſtibulum. b, a Ramification of this Artery, which paſſes through the common Orifice of the Veſtibulum, and which is diſtributed into the ſuperior and inferior Canals. c, the Ramification which furniſhes the middle Canal.

Fig. VIII. represents the Arteries of the Cochlea, Veſtibulum, and three Semi-circular Canals. A, the Feneſtra Rotunda. B, the Orifice of the Paſſage which gives Entrance to the Veſſels, which is at the Entrance of the Scala Inferior of the Cochlea; it ſhews that one Part of theſe Veſſels is diſtributed into the Cochlea, and the other into the Veſtibulum, and the three Semi-circular Canals; theſe laſt are repreſented as in the Air.

Fig. IX. repreſents a Portion of the Veſtibulum and the three Semi-circular Canals in the Air, to ſhew their natural Situation and their Orifices. A, the Inferior Portion of the Veſtibulum. B, the Superior Canal. C, the Inferior. D, the Middle. 1, the Orifice of the ſuperior

Semi-

*Semi-circular Canal.* 2, *the first Orifice o*
*the middle Canal.* 3, *the Orifice of th*
*inferior Canal.* 4. *the other Orifice of th*
*middle Canal.* 5, *the common Orifice to th*
*ſuperior and inferior Canal.* 6, *the firſt* Fo
ramen, *which affords an Entrance to one co*
*the Branches of the* Portio Mollis. 7, *th*
*ſecond* Foramen, *which affords an Entranc*
*to another Branch of the ſame Nerve.*

Fig. X. *repreſents the* Veſtibulum, *in*
*the ſame Diſpoſition as in the preceeding*
*Figure, with the Nerves of the three Semi-*
*circular Canals in the Air.* a, *a Branch*
*of a Nerve, which enters into the* Veſtibu-
lum *by a* Foramen *mark'd* 6, *in* Fig. IX.
*It is divided into three Branches, the firſt*
*of which enters into the Orifice of the ſuperior*
*Semi-circular Canal, the ſecond into the ſu-*
*perior Orifice of the middle Canal, and the*
*third which is the leaſt deſcends to caſt*
*itſelf into the common Orifice.* b, *the Branch*
*which enters by the* Foramen, *mark'd* 7
*in* Fig. IX. *and is divided into two Rami-*
*fications, the Inferior of which enters into*
*the Orifice of the inferior Canal, and the*
*other advances into the common Orifice, and*
*unites with the third Ramification of the*
*Branch mark'd* a. *Theſe Nerves are repre-*
*ſented ſomewhat larger than Nature.*

On

On that Side of the *Veſtibulum* near the Face, oppoſite to the three Semi-circular Canals, we meet with the third Part of the Labyrinth, call'd the *Cochlea*, which is compos'd of two Parts, *viz.* Of a Semi-oval ſpiral Canal, and a *Lamina*, which runs ſpirally upwards. This *Lamina* follows the Courſe of the Canal, and ſeparates it into two.

*3dly, The Cochlea, in which two Things are to be taken notice of,* viz.

This Semi-oval Canal is excavated out of the interior Part of the *Os Petroſum*, it covers the *Lamina Spiralis* in the Form of a Vault, and which makes a Dint in the Surface of this Bone, which advances forwards into the Inſide of the *Tympanum*, oppoſite to the *Membrana Tympani*: This Dint is elongated and terminates in a ſmall Ridge, which makes the Separation between the two *Feneſtræ*, as above-deſcribed. The Canal makes two Turns and a half round the Axis, diminiſhing and growing narrower as it proceeds upwards: Its Sides, which are fix'd to the Axis, diminiſh ſo much of their Thickneſs, the nearer they approach it, that they appear as thin as the *Lamina*.

1. *The Semi-oval Canal.*

The *Lamina Spiralis* ſeparates this Canal into two Parts, in which it is contain'd, being fix'd to the Axis by its *Baſis*, and by its other Extremity to the Surface

2. *The* Lamina Spiralis.

of

of the Canal oppoſite to the Axis, by means

*Which is fix'd to the Canal by a very fine Membrane,*

of a very fine Membrane, much thinner than the *Lamina*, and of a darker Colour which does not proceed in a plain *Superficies* like the *Lamina*, but turns a little downwards. This Membrane, as it unfolds itſelf, lines the interior Part of this Canal: It is eaſy to imagine, that in taking out the Axis from this Vault in the *Cochlea* which ſurrounds it, there muſt of Neceſſity appear four entire Rounds, and two half Rounds, *viz.* Two Rounds and a half of the Semi-oval Canal, and two Rounds and a half of the *Lamina Spiralis*. This *Lamina* is hard and brittle; its Baſis near the Axis is perforated with many oblique *Foraminula* in the ſame manner as the Axis is; the other Extremity of the *Lamina* is very thin, firm, and tenſe.

*And which divides this Canal into two.*

The Canal of the *Cochlea* being thus divided into two *Scalæ* or Ranges of Stairs in the *Cochlea*, built upon the ſame Axis, one above another, which have no Communication one with another, they have only two ſeparate Orifices, one of which forms an Entrance from the *Veſtibulum* into the *Scala Superior* of the double Range; the other, which is the *Feneſtra Rotunda*, affords a Paſſage from the *Tympanum* into the *Scala Inferior*

*ee* Plate X. Fig. I, II, III, IV, V, *nd* VI.

There is an Orifice in the inferior Part of the *Os Petroſum*, below that through which the auditory Nerve enters, which orms a Paſſage for an Artery and a Vein, which are Branches of the internal Carotids and Jugulars: This is the Entrance f a Canal, which proceeding about the Length of a Line and a half, opens into he *Scala Inferior* of the *Cochlea*, near the *Feneſtra Rotunda*. There Veſſels entring n this Place divide themſelves into a great nany Branches, which are diſtributed to he *Lamina Spiralis*, and to the Membrane that lines the Inſide of the Spiral Canal. This Artery alſo in its Entrance urniſhes a conſiderable Branch to the *Veſtibulum*, which as it enters is divided nto two Ramifications, one of which is xtended on the right Side, and the other n the left. Theſe two Ramifications re commonly ſubdivided again into two nore, one of which enters by the Orifice f the *Veſtibulum*, which is common to the uperior and inferior Semi-circular Canals, nd divides itſelf into two ſmall Filaments, which are diſtributed on the Inſide f theſe Canals: the other Branch entring the ſuperior Orifice of the middle Canal,

*And 3dly, The Arteries and Veins of the* Cochlea,

*And of the* Veſtibulum.

nal, re-enters into the *Veſtibulum* by it other Orifice. Theſe Ramifications form *Anaſtomoſes* in many Places in the Inſid of the *Veſtibulum* : The Veins follow th ſame Courſe as the Arteries.

*4thly, The implanted Air.* Since the two *Feneſtræ*, which ente into the Cavities of the Labyrinth, ar exactly ſtopt up, one by the Baſis of th *Stapes*, the other by its Membrane, it i eaſy from hence to conclude, that th Air which is confin'd in this Place ca have no Communication neither with tha in the *Tympanum*, nor conſequently witt the external Air ; and this Air is tha without doubt which Anatomiſts haw term'd Implanted Air. *See* Plate X. Fig VII, *and* VIII.

*The other Parts of the* Organ *of* Hearing, *are the Canal of the auditory Nerve.* The Canal through which the auditor Nerve paſſes is very large. It is form'' out of the middle of the hinder Part c the *Os Petroſum* next the Brain, and prc ceeeding obliquely backwards about th Length of two Lines, it forms an imper vious Paſſage, whoſe Bottom is partl terminated by the Baſis of the *Cochlea* and partly by a Portion of the Arch c the *Veſtibulum* : At the Extremity of th impervious Paſſage there is a ſmall bon *Septum*, which ſeparates the Baſis of th *Axis* from the *Foramen*, through whic

th

the *Portio Dura* of the auditory Nerve paſſes.

The *Nervus Auditorius* ariſes from the poſterior Side of that Protuberance, which Modern Anatomiſts have call'd *Annular*, about the Diſtance of a Line from a ſmall Lobule of the *Cerebellum*, which is fix'd to the Origin of this *Proceſſus Annularis*: This Nerve is compos'd of two Branches, the uppermoſt of which is the largeſt, and term'd *Portio Mollis*, becauſe it is not only in Reality more tender and ſoft than that which accompanies it, but alſo than all the other Nerves of the *Medulla oblongata*, except the Olfactory Nerves. The inferior Branch is called *Portio Dura*, not only becauſe it is more fibrous and compact; but alſo becauſe it paſſes out of the *Cranium*, whereas the *Portio Mollis* loſes itſelf in the *Organs* of *Hearing*. Theſe two Branches run ſtrait and parallel as far as the *Foramen* of the *Os Petroſum*, proceeding about the Length of three Lines; and as ſoon as they enter into it, the *Portio Dura* paſſes above the other. It is at the bottom of this impervious Paſſage which we have already deſcrib'd, that the *Portio Mollis* is divided into three Branches; the moſt conſiderable of which being come to the Baſis of the *Axis*, ſeems to terminate

Nervus Auditorius.

*Is divided into two Branches*, viz.

*The* Portio Mollis.

*The* Portio Mollis *divided into three Branches; the largeſt of which is diſtributed into the* Axis *of the* Cochlea.

and

and be loſt in this Place: Whereas in reality it enters into thoſe above-mention'd oblique *Foraminula*, and is divided into many ſmall Filaments which are diſtributed to each Winding of the *Lamina Spiralis*. The Diviſion and Diſtribution of this Nerve may well be compared with that of the Olfactory Nerve, which being come to the Root of the Noſe ſeems to be terminated in this Place, and many Anatomiſts have believed that it really terminates here; but if they examine it ſtrictly, they would find the Nerve divided into ſmall Fibres, which are cover'd with the *Dura Mater*, paſſing thro' the ſmall *Foramina* of the *Os Cribroſum*, and entring into the Cavity of the Noſtrils, are diſtributed to the Membrane, which lines the *Laminæ* of the Noſe. *See* Plate XI. Fig. I, II, *and* III.

## Explanation of Plate XI.

Fig. I. *repreſents the Baſis of the* Cerebrum *diveſted of all its Veſſels, to ſhew the Origin of the ten Pair of Nerves, which proceed from the* Medulla Oblongata; *all that Part of the Subſtance of the* Cerebrum, *which Mr.* Willis *call'd its Poſterior Lobes, is cut off*; i. e. *the Inciſion paſſes through that*

Plate XI.

Fig. I.


Fig. II.

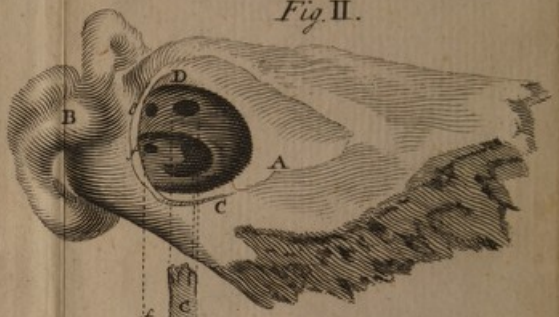


Fig. III.


B. Cole, Sculp.

*hat Place, where a great lateral Branch f the carotid Artery is ſent off upon the Subſtance of the* Cerebrum, *into the Interlice of its Lobes: This Inciſion ſerves to diſcover the true Origin of the firſt Nerves, nd to place the* Cerebellum, *which in a revers'd Brain is always found ſupported by he poſterior Lobes, in the ſame* Superficies *is the* Cerebrum; *which is abſolutely neceſſary to ſhew the true Figure of the* Medulla Oblongata, *and the Origin of all the Nerves which proceed from it.* A A, *the forepart of the* Cerebrum *revers'd.* B B, *the* Cerebellum. C C, *the Place where a Part of the* Cerebrum *has been cut off; his Cut is mark'd but on one Side, but we may ſuppoſe the ſame on the other.* D D, *he* Corpora Striata, *which are the Origins of the* Medulla Oblongata, *their poſterior Part is here ſhewn, and a Portion of them is cut off with the* Cerebrum. E E, *the* Nervorum Opticorum Thalami. F, *the* Medulla Oblongata, *whoſe two Branches are united in this Place, although Mr.* Willis *fancied they were divided.* G, *the* Proceſſus Annularis. H H, *the firſt Pair of Nerves, nam'd the Olfactory, which take their Origin from the Baſis of the* Corpora Striata, *by a medullary Fibre mark'd* h h, *and which increaſes in Bulk in the Place where*

*where they wind about, near the optic Nerves.* I I, *the optic Nerves, or the second Pair of Nerves, which from their Origin from the* Thalami *are shewn as far as to their Exit out of the* Cranium. K K, *the third Pair of the Nerves, call'd* Oculorum Motorii. L L, *the fourth Pair of Nerves, call'd* Pathetici. M M, *the fifth Pair of Nerves.* N N, *the sixth Pair of Nerves.* O O, *the auditory Nerves, which form the seventh Pair; they are divided from their Origin into two Branches, the largest of which, which is the uppermost, is the* Portio Mollis. P P, *the eighth Pair of Nerves, which proceed out of the* Medulla, *below the two Eminencies mark'd* y y. Q Q, *the ninth Pair of Nerves, which is mark'd but on one Side of the* Medulla, *and is even placed out of its Direction, for fear of rending the Figure puzzling, on the other Side we have contented ourselves with shewing the Origin.* R R, *the tenth Pair of Nerves which proceed out of the* Medulla Oblongata, *which Mr.* Willis *has confounded with the first vertebral Pair.* S, *the* Medulla *cut off at its Entrance into the* Vertebræ. T T, *the two Nerves which proceed out of the* Medulla Spiralis, *in the Inside of the Cavity of the* Vertebræ *of the Neck, and ascend up into the* Cranium, *to*

*be*

*e united to the eighth Pair of Nerves.* u, *be* Infundibulum. x x, *two ſmall medul-ary Proceſſes, which Mr.* Willis *has taken or Glands.* y y, *two Eminences of the Medulla form'd in the Shape of Olives, which Mr.* Willis *has call'd* Corpora Py-amidalia. z z, *two ſmall Filaments of Nerves which proceed out of the* Medulla, *be united to thoſe Nerves which come from be Spine, and are join'd to the eighth Pair; metimes two or three of theſe Filaments of Nerves are found on each Side.*

Fig. II. *repreſents the back-part of the* s Petroſum *much larger than Nature, nd as much of it taken off as was neceſſary diſcover the three Semi-circular Canals, nd the impervious Paſſage, which termi-ates the Canal of the auditory Nerve, and ſhew all the* Foramina *which we find ere.* A, *the Canal of the auditory Nerve ken off.* B, *the Semi-circular Canals.* , *the Baſis of the* Axis *of the* Cochlea, *erc'd by a great Number of ſmall* Fora-minula, *which give Entrance to the ner-us Filaments, which are diſtributed to all e Turnings of the* Lamina Spiralis. D, *e Entrance of the Canal which incloſes the* ortio Dura. e, *the* Foramen *which gives ntrance to the Branch mark'd* e *in* Fig. III. *another* Foramen *which gives Entrance*

*to*

*to the third Ramification of the* Portio Mol
lis, *mark'd* f, in Fig. III.

Fig. III. *repreſents the auditory Nerv*
*much larger than Nature, which appear*
*as if it were torn off from the* Os Petro
ſum, *to ſhew how it is divided at the Bot*
*tom of the Paſſage.* A, *the auditory Nerv*
*divided into two Branches.* B B, *the* Portio
Mollis. C C, *the* Portio Dura, *part o*
*which is plac'd at the Top of the Figure, t*
*ſhew the Filaments of one of the Branche*
*of the* Portio Mollis; *the Trunk of the*
Portio Dura *enters into the* Foramen *mar*
*ked* D, *in* Fig. II. D, *a large Branch o*
*the* Portio Mollis, *which is divided in a*
*great many ſmall Filaments which enter*
*into the* Foraminula, *which are ſituated*
*at the Baſis of the* Axis *of the* Cochlea,
*and are diſtributed to all the Circumvolu*
*tions of the* Lamina Spiralis. e, *another*
*Branch of the* Portio Mollis, *which en*
*ters into the* Foramen, *mark'd* e, *in* Fig. III.
f, *the third Branch of the* Portio Mollis,
*which enters through the* Foramen, *mark'd*
f, *in* Fig. II. *See the Diſtribution of theſe*
*two laſt Branches in* Plate X. Fig. X. *the*
*Branch* e, *is there mark'd by the Letter* a,
*and the Branch* f, *by the Letter* b.

The

The two other Ramifications of the *Portio Mollis*, are for the uſe of the *Veſtibulum*. The moſt conſiderable of theſe two Branches run in at the Entrance of the Canal of the *Portio Dura*, and afterwards enters obliquely into a particular *Foramen*, which opens into the Arch of the *Veſtibulum* at the ſide of the Orifice of the ſuperior Canal of the *Cochlea*: This Ramification, as it enters, forms a ſort of a Tuft, one Part of which proceeds into the Orifice of the ſuperior ſemi-circular Canal, and into that of the anterior or middle Canal, joining them together, and partly ſhutting them up; afterwards it furniſhes a ſmall nervous Filament to each of theſe Canals, joining it ſelf to an Artery which is diſtributed to theſe Parts, and proceeding every where with it in the ſame Courſe; the other Part of the Tuft is elongated to the bottom of the *Veſtibulum*, and produces a ſmall Twig, which enters into the common Orifice.

*The two other Branches into the* Veſtibulum.

*And into the Semi-circular Canals.*

The ſecond Branch of the *Portio Mollis*, which is deſtin'd for the uſe of the *Veſtibulum*, enters into a very oblique *Foramen*, which opens a little below the above deſcrib'd Branch: This Nerve at its entrance into the *Veſtibulum*, is di-

vided into two ſmall Twigs; one
which enters into the Orifice of the in
ferior Canal, which is ſituated at th
bottom of the *Veſtibulum*, and the othe
aſcends towards the common Orifice. All
theſe ſmall Ramifications of Nerves, hav
a Communication with one another. See
Plate X. Fig. X.

*The* Portio Dura,

The *Portio Dura* enters into a *Fora*
*men*, ſituated near the upper Part o
the *Fundus* of that impervious Paſſage
which we have already deſcrib'd. Th
*Foramen* is the entrance of the bony Canal
which is form'd out of the *Os Petroſum*
running obliquely towards the *Tympanum*
into which it does not penetrate, but on
ly inſinuates it ſelf into the Surface o
the *Os Petroſum*, which makes one of th
*Parietes* of the *Tympanum*. This Canal
proceeding down to the Top, and by th
Side of the *Feneſtra Ovalis*, and to th
upper Part of the little Canal, which in
cloſes the *Muſculus Stapedis*, deſcends ye
lower; and having proceeded about two
lines and an half, being all along co
ver'd by the *Os Petroſum*, it paſſes out
thro' a *Foramen*, which is between th
*Maſtoid* and *Styloid Proceſſes*. Th
Nerve before it protrudes out of its *Fora*
*men*, receives a Ramification from

Nerv

erve of the fifth Pair, which paſſes be-
nd the *Membrana Tympani*, which we
all deſcribe in the Sequel. This ſame
*ortio Dura* at its Exit out of the *Fora-*
*en*, furniſhes a Ramification, which aſ-
ending towards the back part of the
ar, is expanded over all the Parts of
e exterior Ear, and near the *Proceſſus*
*Mammillaris*. It furniſhes many other
anches which are diſtributed to other
arts, of which we ſhall treat at the End
this Deſcription. *See* Plate XI. Fig.
. Plate XII. Fig. I, II, and III.

*Which produces as it paſſes out of the* Cranium, *a Ramification which is expanded over the back part of the Ear.*

## Explanation of Plate XII.

Fig. I. *repreſents the Surface of the* Os
etroſum, *twice as large as Nature, to*
*ew the bony Canal, thro' which the*
ortio Dura *paſſes, and that thro' which*
*e* Chorda Tympani *deſcends to be join'd to*
*e* Portio Dura. A, *the* Proceſſus Mam-
illaris. B, C, *the bony Canal which is*
*the* Tympanum. C, D, *part of the*
*ne Canal which is ſituated without the*
ympanum, *and which is excavated out*
*the* Os Petroſum. *Its Extremity lies*
*tween the* Proceſſus Mammillaris *and*
yloides. E, *the little Canal of the* Os
etroſum, *thro' which the ſmall Nerve of*

*the* Tympanum *passes to be join'd to th*
Portio Dura.

Fig. II. *represents the* Portio Dur
*bare, extracted from its Canal, with th*
*little* Chorda *which crosses the* Tympanum
A, B, *part of the* Portio Dura, *whil*
*is inclos'd in the* Tympanum. B, C, *pa*
*of the* Portio Dura, *which is conceal'd*
*the* Os Petrosum. D, E, *that part of th*
Chorda *which crosses the* Tympanum
E, F, *part of the same* Chorda, *whi*
*passing out of the* Tympanum, *hides it*
*in the little Canal, mark'd* E, *in the fir*
*Figure of this Plate, and which is join'd*
*the* Portio Dura. F, *the place where th*
*little Nerve joins with the* Portio Dura.

Fig. III. *represents the Ear revers'*
*to show the Ramification of the* Port
Dura, *which is distributed upon it.*
*the Ear revers'd.* B, *the* Process
Mammillaris. C, *the Trunk of the* Po
tio Dura, *passing out of the* Os Petrosu
D, D, *the first Ramification of this Ner*
*which ascends up the back Part of*
*Ear, and distributes a great many*
*laments to it, and to the* Processus Ma
millaris. E, *the Division of the* Por
Dura *into two Branches.* F, *the super*
*Branch.* G, *the inferior Branch.*

The little Nerve which croſſes the *Tympanum*, takes its Origin immediately from a Branch of the fifth Pair, which proceeding downwards, is diſtributed on the Side of the Tongue; afterwards this Nerve reaſcends up to the exterior Side of the bony Canal of the Aqueduct, and following the Courſe of the external Muſcle of the *Malleus*, upon which it is plac'd, it enters into the *Tympanum* through the ſame *Foramen*; afterwards it repaſſes under the Tendon of the internal Muſcle, and deſcending obliquely backwards, it leans upon the *Membrana Tympani*, and paſſing before the long Branch of the *Incus*, it comes out of the *Tympanum*, running into a ſmall Canal, which is form'd out of the *Os Petroſum*, and joins to the Trunk of the *Portio Dura*, a little before the *Portio Dura* is protruded out of its Canal. It is this ſmall Thread of a Nerve, which Anatomiſts have conſider'd as the *Chorda Membranæ Tympani*, and which they fancied might cauſe ſome Sound in communicating its Agitations to this *Membrane*, in the ſame manner as a Cord does, which they put upon a Skin of a Drum. But although it is true, that this *Chorda* touches the *Membrana Tympani*,

*The* Chorda Tympani, *is a Nerve which is a Branch of the fifth Pair.*

*Which is join'd to the Trunk of the* Portio Dura.

*pani*, if we but examine its Structure, w
ſhall ſoon diſcover its Uſe. For beſid
its Origin, which plainly makes it appe
that it is a Nerve, its diſtribution leav
no room to doubt of it; there being
other Nerve, which is diſtributed either to t
Muſcles or the *Officula*, or to the oth
Parts which are contain'd in the *Tymp*
*num*. *See* Plate VII. Fig. I, *and* II. Pla
XIII. Fig. I. *and* Plate XII. Fig. I, *and*

## Explanation of Plate XIII.

*This repreſents the whole temporal Bo*
*as large as Nature, ſomewhat revers'd, a*
*the under Part ſhewn, with the Branch*
*the fifth Pair of Nerves, which is diſt*
*buted to the lower Jaw, to ſhew the Ori*
*and Courſe of that ſmall Twig of a Ner*
*which is call'd the* Chorda Tympani, *a*
*the diſtribution of another Ramification of t*
*ſame Nerve, which goes to the external E*

A, *the ſcaly Part of the temporal Bo*
B, *the* Proceſſus Mammillaris. C,
Proceſſus Styloides. D, *the* Zygom
ticus. E, *the Paſſage which goes from*
*Ear to the Palate.* F, *the Branch of*
*fifth Pair call'd the inferior maxill*
*Nerve, becauſe it is particularly diſtribu*
*to the lower Jaw, and to the Part wh*
*ſi*

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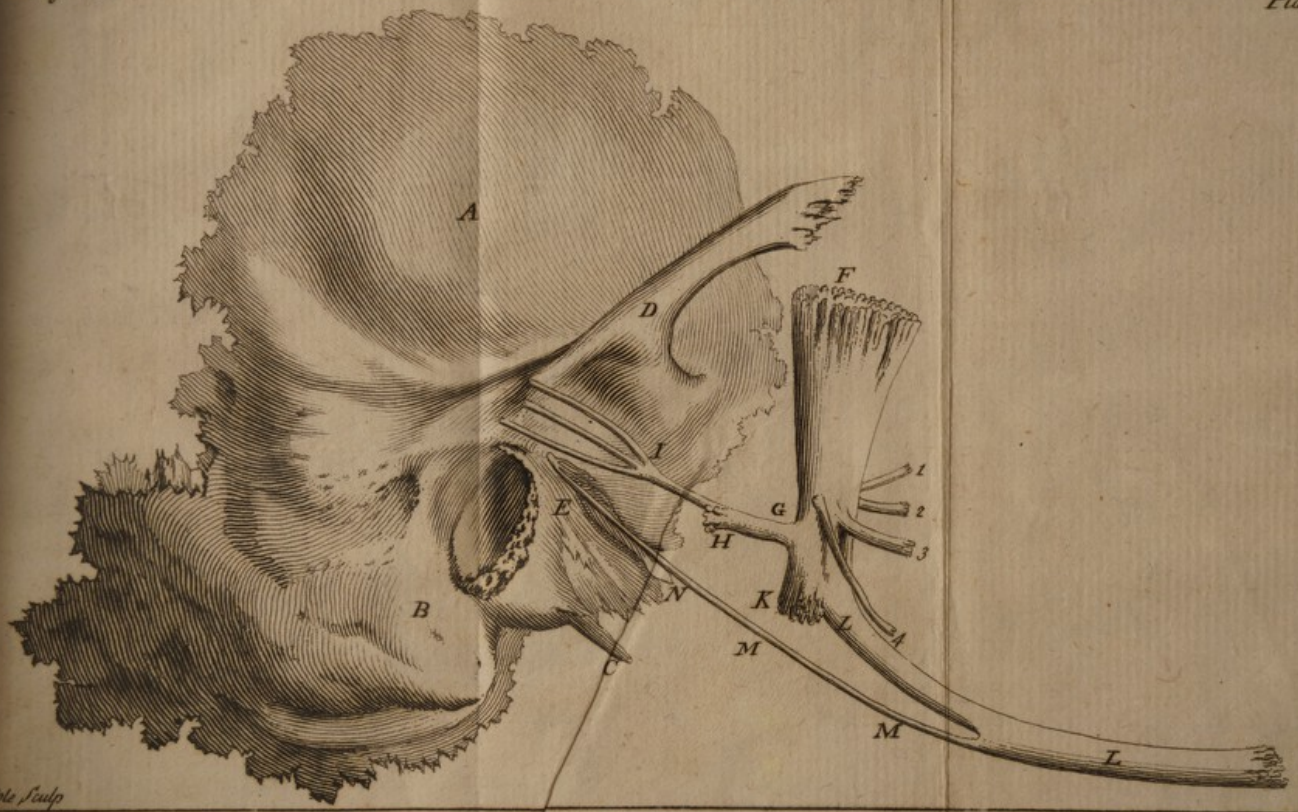
Plate XIII




B Cole Sculp

*urrounds it.* 1, 2, 3, 4. *Four Ramifica-ions that this Branch furniſhes immediately fter its Exit from the* Cranium, *the* 1. *of which goes to the temporal Muſcle.* 2. *to the external Maſſeter.* 3, *to the* Buccinator, *and to the Glands of the Cheek.* 4. *to the* Pterygoideus internus. G, *another Ramification which it alſo ſends off at its exit.* H, *a Branch of this Ramification, which goes to join the Ramification of the* Portio Dura, *mark'd* 6, *in the* XVIth *Plate.* I, *the Diſtribution of the Ramification* G, *to the external Ear, the Branches of which are cut off.* K, *the Branch which enters into the lower Jaw cut off.* L, L, *the Branch which goes to be diſtributed to the Sides of the Tongue.* M, M, *a Ramification of this Branch which aſcends over the bony Part of the Paſſage of the Aqueduct, and enters into the* Tympanum ; *and this is what is call'd the* Chorda Tympani. N, *the external Muſcle of the* Malleus *in its Situation.*

*The ſecond vertebral Pair, furniſhes a Branch to the Ear.*

Laſtly, The ſecond vertebral Pair ſends forth a conſiderable Branch, which goes up to the Ear : It creeps under the Skin, the Length of the *Muſculus Maſtoideus*, and of the parotid Gland, and parts into three Branches near the Ear, one of

which is expanded upon the back Part and upon the End of the Ear, and the third distributes its Fibres into the cartilaginous Passage.

It is here proper to take notice, that Mr. *Willis* makes this Branch of a Nerve proceed from the first vertebral Pair. The Reason of this is, that he supposes that the tenth Pair of the Nerves of the *Medulla Oblongata* passes out no where else but between the first and second *Vertebræ* and so he reckons for the first Pair of the *Medulla Spinalis*, that which issues out into the *Interstitiæ* of the second and third *Vertebræ*: But the Reason of this Error proceeds from his not knowing the Egress of the tenth Pair, which he has confounded with the first vertebral Pair; tho', these two Nerves have different Origins, Exits, and Distributions. *See* Plate XIV. Fig. I.

## Explanation of Plate XIV.

A, *the* Processus Mammillaris. B, *the back Part of the Ear.* C, *the Trunk of the second vertebral Pair.* 1, 2, 3, 4, 5, 6, 7. *Many Branches cut off, that this Nerve sends to the neighbouring Muscles, and to the vertebral Nerves.* D, D, *the*

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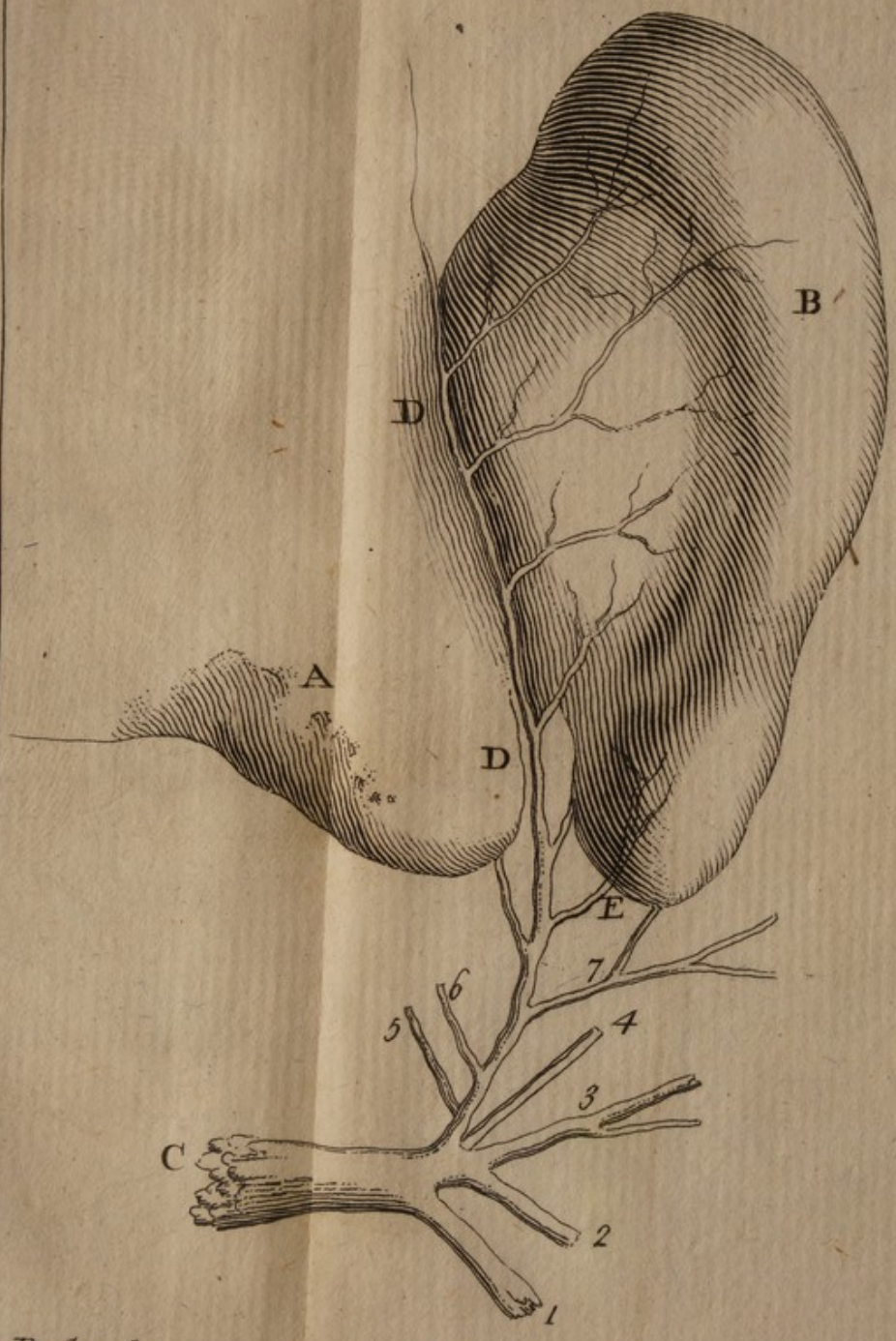
Plate. XIV.




B. Cole. Sculp.

*he Branch of this Nerve, which aſcends up to the external Ear.* E, *the Branch which is loſt in the Lobe of the Ear, and in the cartilaginous Paſſage.*

*There are many particular Things in the Ear of a* Fœtus.

After having explain'd the Structure of the Ear, in Subjects of eighteen or twenty Years old, we thought it neceſſary to take notice, in what it differs from the Ear of a *Fœtus.*

*1. That Part of the auditory Paſſage, which is bony in Adults, is nothing but a Membrane in the* Fœtus.

1. The bony Canal of the auditory Paſſage is, in the *Fœtus*, nothing but a pretty hard Membrane, join'd by one of its Extremities to the cartilaginous Paſſage, and by the other it adheres to the *Membrana Tympani*, by the help of a Groove in the bony Circle, which we are going to deſcribe: This Paſſage, which in Adults is about five or ſix Lines long, is not above a Line and a half in length; and what appears to us of it, is really nothing elſe but what ſerves to form that part of the Canal, which grows flat towards the *Fundus. See* Plate XV. Fig. I.

Explanation of Plate XV. which repreſents many Parts of the Ear of a *Fœtus.*

Fig. I. *repreſents the Ear of a Child one Year old.* A, *the upper Part of the*

*Ear.* B, *its cartilaginous Paſſage.* C *the Membrane which connects the cartil ginous Paſſage to the bony Ring, and whi indurates afterwards to form the beginni of the bony Paſſage of the Ear.* D, *t bony Ring.* E, *the* Proceſſus Zygoma cus.

Fig. II. *repreſents the forepart of t temporal Bone of a* Fœtus. A, *the ſca Part, whoſe ſmall bony Fibres are eaſ diſtinguiſh'd, as they are alſo in all the ther Bones which compoſe the* Cranium a Fœtus. 2, 3, *the Sides of its Circu ference, which are yet Cartilaginons. the* Proceſſus Zygomaticus. C, *t* Membrana Tympani. D, *the bony Ri which receives the* Membrana Tympa E, *the* Proceſſus Styloides, *which is as cartilaginous.* F, *the* Proceſſus Ma millaris, *which is yet very ſmall.* 4, *t* Foramen, *thro' which the* Portio Du *paſſes out.* G, *this Letter marks an ſcure Line, which is the Place where i ſcaly Part is ſeparated from the* Proceſſ Mammillaris; *theſe two bony Pieces c exactly united in Adults.* H, *the Can which incloſes the internal* Carotid. *the* Foramen *where the Tube which g from the Ear to the Palate is connected.*

Fi

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Plate XV.

Fig. 2.


Fig. 3.


Fig. 5.

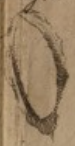


Fig. 6.


Fig. 4.

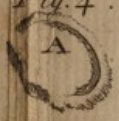



Fig. 1.


B Cole Sculp

Fig. III. *repreſents the back part of the temporal Bone.* A, *the ſcaly Part.* B, B, *the Place where it ſeparates from the reſt of the* Os Petroſum. C, *the ſuperior Semicircular Canal, which is ſeen without any Preparation.* D, *the Inferior.* E, *the Place of their Communication.* F, *A conſiderable* Foſſa, *which is ſituated under the ſuperior Canal, and which is fill'd up and effaced as the* Fœtus *grows older.* G, *a* Foramen, *which is in the Paſſage of the* Portio Dura. H, *the* Foramen *of the auditory Nerve.*

Fig. IV. *repreſents the bony Ring, leaning a little to ſhew the Groove.* A, *the bony Ring leaning on one Side.*

Fig. V. *repreſents the ſame Ring, leaning in another manner, to ſhew the reſt of its Groove.*

Fig. VI. *repreſents the* Membrana Tympani, *twice as large as Nature, half of it diſcover'd from a Membrane, which covers it.* A, *the* Membrana Tympani. B, *a mucilaginous Matter indurated into a Membrane which covers it in the* Fœtus.

In the *Fœtus*, we find a Circle which is plac'd exactly above the Entrance of the *Tympanum:* this Circle is eaſily ſeparated from the *Os Temporum*; and may plainly be ſeen with the *Membrana Tympani,*

2. *There is a Circle.*

*pani*, when the Ear and auditory Paſſage is remov'd.

*Which is not entire.* This Circle is broke off about half a Line in its upper Part, near the Place where the Head of the *Malleus*, and the maſſy Part of the *Incus*, are conceal'd in the *Tympanum*; this interruption is found in Adults, as we have ſaid before, and in this Place the *Membrana Tympani* is directly fix'd to the Edge of the Extremities of the bony Canal, belonging to the external Ear.

*It is hollow in the Inſide like a Gutter.* In the Inſide of this Circle, there is a ſmall Cavity, which runs hollow through its whole Circumference, which forms the above-mention'd Groove, in which the *Membrana Tympani* is inchas'd. We muſt alſo take notice of a ſmall Sinuoſity in its ſuperior Part, upon which the external Muſcle of the *Malleus* runs: This Sinuoſity is alſo found in Adults.

*This Circle is united to the bony Canal in Adults.* Although this ſmall Circle is eaſily diſtinguiſh'd, and ſeparated in new-born Infants, yet it diſappears in Adults, and forming but one Body with the bony Canal, it is impoſſible to ſeparate it. One may diſtinguiſh it in Children of three or four Years old, but it is ſo ſtrongly fix'd to the temporal Bone, that it is not to be ſeparated from it. We muſt take notice that

hat it begins to join by its two Extre-
nities, and insensibly through the rest
f its circumference.

There is no room to doubt, but that
he Groove into which the *Membrana*
*ympani* is fix'd, × is the same as the Ca-
ity in the bony Circle, since the *Mem-*
*rana Tympani* has constantly the same
ituation, and the same Plan in the
*Fœtus*, which it has in the Adult. *See*
Plate XV. Fig. IV.

*It has the same Plan, both in the* Fœtus *as in the* Adult.
× *in adults*

3. The Passage which goes from the
Ear to the Palate, which in Adults is part-
y bony, and partly cartilaginous, is al-
most entirely membranous in the *Fœtus*,
nd its bony Part becomes insensibly os-
ified, as the *Fœtus* advances in Age, in
much the same manner as the bony Ca-
nal of the auditory Passage does.

3. *The* Aque-duct *almost entirely* Membranous.

4. During the Time, the *Fœtus* re-
mains in the *Uterus*, the *Membrana Tym-*
*pani* is cover'd with a mucilaginous Mat-
ter, which indurates into a *Membrane*,
but afterwards it disappears. *See* Plate
XV. Fig. VI.

4. *The* Membrana Tympani *is cover'd with a mucilaginous Matter.*

Besides these, in the posterior Part of
the *Os Petrosum*, there are some pretty
remarkable Differences to be seen.

The *Canalis semi-circularis Superior*
of the *Labyrinth*, may be distinguished
and

5*thly*, *The superior Semi-circular Ca-*

*nal, and a Portion of the Inferior are visible, without any Dissection.*

and seen almost without any Preparation as may also a Portion of the *Canalis Semicircularis Inferior*, at the Place where it communicates with the Inferior.

6thly, *There is a* Fossa *and a* Foramen, *in the* Os Petrosum.

2. Under the superior Canal, there is a considerable *Fossa* to be seen, which disappears as the Child grows older: And there is besides, a *Foramen* in the upper Part of the *Os Petrosum*, and in the Passage of the *Portio Dura*, which is very remarkable in the *Fœtus*, and which is also found in People of a very advanc'd Age, but is much more minute in them.

7thly, *The scaly Part of the temporal Bone is separable from the* Processus Mammillaris, *which is very minute.*

3. The scaly Part of the *Os Temporum* is separated from the *Os Petrosum*, the *Processus Mammiformis* is very small. As for the other Parts of the Ear, there is no remarkable Difference between them. *See* Plate XV. Fig. I, II, *and* III.

8thly, *The* Officula, *and the* Labyrinth *are of pretty nigh the same Size, in the* Adult, *and in the* Fœtus.

We shall here take notice, that the small Bones of the Ear, the Semi-circular Canals, and the *Cochlea* are of the same Form, and very near of the same Size, in new-born Children, as they are in *Adults:* So that Age serves only to strengthen and render them firmer.

*The Trunk of the* Portio Dura, *has two principal*

To finish this Description, there remains nothing to be taken notice of, but some other Ramifications which the *Portio Dura* sends forth. After it hath furnish'd a

Branch

Branch which goes to the Ear, it proceeds about the Length of four or five Lines without any Diviſion; after this, it is divided into two conſiderable Branches, the Superior of which is many times divided and reunited, as it aſcends over the Maſſeter Muſcle, and croſſing the Parotid Gland, at laſt forming a Figure like a Gooſe's Foot, it is commonly ſubdivided into ſeven other Ramifications; the firſt five of which aſcend obliquely, and are diſtributed to the Muſcles of the Forehead, the Temples and Eye-lids. Some of theſe Ramifications being ſpread over the *Os Malæ*, paſs through particular *Foramina*, into the *Orbit*: The ſixth Branch paſſing over the middle of the Maſſeter Muſcle, receives a conſiderable Branch from the fifth Pair, which we ſhall afterwards deſcribe; it furniſhes ſome Branches which accompany the ſalivary Duct, and which embrace it in many places, and it is ſubdivided upon the Middle of the Cheek, into a great Number of ſmall Filaments, which are diſtributed to the Muſcles of the Noſe, and upper Lip. The Seventh is deſtin'd for the Uſe of the Muſcles of the lower Lip. Laſtly, many Ramifications

*Branches, which are divided into many Ramifications.*

*The Ramifications of the firſt Branch, are diſtributed to the Muſcles of the Forehead, Temples, and Eyelids.*

*And paſs into the* Orbit.

*They alſo go to the Muſcles of the Noſe and Lips.*

*And to all Integuments of the Face.*

cations of all these Branches, are lost in the outward Integuments of the Face.

*The Ramifications of the second Branch are distributed to the Muscles which are under the Jaw.*

The inferior Branch proceeds downwards under the Angle of the Jaw, and is divided into many little Twigs, which are distributed to the Muscles that are cover'd by the Jaw. *See* Plate XVI Fig. I.

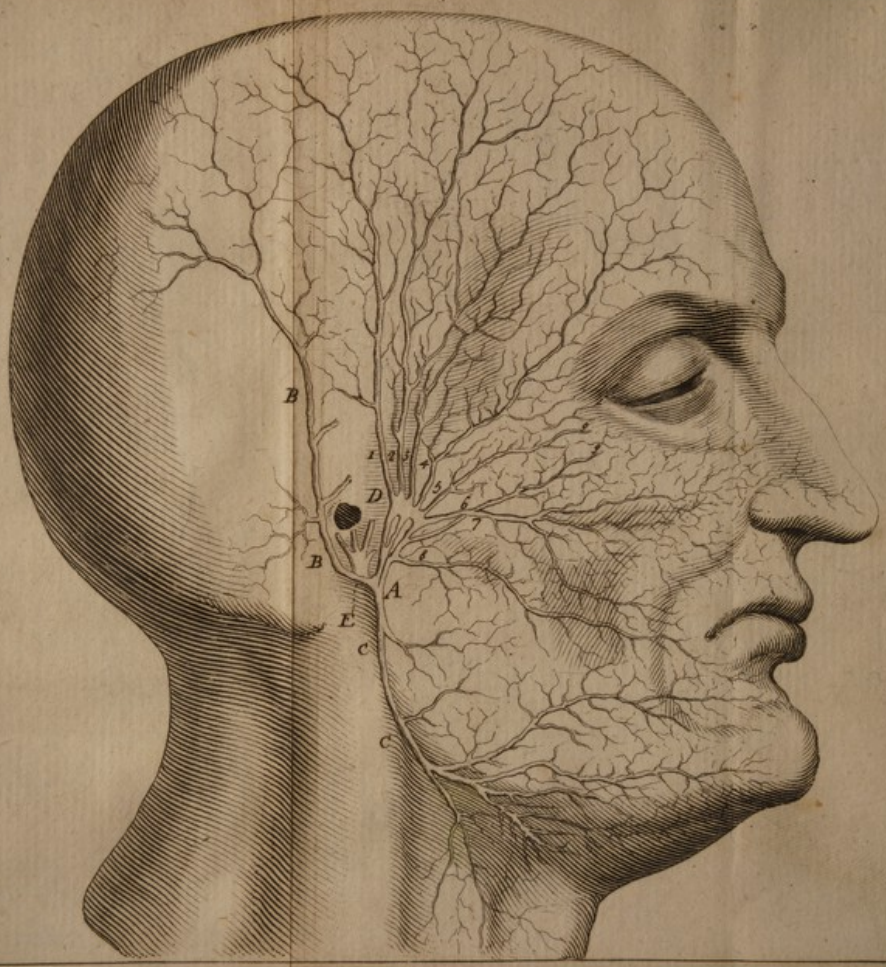
## Explanation of Plate XVI.

*It represents the* Portio Dura, *in the different Parts of the Face.* A, *the Trunk of the* Portio Dura, *which proceeds out to the* Cranium *thro' the* Foramen, *which is between the* Processus Mammillaris *and* Styloides. B, B, *a large Ramification which it furnishes to the external Ear, some Branches of which are cut off, which appear whole in* Fig. III. Plate XII. C, C, *the inferior Branch which is distributed to the Chin, to the Muscles, which are situated under the Jaw, and to the Integuments.* D, *the superior Branch, which immediately divides into the Shape of a Goose's Foot.* 1, 2, 3, 4, 5, *five Ramifications of this Division, which are distributed to the Muscles of the Temples, Forehead, and Eyelids.* 6, *the Ramification of this Division, which expands it self over the Middle of the Cheeks,*

*and*

to Face page 64.

Plate. XVI.




B. Cole Sculp.

d which is enlarg'd by the Branch of the th Pair, mark'd 7, 8, the laſt Rami- ation of this Diviſion, which furniſhes wigs to the Muſculus Buccinator, and to oſe of the Lips. 9, 9, two ſmall Fila- ents, which appear as if they were cut f, becauſe they ſink into the Orbit thro' rticular Foramina, which are in the Os lalæ. All theſe Ramifications furniſh a ry great Number of Filaments to all the In- guments of the Face, we muſt ſuppoſe them t off in taking off the Integuments. E, the ranch of the fifth Pair, mark'd G in the late XIII, from whence a ſmall Branch. , paſſes out, which is united to the Ramifi- tion, 6, of the Portio Dura. The other ranches being cut off, which are diſtributed the external Ear, and to its Paſſage, may ſeen in the ſame Plate, i. e. the XIII.

*The fifth Pair furniſhes a Branch to the Portio Dura.*

One of the Ramifications from the runk of the fifth Pair call'd the *Maxil-* ry, immediately at its Egreſs out of the ranium, ſends off many Branches, one of hich paſſing under the *Proceſſus Condy-* ides of the Jaw, advances forwards, and cending above the Jaw, very nigh the lace of its Articulation, ſends forth a ilament, which paſſes over the Maſſeter uſcle, and is united to that Branch of the

the *Portio Dura*, which ſpreads it ſelf
ver the middle of the Cheek. All t
reſt of this Branch is divided into ma
Ramifications, which are diſtributed
the cartilaginous Paſſage, to the E
and to the parotid Gland. Sometim
this Communication is made by a doul
Branch. Mr. *Willis* and all the mode
Anatomiſts after him, have advanc'd th
the eighth Pair furniſhes a Branch, whi
is join'd to the Trunk of the *Portio Dur*
at its Egreſs out of its *Foramen*: I ha
examin'd many Subjects in hopes of firm
ing this Branch, but never could me
with it; and I can ſcarce believe M
*Willis* has ever ſeen it but in Brutes, wh
this Communication is always to
found, and is form'd before the *Por*
*Dura* proceeds out of its Canal.

*End of the Firſt Part.*

# OF THE ORGAN OF HEARING.

## PART II.

### *Containing the Use of the Parts of the Ear.*

AFTER having given a pretty exact Description of all the Parts of the Ear, to render this Treatise more useful, I thought my self obliged to accompany it with some Reflections, and to draw from the Mechanism

*The Mechanical Structure of the Organs of Hearing, serve to discover the Use of them.*

niſm of theſe Parts, ſome Conſequen
by which we may be able to explain th
Uſe, and the Manner by which we a
made ſenſible of different Sounds a
Noiſes. As it is a very important Su
ject, and appear'd to me to be very ni
and difficult, I wou'd not truſt entir
to my own Judgment, and I confeſs th
I am oblig'd to Mr. *Mariote* for a gre
Part of what will here be found curiou
nevertheleſs, I muſt not expect that wh
I am going to treat of, will be well r
ceiv'd by every body. My Conjectur
appear probable to me, but other Pe
ple may be of a different Opinion. Ho
ever it happens, I ſhall think I have ſu
ceeded very well; if by this Eſſay I m
induce them to give us ſomething bett

*The external Ear performs the Office of the Trumpet, which deaf People make uſe of.*

I ſhall follow the ſame Order that I c
in my Deſcription, and therefore I co
ſider the external Ear as a natural Trut
pet, whoſe neat and ſmooth Cavity ſerv
to amaſs the Sound, and conſequentl
renders its Impreſſion ſtronger upon t
other Organs of Hearing. Experien
favours this Opinion, in that, thoſe Pe
ple who have their Ears cut off, car
hear ſo well, and are oblig'd to mal
Uſe of the Palm of their Hand, or of
ſpeaking Trumpet to ſupply this Defec

ar

d alſo for this Reaſon, Brutes, as Deer
ıd Hares, always turn their Ears that
ay from which the Noiſe comes, that
ey may hear the better. Some ſay that
ıe directions of Sound, inſinuating
ıemſelves into the Folds of the Ear,
ıere form many Refractions before
ey come to the *Concha*, and that theſe
peated Refractions ſerve to increaſe the
mpreſſion upon the other Organs; as it
appens in a Semi-circular Vault, that
ıe Rays of the Sound being refracted
o equal Angles, the Length of the Cir-
umference of the Vault, at laſt paſs
rom one end to the other, by many
reat and ſmall Refractions.

*Its Folds ſerve to augment the Force of the Air, which acts upon the Organs by the Refractions which they cauſe.*

The Motion of the Muſcles of the ex-
ernal Ear, is very obſcure; but they
eem to be deſign'd for the Contraction
nd Dilatation of the *Concha*, according
o the Force or Weakneſs of the Undu-
ations of the Air.

*The Muſcles of the external Ear, ſerve to contract and to dilate it.*

The Obliqueneſs of the auditory Paſ-
age ſerves not only to defend the *Mem-*
*rana Tympani* from the Injuries of the
Air, but alſo this Obliquity affords a
arger Surface to the Paſſage, and is the
Cauſe that there are more Refractions made
here, and this may contribute to render
he Impreſſion ſtronger.

*The Obliquity of the Paſſage, is proper to preſerve the* Membrana Tympani *from the Injuries of the Weather. And to render the Vibrations ſtronger, by doubling its Refractions.*

The

*The Wax ſtops extraneous Bodies, which might impair the* Membrana Tympani.

The Wax, or ſort of Glue, which found in the anterior and cartilagino Part of the auditory Paſſage, ſtops a Filth and Inſects which elſe might ent into the Ear, and which wou'd be a fu Cauſe of impairing the *Membrana Tym pani.* But if this Wax has its Uſes, has alſo its Inconveniencies, ſo that if w don't take care to clean our Ears, this gl tinous Matter will be amaſs'd in it too great a Quantity, and growing thic by its Detention, will at laſt be a mea of obſtructing the Undulations of th Air from coming to the *Membra Tympani.* It is not long ſince, that ſearc ing out the Cauſe of Deafneſs in a Perſo who had been afflicted with it ma Years before his Death, I found in th auditory Paſſage, about two Lines fro the *Membrana Tympani*, a ſmall Pell which was ſoft and pretty thick with conſiderable Quantity of Filth indurate collected before it, and I don't dou but that this ſort of Deafneſs is ve common.

*It may alſo be prejudicial to the Ear, when it is too thick, and in too great a Quantity.*

We have taken Notice, that the ca tilaginous Paſſage which is broke off many Places, forms a ſort of a litt Tongue, which is at the Extremity the Cheek before the *Concha*, and direc

at the Entrance into the auditory Paſ-
ge. This little Tongue hinders the
efractions which are made in the Inſide
the *Concha*, from eſcaping out of this
vity, making them paſs more exactly
o the Inſide of the auditory Paſſage:
ſeems alſo to be of Uſe in ſtopping up
e Ear upon which it is plac'd, and con-
quently hindering the Impreſſion of the
r upon theſe Parts, as the Eyelid be-
g ſhut, hinders it from coming to the
e.

We have already ſaid, there are three
mifications of three different Pair of
erves, which are diſtributed upon the
tilaginous Part of the auditory Paſſage,
ich occaſion that extreme Senſibility,
ich is found in this Part, by which the
imal is advertis'd of the leaſt extrane-
s Body, which might inſinuate it ſelf
o the auditory Paſſage.

This will ſuffice for what concerns the
ternal Ear; the *Membrana Tympani* is
e firſt Part which preſents it ſelf to
w in the internal Ear, and although it
y be ſaid not to be abſolutely neceſſary
Hearing, ſince ſome that are deaf ta-
g hold of the Handle of an Inſtrument
their Teeth, can hear the Sound of
it is nevertheleſs of ſo great a Conſe-

*The* Membrana Tympani *is neceſſary for the Preſervation of the other Organs.*

quence, that if we lacerate or pierce through in any Animal, they may hear lerably well for some time; but th Hearing will grow insensibly weaker, a they will entirely lose it at last.

*It is extended and relax'd by the Muscles of the* Malleus.

This Membrane is extended and relax by the little Muscles belonging to t *Malleus*, which is join'd to the back P of this Membrane: the external Mus relaxes it, and forms it into a plain S perficies; the internal Muscle which situated upon the Surface of the *Os P troſum*, draws it inwards, and consequen ly extends it more than it is in its natu State. Now the Tension of the *Me brana Tympani* is form'd in such a m ner, that both the Muscles act togethe whereas in its relax'd State, the Acti is perform'd by the external Muscle lone. The Reason of this is, because t Insertion of the external Muscle, bei oppoſite to it, is fix'd near the Head the *Malleus*; whereas the other M cle is inserted on the other Side, a lit lower towards the Handle. The Force the Contraction of the internal Muscle increas'd by that of the External, so t these two Muscles draw the Extrem of the Handle of the *Malleus* inwards, which the Tension of the *Membrana Ty*

P

*ni* is chiefly attributed. The Figure
xplains this more clearly. *See* Plate VI.
ig. V.

It is certain then that theſe little Muſcles
t, and it is alſo evident at leaſt of the
vo firſt, that one extends and the other
laxes the *Membrana Tympani*; but the
ifficulty is to know on what Occaſions
ey act, and what it is that cauſes them
place this Membrane in thoſe different
oſitions in which it muſt neceſſarily be,
receive the different Impreſſions of
oiſe, and of different Sounds.

Is it the Will that makes them act? *The Will is not the Cauſe of theſe Muſcles acting;* here is not the leaſt Reaſon to ſuſpect : For in ſhort, a Noiſe moſt commonly rpriſes us without our being appriz'd of

And it is my Opinion that the Ob-
ts themſelves are the ſole Motives,
hich cauſe theſe Muſcles to extend or
ax the *Membrana Tympani* on diffe-
nt Occaſions, according to their diffe-
nt Impreſſions.

Therefore it is my Sentiment, that the *But the diffe-* embrane of the *Tympanum* muſt be *rent Diſpoſi-* rioufly diſpos'd for the receiving the *tions of the* rious Undulations of the Air, and that *Objects.* Reality it wou'd be impoſſible for it to nſmit them ſuch as they are, if it was t in ſome meaſure fitted to their Cha-
ter; and if on different Occaſions, it did

not form it ſelf, if I may uſe the Expreſſio
into proper Tenſions to repreſent the v
rious Tones of the ſonorous Bodies. W
know that upon placing two Lutes up
one Table; if upon playing upon o
String, we wou'd make a String of the
ther Lute move, we muſt of Neceſſi
place it in Uniſon with that which we pl
upon; either in the Octave, or ſome
ther Accords; as the double Octave,
the Fifth or the Fourth; otherwiſe it w
indeed vibrate, but the Vibrations w
be very weak, and never audible.

*And according to the different Occaſions which concur,*

This being allow'd, we may with
great deal of Probability advance, th
ſince the Diverſity of Noiſes and Soun
depend upon the different Nature and v
rious Pulſations of the ſonorous Bodie
that for example, the acute Tone pr
ceeds from a Pulſation on a Body, whc
Particles are diſpos'd in ſuch a manne
that they are incapable of any but ve
quick Vibrations, which they immedia
ly communicate to the Air; that on t
contrary the Grave Tone is produc'd
a Pulſation on a Body ſo order'd, that
is capable of none but very ſlow Vibr
tions: We may, I ſay, aſſert that t
Membrane of the *Tympanum* conform
in ſome manner to the different Diſp
ſitio

*The* Membrana Tympani *is more or leſs relax'd.*

*According to the Diverſity of Sounds.*

ions of the ſonorous Bodies in its diffe- *Which it does*
ntStates of Tenſion and Relaxation; and, *in putting on*
we may be allow'd the Expreſſion, *their Charac-*
ts on their Character; as for example, *ters.*
is extended for acute Tones, becauſe
this State of Tenſion it is more capable
quick Vibrations, but on the contrary,
is relax'd for Grave Tones, becauſe it
ing thus relax'd, it is better diſpos'd
r ſlower Undulations; and laſtly, it ri-
and falls in a thouſand different Ways,
the different Ideas of the different
oiſes and Sounds. I confeſs it is hard *By mechani-*
conceive how this is perform'd; they *cal Motions,*
e mechanical Motions which are imper- *which are dif-*
ptible, the Nature and Cauſes of which *ficult to ex-*
e difficult to explain. *plain.*

The *Membrana Tympani* therefore re- *The Agita-*
ves the various Undulations of the *tion of the*
r, and communicates them afterwards Membrana
the other Parts of the internal Ear. It Tympani *is*
a dry, thin and tranſparent Membrane, *communicated*
s Structure renders it fit for that Uſe, *to the other*
d if theſe Qualities happen to be im- *Organs of*
r'd, we need not be amaz'd if a *Hearing.*
hickneſs of Hearing thereupon enſues.

There is room to believe that the Air, *Not ſo much*
ich is found in the *Tympanum*, being a- *by the help of*
ated by the Pulſations on the *Mem-* *the Air which*
*na Tympani*, contributes partly at leaſt *is inclos'd in*
communicate them to the immediate *the Cavities*
*of the Ear,*

Organ. But nevertheleſs there is no ap
parent Reaſon to imagine that this ſma
Quantity of agitated Air, is capable co
ſhaking the *Os Petroſum*, or rather th
Labyrinth which is contain'd in the O
*Petroſum* ſtrong enough: So that we ma
*As by the Aſ-* aſſert with great probability, that th
*ſiſtance of the* Pulſations on the *Membrana Tympani* ar
*little Bones.* alſo communicated to the *Malleus*; whic
the *Malleus* communicates to the *Incus*
*Which ſhake* the *Incus* to the *Stapes*, whoſe Vibratio
*the Labyrinth,* ſhakes the *Os Petroſum* and the *Labyrin*
*and the Air* *thus*, in the ſame manner as the Air whic
*which is in-* is between two Lutes that are placed upo
*cloſ'd in it.* one Table, is incapable of communicatin
entirely the Undulation of a String of on
of them to that of the other: but th
String that is ſtruck, muſt firſt ſhake th
Wood of the Lute to which it is fix'd
afterwards the Wood of the Lute mu
ſhake the Table, the Table the Woo
of the ſecond Lute; and laſtly, the Woo
of this Lute the String which is fix'd
it, and which is in Uniſon with that
the other. And this is ſo true, that
we take one of the Lutes off of the T
ble, and hold it up in the Air, the E
periment won't ſucceed.

The Nature, Mechaniſm, and Artic
lation of theſe three little Bones ſeem
favour this Opinion; they are dry, th
a

nd hard, and consequently very capable f being agitated. The *Malleus* through he whole length of its Handle is fix'd o the *Membrana Tympani*, so that it is easy to imagine that this Membrane can't be agitated without communicating its Agitations to the *Malleus*, and so successively to the other little Bones, since they are articulated together, and their Articulation being without Cartilages, may easily facilitate this Communication of the Vibrations from one to the other.

*The Muscle of the* Stapes, *serves to extend the Membrane which is fix'd to its* Basis.

It is very difficult to determine the Use of the Muscle of the *Stapes*; we may suppose that in drawing the *Basis* of the *Stapes* a little outwards, which is immediately situated upon the *Fenestra Ovalis*, it extends the little Membrane with which the upper part of its *Basis* is cover'd; and therefore as it extends it more or less, it renders it also more or less dispos'd to receive the Vibrations of the *Membrana Tympani*, and to communicate them to the *Vestibulum*, and to the Labyrinth. We may also add, that in drawing out the *Stapes*, which is also pretty flexible, it extends it in some measure, and keeps it in a firmer State, and consequently disposes it in a better way, to receive the Vibrations of the *Malleus* and *Incus*.

*And to extend the* Stapes *itself.*

*The Passage of the* Processus Mammillaris *affords a Passage to the Air, when it is over-press'd in the* Tympanum.

I have already said, that at the Sides the *Tympanum* there are two Passages, one of which terminates at the Palate, and the other proceeds into the *Cavernulæ* the *Processus Mammillaris.* It seems to be very likely, that when the *Membrana Tympani* is drawn inwards, the Air which is inclos'd in the *Tympanum* retires into these two Passages, and that it returns in to the *Tympanum*, when the *Membrana Tympani* is relax'd, otherwise the Motion of this Membrane wou'd be very much retarded by the Elasticity and Resistance of the Air, if it had no way to pass out of it. And there is the same Reason to believe that the return of this Air into the *Tympanum*, favours the Reduction of the *Membrana Tympani* into its natural Disposition.

*The* Aqueduct *serves to bring the Air from without to it.*

*And to renew that which is in the* Tympanum.

The Passage which goes from the Palate to the Ear, furnishes the Air which is necessary for the continual Renewing of that of the *Tympanum:* And as the too great Coldness of the external Air might be prejudicial to the internal Parts of the Ear, therefore this same Air as it ascends up the Length of the Cavity of the Nostrils, and during its whole Course as far as the *Tympanum*, receives such Modulations as are necessary and suited to the Structure of the Parts thro' which it is to pass, ye

with

ithout loſing the ſtrength of Elaſticity hich makes it capable of performing the Uſes for which it was deſign'd; and there-ore the Air which returns from the Lungs, nd which is mix'd with impure Vapours, oes not ſo eaſily enter into this Canal, he Orifice of which is ſo plac'd at the *Fundus* of the Mouth, that it oftener re-eives the Air from the Noſtrils, than hat which returns from the Lungs.

*And not to ſupply the Office of the* Membrana Tympani.

Almoſt every body believes that by he aſſiſtance of this Canal, ſome deaf People can hear the ſound of ſtring'd In-truments, and that their Deafneſs pro-eeding from the *Membrana Tympani* its ot being able to diſcharge its Offices, no ody ſhou'd be ſurpriz'd, if the Vibra-ions of the external Air being commu-icated to the *Tympanum*, that theſe ſort f People are capable of hearing the ound of an Inſtrument. Nevertheleſs, o make it appear that the Vibrations of he Air which come into the *Tympanum* y the help of this Canal, are not ſuffi-ient to make theſe deaf People hear the ound of an Inſtrument, we muſt here ake notice that they are oblig'd to hold he Handle with their Teeth, otherwiſe hey could not hear it at all, or at leaſt ot ſo perfect; now it is eaſy to imagine

that the Teeth being agitated, this Agi tation is communicated to the maxillarr Bone, from thence to the *Os Temporale* then to the little Bones of the Ear; and what yet more ſtrengthens my Opinion is, what I have ſaid concerning the Uſe which I have aſcrib'd to theſe laſt mention'd Bones: for even thoſe who are not Deaf, hear better and more ſtrongly the Sound of an Inſtrument, when they hold its Handle with their Teeth, and ſtop their Ears. Beſides this, there are ſome deaf People, who hear much better when we talk with them over their Heads: and in theſe we have Reaſon to believe that the whole *Cranium* being ſhook, the *Os Petroſum* and all the other Bones are alſo ſhaken ſucceſſively.

*The* Feneſtra Ovalis *communicates the Vibrations of the Air to the Labyrinth.*

I have already remark'd that the *Feneſtra Ovalis* is exactly ſhut up by the Baſis of the *Stapes*: This little dry and fine Bone, whoſe Baſis is very ſlender, and one of whoſe Sides is cover'd with a Membrane, having receiv'd the Vibrations from the two other Bones, and from the Air contain'd in the *Tympanum*, may very eaſily communicate them to the *Veſtibulum* and to the Air contain'd therein, and afterwards to the *Cochlea*, and to the three Semi-circular Canals.

Beſides

Beſides this *Feneſtra Ovalis*, there is another which is call'd *Rotunda*, which is ſhut up by a Membrane pretty much like the *Membrana Tympani*; and we imagine that it receives the Vibrations from the Air contain'd in the *Tympanum*, and that it communicates them to that which is inclos'd in the *Scala Inferior* of the *Cochlea*; which being very much confin'd and pent up in this Place, where there is no Paſſage for its paſſing out, it is very capable of cauſing a ſtrong Vibration in the *Lamina Spiralis*; and after this Manner, the Vibrations of the Air at laſt reach the immediate Organ of Hearing, which remains to be treated on.

*The* Feneſtra Rotunda *communicates them to the* Scala Inferior *of the* Cochlea.

This Organ is comprehended under the Name of the Labyrinth, which being inclos'd in the *Os Petroſum*, conſiſts of two principal Parts, *viz.* the *Cochlea*, and the *Veſtibulum*, with its three Semicircular Canals.

*The immediate Organ conſiſts of two Parts which compoſe the Labyrinth.*

As for the *Cochlea*, no body need doubt of its forming Part of the immediate Organ. Its Compoſition is a convincing Proof; for firſt the *Lamina Spiralis*, which is the principal Part of it, is hard, dry, ſlender and brittle, which are the Conditions requiſite to render Bodies capable of being vibrated. Secondly, This

*The firſt of which is the* Cochlea.

*The* Lamina Spiralis *is eaſily vibrated.*

1. *Becauſe of its Subſtance.*

*2. Because it is very much extended.*

*Lamina* does not lie upon the Inside the Semi-oval Spiral Canal, but is ee tended, joining on one Side to the Axi on the other, to a very fine Membra which is connected to the Surface of th Canal: so that this Situation of the *La mina Spiralis*, is very favourable to th Disposition it must have to be easily v brated. Thirdly, The *Lamina Spira* by the means of the little Membra divides the whole Passage of the Spiral Ca nal as it were into Ranges of Stairs *Scalæ* in the *Cochlea*, built upon th same *Axis*, the upper one of which Hh no Communication with the lower. Th *Fenestra Rotunda* opens into the low one, which has no Communication wi the *Scala Superior* of this Canal, which have before taken notice of, nor with th *Vestibulum:* So that the Air which is clos'd in the *Scala Inferior*, is agitated much by the Vibrations of the *Fenest Rotunda*, as by those of the Air in th *Scala Superior* of the Semi-oval Can which is also as much shaken by the Im pulses of the Air contain'd in the *Vestib lum* with which it has a Communicatio as by those of the Air inclos'd in the *Sca Inferior* of this Canal; the *Lamina Spir lis* being agitated on both sides, its V

*3dly. Because in dividing the Semi-Oval Canal into two Scalæ, it receives Pulsations from the upper and the under one.*

bratio

rations muſt be more lively and ſtrong.

ourthly, The Spiral Figure of this *La-* *4thly. Because its ſpiral Figure is the cauſe of its being vibrated in many Places.*
*ina* is moreover a very powerful Argu-
ent to ſuſtain what I aſſert; for as it
akes two Turns and a half round the
*lxis*, it receives the different Vibrations
f the Air in many Places, and this Me-
anism is alſo obſerv'd in the Tongue
nd in the Noſe, *&c.* Fifthly, A con- *5thly. This* Lamina *receives all the different Vibrations of the Air, becauſe of its unequal Figure.*
derable Branch of the *Portio Mollis* of
e auditory Nerve, after it is come to
e Baſis of the *Cochlea*, divides it ſelf into
any ſmall Ramifications, which paſſing
rough all the little Perforations in the
*lxis*, are diſtributed and loſt in the dif-
rent Windings of this ſpiral *Lamina*. In
ort, this *Lamina* is not only capable of re-
iving the Vibrations of the Air, but its
tructure makes it appear credible, that
is ſufficient to anſwer to all their diffe-
nt Characters: For it being larger at the
eginning of its firſt Convolution than it
at the Extremity of the laſt, where it
niſhes as in a point, and its other Parts
miniſhing in proportion in Bulk, we
ay ſuppoſe that the larger Parts may be
brated without the others participating
that Vibration; and therefore they are
apable of receiving none but the ſlower
Indulations, which conſequently anſwer

to grave Tones: And that, on the contra ry, its narrower Parts being agitated, thei Undulations are quicker, and conſequentl ly anſwer to acute Tones. In the ſam manner that the larger Parts of a ſtee Spring form the ſloweſt Undulations, an anſwer to grave Tones: And ſo its narrow er Parts form quicker and more frequen Vibrations, and conſequently anſwer t acute Tones. So that in ſhort the Spirits c the Nerve, which expanded over its Sub ſtance, receive different Impreſſions whic repreſent in the Brain the different Ap pearances of Tones according to the di ferent Vibrations of the *Lamina Spirali*

*The ſecond Part of the immediate Organs comprehends the* Veſtibulum *and the three Semi-circular Canals.*

As for the *Veſtibulum* and the thre Semi-circular Canals, although ſome ſa that they are only ſubſervient in increa ing the Impreſſions of the Vibrations c the Air, others affirm that they deade them; it is my Opinion that they fort Part of the immediate Organ, for th following Reaſons.

In the firſt place, all Birds have bu three Paſſages which are curv'd in a Se mi-circle, and a fourth which is ſtra and clos'd up at one End, but which c pens with the others in a Cavity commo to them all, and which ſupplies th Place of a *Veſtibulum*. Theſe three Cana

ar

are alſo found in Fiſhes; there is no *Cochlea* in neither of them, nevertheleſs they hear: it is therefore certain, that theſe Semi-circular Canals are the immediate Organ of Hearing in Birds and in Fiſhes. Why then ſhould they not have the ſame Uſe in Man, ſince their Structure is the ſame in Man as in theſe Animals? From hence at leaſt it neceſſarily follows, that theſe Semi-circular Canals form part of the immediate Organ in Man, and that therefore this Organ is compos'd of two eſſential Parts.

*The* Cochlea *is not to be found either in Birds or in Fiſhes.*

*The Semi-circular Canals alone perform the Office of the immediate Organ in theſe Animals.*

Secondly, No body diſputes the Communication of the Impreſſion of Sounds to the Brain being perform'd by the *Portio Mollis:* now this *Portio Mollis* has two Ramifications which enter the Cavity of the *Veſtibulum*, and which unfold themſelves and are extended into Filaments and Membranes, which line theſe Semi-circular Canals internally; from hence I conclude, that this Part of the Labyrinth forms alſo part of the immediate Organ.

*There are Nerves and Membranes which are the cauſe of theſe Semi-circular Canals, forming part of the immediate Organ.*

Thirdly, The Structure of the *Veſtibulum*, and of theſe Semi-circular Canals is ſuch, that we may very reaſonably imagine that the Impreſſion of Sounds is increas'd and ſtrengthen'd in theſe convoluted Paths, and that it muſt conſequently

*Their Windings ſerve to augment the Force of the Air, by the Refractions which they cauſe.*

ly become more capable of cauſing a Vibration on the Nerves which are diſtributed there.

*Theſe Canals receive the different Characters of Tones as well as the* Lamina Spiralis.

But as I have already ſaid, that the *Lamina Spiralis* does not barely receive the Vibrations of the Air, and that all its Parts are not indifferently capable of anſwering to the ſame Tones; I alſo aſſert as much of theſe three Semi-circular Canals. Every one of theſe Canals is in the form of two Trumpets, which have their narrower Ends plac'd one within the other; that is to ſay, that the two Orifices of theſe Canals are larger in the Cavity of the *Veſtibulum*, like the broad Ends of two Trumpets; and that the Middle of theſe Canals, which I look upon as the Place where the two Trumpets meet is narrower in Proportion: There are two of theſe Canals which have an Orifice into the *Veſtibulum* common to them both, which together form a very large End in compariſon to the others. Now it is demonſtrated by Experience, that the greater Circles of the broad Ends of Trumpets may be agitated without the leſſer being ſenſibly affected: That the Vibrations of the great Circles are ſlower and more diſtinct, and that on theſe Occaſions the Sound of the Trumpet is grave;

grave; whereas when the ſmall Circles of the ſame Ends of the Trumpets are agitated without the great being ſenſible of it, the Sound of the Trumpet is then acute, becauſe the Vibrations of theſe ſmall Circles are quicker and more frequent. We may aſſert the ſame of the Semi-circular Canals; their larger Parts may be agitated without the others being ſo, then the Vibrations of theſe ſame Parts will be ſlow; from whence will neceſſarily follow the Appearance of a grave Tone: *& vice verſâ*, when the narrower Parts are agitated without the others being ſo, the Appearance of an acute Tone will of neceſſity follow, becauſe the Vibrations of theſe ſmall Parts are quicker. From all that I have ſaid, we may conclude that the *Cochlea* and Semi-circular Canals, are the common and immediate Organs, which not only receive the Undulations of the Air in general, but alſo which receive the true Idea, and the different Characters of Tones, according to the different Places of thoſe Parts which are agitated.

*Becauſe they are made like Trumpets.*

It may be objected, that theſe Semi-circular Canals are too much continu'd, and too much fix'd to part of the *Os Petroſum*, to be eaſily agitated in their different

*And their Subſtance is very eaſily vibrated.*

different Parts, and in ſo many different ways. But beſides that no body can make any conſiderable Noiſe without the *Os Petroſum* being agitated, it is certain that when we prepare theſe Circles to ſhew 'em plainly by themſelves, we take notice that they are ſurrounded with nothing but a ſpongy Subſtance. It is true, that in old Heads the bony *Laminæ* which cover theſe Circles before and behind, are pretty hard; but that which fills up the Space which is round theſe Circles, is of a more porous Nature: therefore they are always diſengag'd enough, and very capable of being agitated, and of Reverberating.

*It is by the Communication of the auditory Nerves with thoſe of the Voice,*

*That the Sympathy between the Voice and the Hearing is caus'd.*

By the Communication of the *Portio Dura* of the auditory Nerve, with the Ramifications of the fifth Pair which are diſtributed to the Parts, which ſerve to form and to modulate the Voice, the Communication which there is between the Hearing and Speech is commonly explain'd. Some ſay that the Vibrations of the Nerves of the Ear, being communicated to the Nerves of the fifth Pair, cauſes the Spirits which flow from the Brain into theſe Nerves, which proceed to the Parts which form the Voice, to diſpoſe the Muſcles in ſuch a manner, that

hat anſwering the Impreſſion which the
oice hath made in the Brain, they are
ut in a Method of forming a Voice quite
ke it. And this Reaſon is alledg'd for
Men and Birds exciting one another to
ng, and for thoſe Men who are born
eaf, being alſo conſequently dumb.

It is alſo ſaid, that it is by the Communication of the ſecond vertebral Pair with the external Ear, that at the leaſt Noiſe it is cuſtomary to turn one's Head: And all the Body is diſpos'd to make different Motions, according as the Cauſes of the Noiſe are beneficial or hurtful. And as theſe Nerves communicate with thoſe of the Heart and the Lungs, it is from hence that we feel the ſame Alterations in the Pulſe and in Reſpiration, according to the Difference of the Noiſes. But every one does not agree in the Effects of all theſe Communications.

*And by the Communication of the ſecond vertebral Pair.*

*That the Affinity that there is between the Tones of Hearing, and the Motions of the Body is produc'd.*

*And that of the Pulſe.*

*End of the Second Part.*

OF

# OF THE ORGAN OF HEARING.

## PART III.

### *Containing the Diſorders of the Organ of Hearing.*

*The Knowledge of the Diſtempers of the Ear, depends upon that of its Parts which are affected.*

AFTER having explain the Structure and Uſes the Organ of Hearing, finiſh this Subject, there r mains nothing elſe for m to deſcribe, but the Diſtempers of th Ea

ar. My Deſign is not to trace them om their Origin, but only as they relate the Structure of this Organ; to make appear how advantageous the Knowdge of the Parts is to the Explication of e Diſeaſes. I ſhall not confine my ſelf the Diviſions which Authors commonmake; but ſhall here follow, as I have one in my Explanation of the Uſe of the arts, the Order of my Deſcription: hat is to ſay, I ſhall firſt examine what iſtempers happen to the external Parts, terwards thoſe which attack the *Membrana Tympani*, the *Tympanum* and *Labyrinthus*; and laſtly, thoſe which belong the auditory Nerve. After which I ſhall xplain the Noiſe or Tinckling, which is Symptom common to the Diſorders of l theſe Parts; and I ſhall not ground y Reaſons but upon Obſervations taken om very creditable Authors, and upon oſe which I have had an Opportunity of aking my ſelf, when I was working pon the Ear.

The moſt common Symptom of the xternal Parts of the Ear, is Pain; it ommonly infeſts the *Concha*, and the hole auditory Paſſage as far as the *Membrana Tympani*. Experience teaches us hat it is accompany'd with Pricking, Eroſion,

*The Diſorders of the auditory Paſſage, which cauſe extreme Pain and remain in this Part, proceed from*

Eroſion, Tenſion, Weight and Pulſ
tion.

I ſhall not in this place explain th
Nature of Pain in general, but ſhall tre
of it more largely when I come to th
Organ of Feeling. Now here it will
ſufficient to know that Pain is caus'd b
*The Solution of Continuity.* a Solution of Continuity of Particle
which when they are united, form t
firſt Conſtitution of the Parts of Anim
Bodies: This Solution of Continui
cauſes an irregular Motion in the Spiri
and in theſe two Things the former Re
ſon of Pain conſiſts.

This being allow'd, we may eaſi
know that whatſoever can cauſe a So
tion of Continuity in the Particles of t
Membrane, which lines the audito
Paſſage, and excite this irregular M
tion of the Spirits, is capable of prod
cing Pain. Thus an Inflammation, e
traneous Bodies in the paſſage, Worm
and in a word, all that can cauſe Pain
other Parts, may be applicable to t
here. But beſides this, the Ancie
have maintain'd that the Pains in the E
may happen without an Inflammatic
and without any conjunct Cauſe; fr
whence they have explain'd theſe Pa
by Intemperies alone without Matt
whi

hich they commonly believ'd to pro-
eed from Exceſs of Cold or Heat: but
s theſe Intemperies without Matter are
naginary, and as we may find in the
art, Things capable of producing this
iolent Pain, I will lay down my Senti-
nents of it in few Words.

I take notice, that the Wax which is a- *Caus'd by the Wax, which is in the Inſide of the auditory Paſſage.*
naſs'd in the Ear is bitter and viſcous,
nd that conſequenlty it abounds with
crid and lixivious Salts, which are mix'd
ith thick and oleaginous Particles; theſe
rinciples give it very nigh the Qualities
hich are attributed to the Bile, which
very much reſembles. If it happens
y any Means whatſoever, that theſe
line Juices diſengage and expand
nemſelves, and that being more exalted
han uſual, their Points act with more
iolence; it is evident that they muſt
auſe great Diſorders in the auditory
aſſage, becauſe of its extreme Senſibili-
y. Cold and Heat are moſt commonly
ne Cauſes of it. For Cold thickening *The external Cold increaſes the Acrimony of it;*
his Wax, and rendering it more viſcous,
auſes it to obſtruct and ſtop up the ex-
retory Ducts of the Glands, as it may be *By the Obſtruction of the excretory Ducts of the Glands.*
bſerv'd in the other neighbouring glan-
ular Parts, in which this Action of the
ir cauſes the like Obſtructions: from
whence

whence it follows, that the ſaline Juic
which were in motion, and in a Diſpoſ
tion to paſs out, being obſtructed in th
Glands, puff up and ſwell them; arn
becoming more acrimonious by their bo
ing detain'd, prick upon the Extremitii
of the Nerves, with which the auditor
Paſſage is ſtor'd; and are the Cauſe off
very great Diſorder in the Spirits, arn
conſequently of that great Pain of th
Ear. On the other hand, the extern
Heat looſens and diſſolves the ſaliu
Juices of this Wax, and produces by th
Means the ſame Effect. The ſame Thin
is obſervable in the Pains, which ar
caus'd by the Bile in the alimentar
Parts, by the exceſſive Degrees of He
or Cold.

*Which renders the ſaline Juices more pungent.*

*By Heat, which looſens and diſſolves theſe ſaline Juices.*

But the Ear-Wax is not the only Cau
of theſe acute and violent Pains; it ver
often happens that thoſe ſharp, ſalin
ſerous Humours, which are evacuated b
the Glands of the Ear, cauſe Pain in th
auditory Paſſage, which is apparent
the Suppurations of this Part: For
theſe ſerous Humours which are emitte
are ſometimes Acrimonious or Salin
they ſtimulate the Membrane of the Pa
ſage, and excite an uneaſy Senſatio
which is what we call Pain.

*Or by the ſharp ſaline and ſerous Humours, which ſometimes come out of the Glands of the Ear.*

A

As for the different Senſations of Pain, I believe they may be accounted for in is Manner: When the ſaline Particles Wax, or even the other Humours ntain'd in the Subſtance of the Glands, e become pointed and hard, and by be- g more ſtrongly agitated than uſual, ey ſtrike violently upon the nervous laments of this Paſſage, and produce pungent Pain, which happens in all In- mmations, and eſpecially in Perſons of dry and bilious Habit of Body, whoſe umours are fill'd with thoſe acrid and ine Juices: and in People of a melan- olic Habit, in whom the ſerous Part the Blood is always ſharp or ſalt; hen theſe Salts become very acrimo- ous or very corroſive, they cauſe Pain company'd with Eroſion, which is iefly to be taken notice of in Ulcers this Part. When the Subſtance of the ax which is ſtill contain'd in the Glands, fermented alone or with other Fluids, extends or dilates the Particles of the embrane, and cauſes a Senſation of enſion. When the Glands are ſwell'd th the abundance of the Fluid with ich they are fill'd, they leave a Senſa- n of Weight: As for that ſort of Pain ich is accompanied with Pulſation, I

*The different Solutions of Continuity, cauſe the different Senſations.*

*Of pungent Pain.*

*Of Eroſion.*

*Of Tenſion.*

*Of Weight.*

*Of Pulſation.*

believe

believe it never happens to the auditory Paſſage, but when it is inflam'd.

*This Pain is very violent, becauſe*

There is nothing ſo ſurprizing as the Violence of this Pain; it is hardly ever without an acute Fever, which is attended with Wakings, Deliriouſneſs, Convulſions, and Swoonings; Symptoms which are often the Cauſe of Death, as may be ſeen in Obſervations made by many Authors: For the better underſtanding the Violence of this Pain, we muſt obſerve, Firſt, That the Membrane, which lines the auditory Paſſage, is fine and nervous, and compos'd of the ſame Texture as the nervous Membrane of the Stomach and Inteſtines, excepting its not being indu'd with thoſe *Villi*, to preſerve it from the Acrimony of the Humours.

*The Membrane of the Paſſage is compos'd of a fine and nervous Texture.*

*And receives a great Number of Nerves.*

2. It is cover'd with an infinite Number of Nerves, which it receives from the fifth Pair, from the *Portio Dura* of the auditory Nerve, and from the ſecond vertebral Pair, as it has been deſcrib'd in the firſt Part of this Treatiſe; and we may aſſert, that there is no Membrane in the whole Body, which has more Nerves in proportion than this has. It is certain that thoſe Membranes which are fix'd cloſe upon the Bones, have a more exquiſite Senſation than the others, which may

*This fix'd cloſe upon the Bone.*

ay poſſibly proceed from their being ore firm and more extended, and that eing connected to the Bones by all their nall Veſſels which they ſend off to them; is impoſſible that theſe Veſſels can be imulated, without all their ſmall Ramiications being agitated at the ſame time, nd for this Reaſon the *Perioſteum* and *Pecranium* have ſo exquiſite a Senſation: nd in the ſame manner we may imagine at the acuteſt Pains of the Head proeed from the Adherence of the *Dura Mater* to the Top of the *Cranium*, as has been obſerv'd. This is eaſily apicable to the Membrane of the auditory aſſage, for this Paſſage is partly bony nd partly cartilaginous, and the Memrane is extended upon the Cartilage, ough not quite ſo much as it is upon e Bone. Now it is remarkable that oſe Pains which infeſt the Bottom of e Ear, which is the bony Canal, are ways the moſt violent. 4. The Conexion of this Membrane with the neighouring Parts, may greatly contribute to e Acuteneſs of the Pain; for this Memrane is extended as far as the *Membrana ympani*, which communicates with the Iembranes which line the *Tympanum*, nd with thoſe of the Labyrinth; and

*And connected with other very ſenſible Membranes.*

by their means with the *Dura Mater*. After, need we be aſtoniſh'd if the Pain in the Paſſage are ſo ſharp and violent!

Although the greateſt Part of the Symptoms which accompany the Pain of the Paſſage, may be met with in the Pains of other Parts, nevertheleſs as theſe Symptoms are more frequent and more violent in this Part, I judg'd it neceſſary to explain them.

When this Pain is caus'd by an Inflammation, there is no Difficulty in giving a Reaſon for the Fever, and the other Symptoms which commonly attend it. But as I am convinc'd the Acuteneſs of the Pain alone may cauſe all theſe Symptoms without either Inflammation or Tumour, I ſhall apply myſelf chiefly to this laſt Caſe.

*And this often cauſes an acute Fever,*

I begin with the violent Fever, which almoſt always accompanies the Pain of the Ear; and I take this to proceed from

*By the Agitation of the Spirits.*

the Spirits being agitated by the Violence of the Pain, which encreaſe the Motion of the Heart and of the Arteries which is the Cauſe of the Quickneſs of the Pulſe and of the Increaſe of Heat as is viſible in ſome Paſſions, and particularly in that of Anger. But this Augmentation of the Motion of the Heart

ar

d Blood, does not produce a real Fe-
r without it diſorders the Principles of
e Blood. Now it is eaſy to conceive,
at by theſe ſtrong Contractions of the
eart, the Parts of the Blood being
ore exactly broken and divided, an
altation of its moſt active Particles
caus'd, and its oily Part is more per-
tly diſſolv'd, whoſe ſwift and rapid
otion is the Cauſe of Heat in the Fe-
r. Moreover, the acrimonious and cor-
ive Juices of the Wax, and of the ſe-
us Humours which are amaſs'd in the
r, may re-enter and mix with the
aſs of the Blood, and there cauſe an
raordinary Fermentation, in which
e Eſſence of a Fever conſiſts. We
ll eaſily comprehend this ſort of Fe-
r, if we conſider that in Colds the
ver ſprings from the Mixture of the
rp Juices, which ſeparating from the
aſs which is the Cauſe of the Continu-
ce of the Cold, mix with the Blood.

*And by the Fermentation of the Blood.*

The Watchfulneſs, or Inability of
ep, depends upon the extraordinary
gitation of the Spirits; which finding
mſelves continually irritated by the
olence of the Pain, flow continuallly
o the Parts, and maintain them in their
nctions.

*Watchfulneſs.*

*The Delirium.* The Deliriouſneſs differs in noth
from the Watchfulneſs, but that in
the Spirits moving irregularly in
Brain, they touch at the ſame time m
Traces of the Memory and Imaginati
which cauſe a Confuſion in the *Id*
that theſe ſame Spirits repreſent to
Soul.

*Convulſions,* The Convulſions are eaſily explai
in this *Hypotheſis*; for the involunt
Contractions of the Muſcles being cau
by the irregular Motion of the Spir
it is ſufficient that the ſaline Juices
mulate the Nerves, which are interſpe
ed in the Membrane of this Paſſage,
cauſe that Irritation to be communica
to all the Spirits, by the Communicat
of the Nerves and Membranes, and
terwards to cauſe Convulſions in the M
cles. Beſides, it may happen that th
ſharp Juices re-enter the Blood, and
ing carried to the Brain, cauſe Irr
tions in that Origin of the Nerves.

*And Swooning.* To give a Reaſon for the Swooni
we muſt conſider, that the Spirits fl
ing ſwiftly, and in great abundance
to the Muſcular Fibres, which contr
and ſhut up the Orifices of the Hea
they ſtop the Motion of the Blood ;
when this Contraction ceaſes, and

Blo

ood enters afresh into the Heart, the
lse and the Heat are renew'd: The
ppression of the Heart and Weight in
e Breast, which are felt in this State,
e pretty sure Indications of the Swoon-
g proceeding from the Cause which
have just describ'd; and this Oppressi-
of the Heart may continue so long,
sometimes to be the Occasion of
eath.

For an Example of a great Pain in
e Ear, accompanied with violent Symp-
ms, I shall content myself with only
ving you the fourth Observation of the
st Century from *Fabricius Hildanus*, be-
use it includes all the principal Symp-
ms. A young Girl twelve Years old,
ving by chance let a Glass-Ball enter
to the Hole of her left Ear, which
uld by no means be extracted, was
zed with acute Pains, which were com-
unicated to the same Side of the Head:
hese Pains, after a long space of Time,
d produce a Numbness in the Arm and
and, afterwards in the Thigh and Leg,
d at last in all the left Side. This
umbness was accompanied with very
eat Pains, which encreas'd in the Night,
d in cold and wet Weather with an
regularity in her *Menses*, with Epileptic

*History upon this Subject.*

Fits, and with an Emaciation of her l
Arm. *Fabricius Hildanus* eight Years
ter extracted the Glaſs-Ball, and th
all the Symptoms ceaſed, to which
the other Remedies which were us'd
ſo long a time, could not give the lea
Eaſe.

*Remarks upon this Hiſtory.* Many Remarks might be made up
this Obſervation; but as I have explai
the greateſt part of its Symptoms, I ſh
apply myſelf only to ſome which are pa
ticular in this Caſe. The Pains and Co
vulſions ſeiz'd on all her left Side to t
end of her Foot. *Hildanus* has explain
this *Phænomenon*, by ſaying that t
*Portio Dura* is diſtributed along the Ar
and to the Thigh: But as this Diſtrib
tion is imaginary, I ſhall endeavour
give a Reaſon more ſuitable to the Par
I therefore think that the Irritations a
irregular Motion of the Spirits, had pa
into all the Nerves of the *Medulla*
this ſide, by the Communication of t
ſecond Vertebral Pair: This is wh
would not have happen'd, if the Irrit
tion had been communicated to the Brai
for then there is Reaſon to imagine th
this Girl would have ſuffer'd Pains a
Convulſions in all Parts of her Body
From whence I ſuppoſe the left Side

t

the *Medulla* to be only affected: it is eaſy to conceive how this Indiſpoſition ſhould paſs into the Arm and into the Leg, ſince we know that all the vertebral Nerves of the ſame Side communicate with one another by tranſverſe Ramifications, after they have paſſed out of the *Foramina* of the *Vertebræ*.

All the Symptoms increas'd in the Night and in wet weather, becauſe the Humidity of the Air puffing up the Glands and the Membranes of the Paſſage, made it more cloſely embrace the Glaſs-Ball, which increas'd the Irritations.

The Numbneſs in all likelihood proceeded from the irritated Spirits opening and dilating the Orifices of the Nerves, in ſuch a manner that they not only afforded a Paſſage to the Spirits, but alſo to much groſſer Subſtances; which being forc'd into their Tubes, caus'd a ſort of an Obſtruction in them, capable of hindering the Motion of the Spirits, which is ſufficient to cauſe a Numbneſs. Theſe Subſtances becoming more acrimonious by their Detention, increas'd the Pains and Convulſions; which being found more violent in the Arm, its Nerves imbibed ſuch a Quantity of theſe extraneous Sub-

ſtances, that the Motion of the Spirits was thereby interrupted, which was the Reaſon of the Arms becoming emaciated and wither'd, as it happens in Palſies.

After the Glaſs-Ball was extracted, the Irritations which it caus'd ceas'd, and conſequently the Pains and Convulſions: The Spirits recovering their commom Courſe, inſenſibly diſſipated all the extraneous Bodies, which caus'd the Arm to regain its Motion and priſtine Vigour.

*Remedies to be us'd for the Pain caus'd*

I now come to the Means which are to be us'd in the Cure of this Diſtemper. They muſt be different, becauſe of the Diverſity of the Cauſes which produce it. As for the Pain, that which is produc'd by Cold, is ſometimes cur'd by taking away the external Cauſe; that is to ſay, by keeping it from the Cold and the Wind, and by applying upon the Ear, every thing that ~~way~~ warm it, as thick Wool, or hot Bread, which may alſo be ſteep'd in Spirits of Wine; but the Pain ſeldom yields to theſe firſt Remedies, and then we muſt be oblig'd to proceed to the general Remedies: Bleeding is neceſſary to hinder a Collection of thoſe Bodies, which the Cold has detain'd; and as for Purging, it is not to be order'd till the violence of the Pain is diminiſh'd. During

ring their Uſe, Fomentations are very ſucceſsfully employ'd, or Injections compos'd of the Juices or of the Decoctions of *Baum*, *Hyſſop*, *Calamint*, *Origany*, *Marjoram*, in which we may mix ſome Drops of Bullocks Gall, or rather ſome Drops of Oil of bitter *Almonds*, or *Camomile*, *Cloves*, *Aniſeeds*, &c. Authors very much recommend the ſtopping the Ear with Cotton perfum'd with Musk; there is no Difficulty in explaining the Effect of theſe Remedies, they are all endued with a very penetrating volatile Salt, which warming theſe Parts, open the Pores, and the Ducts of the Glands, and cauſe the Subſtance to flow, which was before retain'd by the Cold.

*For the Pain proceeding from Heat.*

The Pain which proceeds from Heat, is moſt commonly cur'd by general Remedies, eſpecially by Bleeding, which is abſolutely neceſſary to hinder a Fluxion and an Inflammation, which might happen to the Part. During the Uſe of theſe Remedies, we may with great ſucceſs make uſe of Injections compos'd of Milk, that of a Woman is better than any other, when it is mix'd and beat up with the White of an Egg; beſides this, they make their Injections of ſome cooling and emollient Decoction, in which they

drop ſome Oil of ſweet Almonds; th
oil Yolk of an Egg is very much commend
ed by *Devigo*. We may alſo apply ſom
emollient and anodyne *Cataplaſm* upo
the Ear; and when the Pains are extreme
ly violent, we muſt have recourſe t
*Narcotics*, which may be mix'd with th
topical Remedies, and likewiſe be give
internally. All theſe Remedies are ſ
well known, and ſo much us'd, that
ſhall not ſtop here to give you an Ac
count of their Operations.

*For the Pain caus'd by ſerous Humours.*

When the Pain is caus'd by ſharp anc
ſalt ſerous Humours, the Water of *Car
duus Benedictus*, or bleſſed Thiſtle, is us'd
in which, Woodlice, Earthworms, anc
Ants Eggs, *&c.* are boil'd: We may add
a few Drops of Oil of Box. As the Medi
cines abound with an *alkalious* volatile Salt
they deſtroy the Acidity of the ſerous
Humours, which were the Cauſe of the
Pain.

*The Cauſes which produce the Inflammation in the auditory Paſſage are,*

The ſecond Diſtemper that I ſhall take
notice of incident to the auditory Paſſage
is Inflammation with Abſceſs, and Ul
cer, which commonly ſucceed it. An In
flammation proceeds from Wounds and
Contuſions of this Part, and may alſo be
the Sequel of certain Fevers, as of the
*Pleuriſy*, *Quincy*, and of many others

of

of the ſame nature. It very often happens that an Inflammation may be produc'd in the auditory Paſſage, in two different Ways. The firſt is from an Obſtruction of the Glands, which preſſing upon the Veſſels, ſtop the Blood, and by that means are lacerated by it. The ſecond is from the Acrimony of the Wax, which may lacerate theſe ſame Veſſels, and by that means cauſe an Extravaſation of the Blood. However it be, the Inflammation and Abſceſs which ſucceed it, have nothing particular in them, but the violent Pain which I have already deſcrib'd.

*The Obſtruction of the Glands.*

*The Acrimony of the Wax.*

*Which cauſe Abſceſſes,*

The Ulcers of this Part are form'd in the ſame manner as Ulcers of other Parts, either from a Rupture of an Abſceſs, or by the Acrimony of ſome Fluid: I take notice that they commonly ſend forth a very large Quantity of Matter, and that they are very difficult to cure, eſpecially thoſe which are in the bony Part of the Paſſage. The Quantity of Matter proceeds not only from the Blood which is ſuppurated, but alſo from the Glands, which being always irritated by the *Pus*, ſpue forth a very large Quantity of Fluids through their excretory Ducts; and the Difficulty which is found in curing theſe

*And Ulcers.*

*Which are very difficult to cure.*

Ulcers, proceeds from their being conſtantly moiſten'd by the Fluid, which comes from theſe Glands, ſo that they cannot be dry'd up : beſides, the Matter which proceeds from theſe Glands, being ſharp and ſaline, hinders the *Reunion* and the *Cicatrix*; the ſame thing happens in Ulcers of the Noſe, of the ſalivary Ducts, *&c.* Ulcers in the bony Paſſage are more difficult to cure than thoſe of the cartilaginous Paſſage, becauſe the bony Paſſage runs down towards the *Membrana Tympani*, and makes a conſiderable Deſcent in the Place where it grows flat, which is the Cauſe that the *Pus* cannot paſs out of it but with difficulty ; whereas the Deſcent of the cartilaginous Paſſage being towards the *Concha*, the *Pus* and other Humours are immediately evacuated, and don't remain here as they do in the other Paſſage.

*We ſometimes meet with Worms in the Paſſage.*

It ſometimes happens in old Ulcers of the Ear, that Worms of different Figure and Size come out with the *Pus*, as may be ſeen in the Obſervations made by *Foreſtus Schenkius*, and in the *German* Journals. I ſhall not ſtay here to examine whether theſe Worms are produced by the Corruption of Humours, or whether the Heat only of theſe Ulcers hatch the

the Eggs, which thouſands of Inſects that fly in the Air may poſſibly leave in this place; I ſhall have an Opportunity of treating of it upon ſome other Occaſion.

*The Cauſe of the Suppuration, and the Flux of Blood,*

Beſides the *Pus* which paſſes out of the Ears in Ulcers, it is remark'd that in almoſt all Children the Ears emit a great Quantity of Humidity, and that this Evacuation is of very great uſe to 'em; wherefore we take care not to ſtop it, or elſe the Children wou'd fall into convulſive and epileptic Fits, which has made it been believ'd that this Fluid came from the Brain as well as thoſe clear and fetid Humours which ſome People emit at their Ears: Nevertheleſs, it is certain that there is no viſible Ways by which any thing can come from the Brain into this Part: for there is but one *Foramen* in the *Os Petroſum*, which forms an impervious Paſſage at its Extremity on the Side of the Ear, and which is exactly ſtop'd up by the auditory Nerves; therefore it is ſcarcely credible, that any thing can come by that Way. But if even theſe watry Humours and Blood cou'd erode the Bottom of this *Foramen*, and ſo procure a Paſſage through this Place, theſe cou'd enter no where but into the *Veſtibulum* and *Cochlea*, and muſt neceſſarily

*Which apparently does not come from the Brain.*

neceſſarily erode the Membrane which cloſes up the *Feneſtra Rotunda*, the Baſis of the *Stapes*, and the Membrane that covers it, to paſs into the *Tympanum*; at laſt, when they are come into the *Tympanum*, they certainly muſt rather fall into the Mouth through the Aqueduct, than lacerate the *Membrana Tympani*, to paſs through the auditory Paſſage. I do find this Difficulty in explaining theſe *Phænomena*; if Children emit a great Quantity of watry Humours through their Ears, it muſt be attributed to the Diſpoſition of their Blood, which is aqueous; and to the Relaxation of the Glands of the Ear, which is alſo found in the Glands of the neighbouring Parts. And if the Suppreſſion of this Evacuation cauſes them to fall into Convulſions and Epilepſies, it is eaſy to underſtand how this happens, becauſe theſe Juices being ſtopt, may become more acrimonious by their being retian'd, and cauſe Irritations on the Membrane of the Paſſage, and may even return into the Maſs of Blood, and afterwards be diſcharg'd on the Brain. As for thoſe Perſons who emit clear fetid Water from this Paſſage, we muſt take notice, that although the Glands of the Ear are chiefly deſign'd in their natural State

State for the Secretion of the Wax, for the Uſes I have before ſpoke of; there is no Obſtacle to hinder them from ſerving as an Outlet, for the Evacuation of pernicious Humours, which is plainly ſeen in all the conglomerate Glands: and as for the Blood which in Wounds of the Head comes out of the Ears, we know that this proceeds from a Rupture of the Veſſels, which are interſpers'd upon the Paſſage. It is eaſy to judge, by the violent Emotion, that all the *Cranium* ſuffers on this Occaſion, how a Rupture may be produc'd in this Part as well as in the Brain. Laſtly, I ſhall give ſome Obſervations to prove that the Suppurations which are made in the Ear, have no manner of Communication with the Brain. A Man about ſixty five years old, of a full and ſanguine Habit of Body, had a very conſiderable Suppuration in his Ears, and eſpecially in his Right, for five and twenty Years together, although in all other reſpects he enjoy'd a perfect Health. The Matter which he diſcharg'd was fetid and very thick; he died of an Apoplexy in four and twenty Hours after this Suppuration was ſtopt. I open'd the *Cranium*, and having carefully examin'd all the Parts of the Brain near the

the *Os Petroſum*, I found them perfectly ſound, and the Bone in its natural State, and I actually met with ſerous Humours in the Ventricles and Cavities of the Brain, which were extremely different from the Matter which came from the Ears: I have open'd the Ears of many Children, whoſe *Tympanum* was full of Filth, yet I never found any bad Diſpoſition either in the Brain, or in the *Oss Petroſum*.

*Cure of the Inflammation.*

To cure the Inflammation of the auditory Paſſage, we muſt take the ſame Methods that are uſed in all Inflammations of the external Parts; that is to ſay, firſt to ſtop the Fluxion by Bleedings, and by thoſe Remedies which are called *Anodyne*, which we have already mentioned in the Cure of the Pain; to which may be added, Oil of Roſes, Oil of Water-Lillies, the Juice of Lettices, of Garden-Nightſhade, *&c.* But if the Inflammation continues and tends to Suppuration, we muſt make uſe of Suppuratives; ſuch as the Cataplaſms of Crumb of Bread, and thoſe which are made of Onions, Lilly-Root, freſh Butter, and Oil of Chamomile or Melilot.

*Abſceſs.*

*Ulcer.*

When the Abſceſs is open'd, we muſt make uſe of deterſive Injections, made with

with Barley-Water and Honey of Roſes; and if there is a Neceſſity for ſtronger Remedies, we may uſe Decoctions of Agrimony and Birthwort, and other vulnerary Plants, in White-Wine, in which we muſt mix Honey of Roſes or Oxymel Squills; if the Ulcer is ſordid and putrid, the Tincture of Aloes made with Spirits of Wine may be us'd, and the Green Balſam of *Mets*, if it is very deep.

After this Ulcer is deterg'd, we muſt dry it up, and cicatriſe it: for theſe Intentions, the Decoctions made of Plantain, Birthwort, Gall-Nuts, *&c.* are very much eſteem'd. The *Grenada*-Wine, deſcrib'd by *Devigo*, is an admirable Medicine. As theſe Medicines have no particular Quality in them, and as they are us'd in all ſorts of Inflammations and Ulcers; I ſhall not here explain their Operation: I ſhall only ſay this, that whilſt theſe are uſing, we muſt not neglect the general Remedies, which are a very great Help in the whole Courſe of theſe Diſeaſes.

To deſtroy the Worms, we make uſe of bitter Things to put into the Ear, as the Juices of Wormwood, of little Centory, the Decoction of Coloquintida, or elſe a few Drops of Oil of bitter Almonds, or of *Worms.*

Oil

Oil of Box. The *Journal des Scavans* of 1677, relates that Spirit of Wine is an infallible Remedy for Worms which are form'd in the Ears. Thoſe of theſe Medicines, which are oily and thick, are excellent, becauſe they ſtop up the *Bronchiæ* of theſe Inſects, and ſuffocate them in an Inſtant.

*And Fluxes of ſerous Humours.*

As for thoſe Fluxes of ſerous Matter which we have term'd Suppurations, as they are for the moſt part indolent, and cannot be ſtopt without cauſing pernicious Effects, we ought not imprudently to ſtop 'em: In thoſe that are painful, we muſt have recourſe to the Remedies which have been already deſcrib'd, when we treated of Pain.

*The third Diſeaſe of the auditory Paſſage is Obſtruction; it is occaſion'd by Extraneous Bodies.*

The third Diſeaſe of the auditory Paſſage is Obſtruction; it moſt commonly ſucceeds an Inflammation, Abſceſſes and Ulcers, which uſe to ſwell this Part. Beſides this, it may happen from many other Cauſes. In the firſt place, from extraneous Bodies, which may be introduc'd into the Paſſage, ſuch as Peas, Shot, Nut, Kernels, *&c.* When they have been put a great way in, it is extremely difficult to extract them, becauſe they are inclos'd by the bony Paſſage, which is very oblique, and proceeds downwards towards the

*Membrana*

*Membrana Tympani*; beſides their being detain'd by the viſcous Wax, which is collected there, the greateſt Difficulty is in taking out Peas, and thoſe other Grains which ſwell in the Paſſage, and which may even bud there, as you may ſee in the Examples of *Fabricius Hildanus* and *Schenkius*.

2. The moſt frequent Cauſe of Obſtruction in the Paſſage, is the Wax which is inſpiſſated and retain'd in it: This Wax in thoſe that don't take care to clean their Ears, is collected in a great quantity, and grows ſo thick by its Stay, that it entirely ſtops up the Paſſage. It may alſo be ſometimes naturally very thick in People of a cold and pituitous Habit of Body, whoſe Humours are viſcous, and the Cold of the external Air may very much contribute to this Effect. *2. The retain'd Wax.*

There is alſo great reaſon to ſuſpect that this Wax may be petrified, and cauſe an incurable Deafneſs, which ſeems very likely from the Conformity there is betwixt it and the Bile, which is often petrified in the *Veſica Fellis*: and this may be confirm'd by the 45th Obſervation of *Bartholine*'s *Journals*, which relate, that his Wife having been a long time tormented with a Pain round her *Which petrifies ſometimes.*

Ear,

Ear, discharg'd small Stones thro' the auditory Passage which came out with the Wax, after which the Pain was assuag'd: However, it happens this Wax is often found very thick in the form of Plaister, which exactly fills up the bony and cartilaginous Passage, which I have observ'd in more than ten or twelve Subjects, during the time I was busy upon the Ear: I have consulted many skilful Surgeons about it, and I may say, I have more than thirty Observations which they communicated to me, which makes it evident that this sort of Deafness is the most common and most curable. And that famous Surgeon of *Mons*, who has made so much noise in the World for curing Deafness, undertook none but this sort of Deafness: to know this, he turn'd his Patient's Ear to the Rays of the Sun, and when he discover'd any Obstruction in the Passage, he made use of a particular Instrument to clean it, and after this manner he cur'd a great Number of deaf People.

*Causes a sort of Deafness easy to cure.*

3d. *A Membrane.* There are sometimes Membranes form'd in the Inside of the Passage, which close it up exactly, and form a particular sort of Deafness. I have before, in my second Part, related that when I was examining

examining the Reaſon of Deafneſs in a Perſon of Merit after his Death, who had been afflicted with it a long time, I found in the right Ear, which was that with which he could not hear at all, a very thick and looſe Membrane, before which there was a conſiderable Collection of Matter like Plaiſter, which was certainly the cauſe of his Deafneſs; for the *Membrana Tympani* was in its natural State, and ſo were the other Parts of the Ear.

4. The fungous and fleſhy Excreſcences, which ſometimes ſucceed Ulcers of this Paſſage, or Excoriations which may be cauſed by cleaning the Ear with too ſharp an Inſtrument, may fill it, and cloſe it up exactly.

4. *Fleſhy Excreſcences,*

5. There is another Sort of Obſtruction in the Paſſage, which is produced when all the Glands which ſurround it are tumified, and are fill'd with an over-great Quantity of ſerous Matter, in the ſame manner as we know the ſpongy Membranes of the Noſe may be ſo much ſwell'd, that they almoſt entirely ſtop up the Paſſage of the Air: This Obſtruction is always accompanied with a Relaxation of the *Membrana Tympani*, and from hence it cauſes a Deafneſs, or at

5. *By the Glands which ſurround it becoming tumified.*

*Which is commonly accompanied with a Relaxation of the* Membrana Tympani.

at leaſt a Thickneſs of Hearing, which diſſipates when this over-great Quantity of ſerous Humours are evacuated by the Ear, or by ſome other way, in the ſame manner as all Catarrhs are cur'd.

*Cure for the Obſtruction caus'd by extraneous Bodies, and the Extraction of them;*

In the firſt ſort of Obſtruction the whole Method of Cure conſiſts in extraneous Bodies: to ſucceed in this Caſe, we muſt firſt conſider whether they are Bodies that may grow ſofter, ſuch as Peas, or whether they are hard and ſolid, ſuch as Leaden-Shot, Fruit-Stones, *&c.* We muſt alſo obſerve whether theſe Bodies are enclos'd in the cartilaginous Paſſage, or whether they are intangl'd in the bony Paſſage. To extract ſoft Bodies which are got no farther than into the cartilaginons Paſſage, we muſt endeavour to break them, or to introduce the Scoop behind them, which may be effected in a ſupple pliant Part, ſuch as the Cartilage of the Ear is, and ſo draw them out of the Paſſage. Hard Bodies alſo which are in the ſame Place may be extracted with the ſame Succeſs; and this may be done either with the Scoop or the *Terebra*. As for thoſe Bodies which are in the bony Paſſage, it is extremely difficult to extract them, as we have before taken notice of, eſpecially when they entirely

*Which is perform'd by the Scoop, or the* Terebra *when they are encloſed in the cartilaginous Paſſage.*

entirely fill up the Paſſage; for then it is eaſy to conceive that neither the Scoop nor the *Terebra* can be of any great Service. Therefore in this Caſe I recommend the making an Inciſion into the back-part and top of the Ear, which may very ſafely be practis'd in this Place, where there are no conſiderable Veſſels, and where the Paſſage is cover'd with nothing but a glandular Skin, as may be ſeen in *Plate* III. *Fig.* II. By this means we partly avoid the Obliquity of the Paſſage, and make uſe of the *Terebra*; which is beſt to uſe in the Extraction of Shot.

*Or when they are contain'd in the bony Paſſage, it is effected by an Inciſion into the back-part of the Ear.*

If a Fruit-Stone ſhould be inclos'd in the bony Paſſage, as it may be taken hold of by one of its Extremities, becauſe it is of an oval Figure, we then may make uſe of the Inſtrument call'd *Tenaculæ*, deſcrib'd in the 4th Obſervation of the 1ſt. Century, and which, to ſpeak properly, is but a double Scoop in the Form of Pincers: And for this Reaſon the Shanks muſt be made of a Plate of very fine Steel to have a Spring, and muſt be very thin. I ſhall not ſtop here to deſcribe all the Circumſtances of theſe Operations, nor to ſay it is neceſſary to drop ſome Oil of ſweet Almonds into the Ear to relax the Paſſage; becauſe I ſuppoſe theſe

*From whence we extract Shot with the help of the* Terebra,

*And Fruit-Stones with* Hildanus *his Scoop.*

theſe things are ſufficiently known. In the ſecond Sort of Obſtruction, which is occaſioned by the hardneſs of the Wax, we muſt break it, and bring it away by Injections made with warm Water, emollient Decoctions, Hydromel, Linſeed-Oil mix'd with ſome Drops of Spirits of Wine; Oil of bitter Almonds, Oil of ſweet Trefoil. Some make uſe of Mineral Waters, and all Galls of Animals are commonly us'd, and that with good Succeſs. There are ſome that prefer warm Water to all other Liquids, and content themſelves with adding to it Drops of Spirits of Wine, to render it more penetrating.

*Cure for the Obſtruction proceeding from the hardneſs of the Wax.*

The Wax is looſen'd, and comes away ſometimes in five Days, ſometimes at the Expiration of the fifteenth Day; which plainly demonſtrates that we ought not to grow weary of continuing Injections.

In the third ſort of Obſtruction, where there is commonly a Collection of Wax gather'd before the Membrane, which is form'd contrary to the Courſe of Nature: we muſt clean the Paſſage with the foregoing Injections, and afterwards pierce the Membrane; but Surgeons ought to take care at the ſame time not to damage the *Membrana Tympani*.

*For the Membrane which ſtops up the Paſſage.*

For

For to have a true Idea of the Cure of the fourth Sort of Obſtruction which is form'd by fungous and fleſhly Excreſcences, the reading of *Fabricius Hildanus*'s firſt Obſervation of the third Century will be almoſt ſufficient; wherein he gives a Deſcription of a fungous and ſchirrous Excreſcence, which happen'd in the Paſſage after an Abſceſs. Before he extirpated it, he carefully prepar'd his Patient's Body; after that, he cut away as much as he cou'd by the Ligature: but as the Root of the Excreſcence was very deep, and as his Inſtruments cou'd not poſſibly reach the bottom of the Paſſage, he was obliged to make uſe of ſome Cauſticks, which he apply'd to it by the help of a ſmall thin piece of Wax, for fear of prejudicing the Paſſage, in which he very happily ſucceeded. To make this manner of treating theſe Diſeaſes more plain, we muſt take notice that if the *Fungus* is large, and protrudes out of the Paſſage, we may either cut it off with the Point of the Sciſſors, or of the Incision Knife; or elſe tye all that we can take up with a Ligature; but I think cutting it is the beſt way, becauſe in cutting we take more of it away. As we are afterwards oblig'd to ſtop the Blood, we

*For Excreſcences.*

*Of which we muſt extirpate as much as we can by the Ligature.*

*And conſume the Remainder by Cauſticks.*

make uſe of a little vitriol Stone fix'd to a Quill in the form of a Crayon, ſo that there appears but a ſmall Point of it out to hinder its touching any other Part but that where it is wanted, to ſtop the Blood by making an Eſchar, which alſo takes away part of the *Fungus*, and to conſume the reſt which lies deeper in the Paſſage.

*Which muſt be very carefully us'd, for fear they ſhou'd hurt the Membrane of the Paſſage.*

As there muſt be a great deal of Caution us'd not to prejudice the Membrane by the Cauſticks, the moſt us'd of which are Powder of Savin, burnt Alum, red Precipitate mix'd up with Wax and Turpentine; I wou'd not chuſe to make uſe of the ſmall thin Pieces of the Wax but I think the Cauſticks may be very ſafely apply'd in the form of an Unguent at the end of a Tent, which may be introduc'd into the Paſſage, after we have plac'd a ſmall leathern *Canula*, like the Finger of a Glove in it, into which we may eaſily puſh the Tent with the Unguent at the end of it, without being afraid of touching the Membrane which lines the Paſſage. Inſtead of Leather, we may make our *Canula* of Copper or Silver, which muſt be very thin, and curv'd in the ſame manner as the Paſſage After the Eſchar is made, we mu dreſs it up with ſome Drops of C

of Eggs, or of Oil of ſweet Almonds, is much to give Eaſe to the Paſſage s to ſeparate the Eſchar: we muſt repeat he Application of theſe Medicines till he *Fungus* is conſum'd, and when it is, ve muſt make Tents and ſpread them at he End with *Wourtz* Brown Ointment. Theſe Tents muſt be introduc'd, and puſh'd eyond the *Canula*, that the Ointment nay reach the reſt of that ſuperfluous leſh, which remains in the Surface of he Paſſage, in which the *Fungus* was, o hinder it from ſprouting up afreſh, nd alſo to procure a good Digeſtion. After which we muſt make uſe of deter- ve and anodyne Medicines to incarn and catriſe the Ulcer; always taking care o mix with them every now and then, mething to ſtop the Regeneration of e *Fungus*. A little Vitriol diſſolv'd in a fficient Quantity of ſome vulnerary and terſive Decoction, to give it a little Aſ- ingency, is very fit for this purpoſe; we ay either inject it into the Ear, or paſs little Lint dipt in this Liquor into it: e Lint is the beſt Method when it may eaſily introduc'd, becauſe it preſſes on the Ulcer, and hinders the *Fungus* om ſprouting up.

*Cure of the Obſtruction proceediug from the Glands being tumefy'd.*

In the fifth ſort of Obſtruction, whic
is occaſion'd by Tumefaction of th
Glands of the Paſſage, the ſame gener
Remedies are preſcrib'd, which are us
in all other Colds: We fumigate the E
with the Steam of Carduus, or of Deco
tions of Florentine Orris, Sweet Marj
ram, Carduus, Wormwood, Baum, C
lamint, Aniſeeds, Fennel, *&c.* Th
Decoction of Coloquintida in Oil is ver
much eſteem'd. *Barbette* makes uſe off
Decoction of Cloves in red Wine, ſom
of which he drops into the Paſſage, whi
muſt afterwards be ſtopt up with a Clow
We find in *Platerus*, a particular Watt
for this purpoſe, which is ſaid to be ve
efficacious; there is another in *Minder
rus*, which has been reform'd by *Zw
fer*, in his Remarks upon the *Auſbou
Pharmacopœia*, and we have a compou
Spirit of Wine in *Amynſicht*. The Jui
of Sweet Marjoram preſs'd out alone,
very much eſteem'd: And the Urine
a Hare is very much commended by
ſelf, or mix'd with Spirits of Wine, A
Water, and *Hungary* Water; it is al
a good Method to keep the Ear ſto
with a little Cotton perfum'd with Mu
There are ſome People in whom t
Membrane which lines the Paſſage, a
t

he *Membrana Tympani* are ſo fine, that ve cannot inject their Ear with theſe harp and ſpirituous Liquors; and then ve muſt content our ſelves with dropping ome upon ſome hot Bread, which may be eld upon the Ear. It is alſo a good Me-hod to hold theſe Liquors in the Mouth, ecauſe their ſpirituous Particles become levated, and paſs thro' the Aqueduct nto the Ear; and therefore for the ſame eaſon Maſticatories are us'd with Suc-eſs.

It is very eaſy to explain the Action f theſe Medicines, ſince all of them be-ng of a ſubtile and penetrating Nature, ney open the Ducts of the Glands, and nake room for the Evacuation of the perfluous ſerous Humours. To this I nall add an Obſervation, which was ommunicated to me by Mr. *Paſſerat*, very ſkilful Phyſician and Surgeon, of young Nobleman about eleven or velve Years old, to whom it frequently ppen'd in the beginning of the Spring nd Autumn, that the Glands of the Paſ-ge were ſwell'd in ſuch a manner that e Parts touch'd one another, and that was impoſſible to introduce any thing to it. At firſt they us'd to drop ſome il of ſweet Almonds into the Ear, to

assuage the Pain, afterwards they mad
use of a Decoction of Barley and Agri
mony, which is deterſive and deſiccative
and by this means, the Ear after havin
diſcharg'd a Moiſture which was almo
like *Pus*, recover'd its priſtine State.

*The Diſeaſes which the* Membrana Tympani *is liable to, are, Relaxation.*

I come now to the Diſeaſes of the *Mem
brana Tympani*, which are Relaxatio
too great Tenſion, Schirrouſneſs and Rup
ture. The Relaxation proceeds fro
too great an Humidity, which moiſte
the Membrane; this Symptom commo
ly accompanies that Obſtruction of th
Paſſage, which is produc'd by the ſwe
ling of the Glands, which we have a
ready deſcrib'd, and contributes in a gre
meaſure to the Thickneſs of Hearing,
thoſe People who are ſubject to Fluxio
from Catarrhs; and therefore, as Exp
rience demonſtrates daily, South Wind
Fogs and Rainy Weather diminiſh th
Senſe of Hearing.

*Too great Tenſion.*

The extraordinary Tenſion of th
*Membrana Tympani*, produces a qui
contrary Effect; ſo that it makes t
leaſt Noiſes become inſupportable: th
Tenſion happens in violent Pains in t
Head, and in acute Fevers, becauſe t
Tenſions and Irritations of the Mem
bran

branes of the Brain are communicated to all the neighbouring Membranes.

The Schirrouſneſs of the *Membrana Tympani* proceeds from too great a Dryneſs, as it is viſible in old People; and beſides this, we know by an infinite Number of Obſervations, that the Membranes of the Body may become callous, and even bony: And this is what I have particularly obſerv'd in the *Dura Mater*, and in the Coats of many Arteries, which I have often found oſſified; which may make us imagine that the *Membrana Tympani* may ſometimes grow hard and cartilaginous, and ſo occaſion an incurable Deafneſs. *Schirrouſneſs.*

Laſtly, The *Membrana Tympani* is liable to be ruptur'd either by ſome external Cauſe, as by an Ear-Picker, which we may puſh too far in without thinking of it, or by ſome Strain in ſhutting the Noſtrils and Mouth, and forcing back the retain'd Breath with Violence; which Caſe happen'd to a Perſon of my Acquaintance. This Action of the Air is remarkable in Sneezing, in which we perceive that the Air which paſſes ſuddenly up the Paſſage, forces the *Membrana Tympani* outwards, and ſo cauſes a painful Tenſion. This may alſo *Rupture.*

happen in Quincys and in Difficulties of Reſpiration, where the *Fundus* of the Mouth and of the Noſe are ſwell'd by any Cold or Inflammation: for the Air which is driven out of the Breaſt not having the Liberty of paſſing out, forces it ſelf into the Paſſage which leads from the Palate to the Ear with ſuch Violence, that it is capable of lacerating the *Membrana Tympani*. *Tulpius* gives us two conſiderable Examples of this in his 35th Obſervation of his firſt Book. It is ſomewhat difficult to explain how the *Membrana Tympani*, which is ſo ſtrongly inſerted into a Groove, does not reſiſt the Impulſes of the Air; nevertheleſs, if we conſider that this Groove is not continued in the whole Circle, but that it ends near the Place which anſwers to the Entrance of the Paſſage, which penetrates into the *Cavernulæ* of the *Proceſſus Mammillaris*, as may be ſeen in *Plate* VII. *Fig.* II. and that at this Place the *Membrana Tympani* is only join'd to the Edge of the bony Paſſage of the Ear; it will readily be conceiv'd, that it may eaſily be forc'd out and disjoin'd at this Place; and by this afford a Paſſage for the external Air to enter in. We may perceive by this how greatly *Tulpius* is deceiv'd, when he imagines

*Or at leaſt Diſunion from the Bone to which it was before united.*

imagines that the Paſſage which paſſes from the Ear to the Palate contributes not only to the renewing of the Air of the *Tympanum*, but alſo affords a Paſſage to the Air we breathe upon certain Occaſions; which Notion he has pretended to eſtabliſh upon the Obſervation of thoſe two Aſthmatick Perſons, we ſpoke of before, and upon the Opinion of *Alcmæon*, who, from the Account of *Ariſtotle*, imagin'd that there were ſome Goats, who breathe through their Ears. Moreover, the *Membrana Tympani* may be eroded by the Acrimony of the *Pus* which is retain'd in the *Tympanum*, or in the Inſide of the auditory Paſſage; we find many Examples of this in *Fabricius Hildanus*, *Schenkius*, and in many others. In what manner ſoever the *Membrana Tympani* be broke, it happens that in ſhutting the Mouth and the Noſtrils, the Air comes out of that Ear with Noiſe, and with ſuch a Force that it can extinguiſh a Candle. As for the Hearing, it is preſerv'd for ſome time, but it inſenſibly grows weaker, and is entirely loſt at laſt; which demonſtrates, when it is broke, that this *Membrana Tympani* is not abſolutely neceſſary to hear with, and that its principal Uſe is to tranſmit the

*Theſe Cauſes do not occaſion an entire Privation of the Hearing at firſt: But only ſometime afterwards.*

Vibrations to the Air contain'd in the *Tympanum*, and to the ſmall Bones, and to keep off the Injuries of the external Air. The external Air may alone ſuffice to agitate the little Bones, and the immediate Organ, and excite the Senſe of Hearing; but as it deſtroys all the Parts of the internal Ear by its Coldneſs, and its other exceſſive Qualities, it takes away at laſt the Senſe of Hearing.

*Cure of the Relaxation.* In the Relaxation of the *Membrana Tympani*, we muſt uſe the ſame Remedies which are us'd in the Obſtruction proceeding from a Catarrh. In the Tenſion beſides the Remedies proper for the Diſtempers from which it is produc'd, we muſt foment the Ear with Milk, Oil of ſweet Almonds, or with ſome emollient Decoction: The Schirrouſneſs and Rupture of this Membrane are incurable.

*Of the Tenſion.*

*The Schirrouſneſs and Rupture are incurable.*

*The Diſeaſes of the* Tympanum, *and of the Labyrinth, are*

As for the *Tympanum* and the *Labyrinthus*, as they are bony Parts cover'd only with a Membrane, I don't conceive how they can be liable to any other Diſeaſes than to a Caries of the Bone, and to Inflammation of the Membranes. The Caries of the Bone happens ſometimes after thoſe Abſceſſes of the auditory Paſſages which break in the back part of the Ear; and then it hath been remark'd that a

*Caries of the Bones.*

*Fiſtula*

*Fiſtula* hath been form'd above the *Proceſſus Mammillaris*, which hath penetrated into its *Cavernulæ*, and has caſt off in Scales, the little *Laminæ* which compoſe them. This *Caries* is accompanied with a very offenſive Smell, and with very bad Symptoms, and it eaſily penetrates into the *Tympanum*, by the means of the Paſſage which has already been ſpoken of in the firſt Part, which deſtroying all the therein contain'd Parts, cauſe Deafneſs: But this very ſeldom happens; I have had but one or two Examples of it.

*Which may cauſe Deafneſs,*

As for the Inflammation of the Membranes, I have often found in diſſecting the Ear, the *Tympanum*, *Veſtibulum*, the Semi-circular Canals, and the *Cochlea* fill'd with thick Matter, which might proceed from ſome Abſceſs of the Membranes which line theſe Parts. I don't doubt but that this may be the Cauſe of Deafneſſes, as well as the Collection of other Humours, which may be form'd in all theſe Cavities: and what renders this Opinion more probable, is the Difficulty there is in the diſcharging this Matter out of the *Tympanum*, becauſe its Cavity is ſituated lower than the Orifice of the Paſſage which goes from the Ear to the Palate; and therefore theſe

*Inflammation of the Membranes,*

*And Abſceſs of the Membranes.*

Liquids can't fall into the Mouth without we bend down the Head in a particular manner: And before they can be discharg'd through the auditory Passage, they must first lacerate the *Membrana Tympani*, which they cannot do except they are very acrimonious. We may also suspect that the *Lamina Spiralis* may be eroded by the Acrimony of the Matter, and that it may even become too lax or too callous, much in the same manner as the *Membrana Tympani*, which I don't positively assert, never having had an Example of it.

*Inflammation of the* Lamina Spiralis.

*Which may grow carious.*

*Cure of the Caries.*

I can't recommend better Remedies in treating of the *Caries* of the Bone which happens in the Ear, than those which have been described by Monsieur *Deymier*, a very skilful Surgeon, from whom I had this Remark: At first he dilated the Entrance with a prepar'd Sponge, which made a pretty considerable Opening, so that he cou'd apply his Medicines upon the carious Bones; after that, he made use of Lint dipt in the imperial Water, in which he had dissolv'd a little Camphire; but as this incarn'd the Sides of the Ulcer too soon, and the *Caries* remain'd still, he had recourse to *Euphorbium*

*phorbium* in Powder, which he made uſe of with good ſucceſs; this produc'd ſome little ſmarting but light Pains, which did not laſt long. The Uſe of this Powder produc'd the deſir'd Effect, that is to ſay, the Exfoliation of the Bone, in hindering the *Fungus* from ſprouting up. He made uſe alſo of *Euphorbium* in a Tincture with Spirits of Wine, to which he added ſome Myrrh and Aloes. The *Caries* being thus conſum'd, and the Bone exfoliated, he return'd to the Uſe of the imperial Water, till he made a perfect and entire Cure of it; and over the Lint he apply'd the Plaiſter of *Janua*, to which he added the Eſſence of Juniper and of Cloves, and a little Oil of Marigolds.

*Cure of the Inflammation of the Membranes.*

In the Inflammation of the *Tympanum*, and of the *Labyrinth*, topical Remedies are almoſt of no effect; in this Caſe we muſt keep to the internal and general Remedies, which alſo have no better Succeſs, becauſe the Abſceſſes break out in the Inſide of the *Tympanum*, and of the Cavities of the *Labyrinth*, from whence the Matter can't poſſibly be diſcharg'd: ſo that theſe Humours being collected together in theſe Cavities, occaſion an incurable Deafneſs.

The

*The Diſeaſes of the auditory Nerve.*

The Diſeaſes of the auditory Nerve are Obſtructions and Preſſure, when the whole Brain is overflow'd by ſerous Humours in an Apoplexy, and in any Palſy, it is evident that the Nerve will be obſtructed in the ſame manner as the others are. Beſides this, we may eaſily conceive that the Obſtruction of the Nerve alone, without any other Fault in the Organ of Hearing, may occaſion a Deafneſs, in the ſame manner as the Obſtruction of the optic Nerve produces a *Gutta Serena*. A Preſſure upon the Nerve produces the ſame Effect; it proceeds from many Cauſes, as from the Blood and from other extravaſated Fluids, as we find in the greateſt Number of Apoplexies, or from any Tumour. I find an Example of this laſt Caſe in Monſieur *Bonnet*, a celebrated Phyſician of *Geneva*, in his firſt Book of practical Anatomy, the 53d Obſervation of the ſecond Section; which relates, that Mr. *Drelincourt* found in the Brain of a Man that had dy'd of an Apoplexy, a *Steatoma* between the *Cerebrum* and *Cerebellum*, which at firſt caus'd a Blindneſs, afterwards a Deafneſs, and laſtly, an entire Privation of all the animal Faculties.

*Obſtruction,*

*And Preſſure,*

*Which may proceed from Tumours happening upon the Brain.*

It

It is eaſy to know this Obſtruction, or this Preſſure upon the Nerve, in the Eye where all the Parts are tranſparent and diaphanous; for when there is no Fault to be perceiv'd in theſe Parts, we have reaſon to ſuſpect ſome Obſtruction of the optic Nerve; but in the Ear all the internal Parts are hid from our Sight, ſo that we can ſcarcely judge whether the Fault is in the Organ, or in the Nerve. Nevertheleſs, if any Stupor or Palſy has preceded this Deafneſs, or elſe if there is any other Senſe taken away at the ſame time, we may reaſonably ſuſpect that the Brain is affected, and the Nerve alſo, by Obſtruction or by Preſſure. In this Caſe, we muſt preſcribe the ſame Remedies which are us'd in Palſies, frequent Purges, Emetics, cephalic Waters and Spirits, Sudorifics, Baths, Maſticatories, and Sternutatories, *&c.* The Preſſure which is caus'd by ſome Tumour is incurable.

*It is difficult to know whether the Deafneſs proceeds from any Fault in the Nerve, or from any Defect in the Organ.*

The Diſeaſes which have been explain'd hitherto, take away quite or diminiſh the Senſe of Hearing; but the Noiſe in the Ear is a Depravation of it; this Depravation conſiſts in rendering the Ear ſenſible of Noiſes which are not in reality, or which are not external; ſo that it

*The Noiſe in the Ear is a Symptom, the Cauſes of which are difficult to explain.*

it being already attentive to one Sound, it is leſs capable of receiving the Impreſſions of external Sounds, except they are extremely violent.

*The Ancients attributed it to the implanted Air.*

The Ancients imagin'd that the true Reaſon of the Symptom conſiſted in the Motion and Agitation of the implanted Air in the Ear. They related that this Agitation was commonly caus'd by Winds and Vapours which came into the Ear from all the whole Body, as it happens in ſome Fevers, or from ſome Part of it, as from the Stomach or the Brain; or that it proceeded from ſome pituitous Fluid inclos'd in the Cavities of the Ear; they wou'd alſo have explain'd all the different Sorts of Noiſes in the Ear by the Quality, the Conſiſtence, and the Motion of the Fluids, or Air, which are collected in the Inſide of the Organs of Hearing. I ſhall not ſtop here to take notice of all that may be defective in this Explanation, one may judge pretty well of it by the Idea that I ſhall give of this Noiſe in the Ear; I ſhall content my ſelf with ſaying, that there is no Appearance that theſe different Sounds, which they imagine we hear, are caus'd by any thing which in reality ſtrikes upon the Ear, to produce the Sounds of Bells, murmurings of Waters,

and

and an infinite Number of other Sounds, which Perſons ſubject to theſe Noiſes in the Ear are every day ſenſible of, and that it is credible, that the moſt part of theſe Buzzings in the Ear are but falſe Sounds, and that theſe Appearances of Noiſe may be produc'd without any Wind being in the Ear, or without Matter which ſtrikes the Membranes externally, which compoſe the immediate Organ of Hearing, as I am going to explain it.

*It is more reaſonable to believe that it is commonly produc'd by the Vibration of the immediate Organ.*

It is my opinion, that the Noiſe in the Ear, conſiſts in the Perception of a Sound which is not in reality, or of an internal Sound. To explain how we can be ſenſible of a Sound which is not in reality, we muſt take notice that the Action of Hearing conſiſting in a Vibration of the immediate Organ, it is ſufficient that this Vibration be excited to cauſe a Sound, without it's being neceſſary that this Motion be produc'd by the Air; for in the ſame manner that we conceive, how Viſion, which depends on the manner in which the *Retina* is agitated by the viſual Rays, may be perform'd without theſe Rays, when this Agitation is produc'd from any other Cauſe, as it happens when the Eyes ſee Sparks of Light in the dark, after having

ing

*Which is produc'd by Cauſes enclos'd in the Membranes of the Organ.*

ing receiv'd a Blow: we may alſo ſay, that when any other Cauſe than the agitated Air produces in the Organ of Hearing, I mean the Inſide of the Subſtance of the Membranes, this Agitation, which is regulated in the ſame manner, that it commonly is by the Air which brings the Sound; the Ear ſeems to be ſtruck by a Sound which in reality is no more than the Light of the before-mention'd Sparks is a true Light. But what renders this Compariſon pretty juſt, is, that as theſe falſe Appearances of Light, which are not caus'd by external Objects, have nothing in them diſtinct and particular, but only a ſimple Light; the Sight of a more complex Object, requiring the Concurrence of too many Things: So it ſcarce ever happens, that the Noiſes in the Ear which we are treating of, have any Sound but what is confus'd; the Whiſtling and Tinklings which are the moſt diſtinct Noiſes in this Symptom, being but meer Sounds.

*Which may be attributed to the Diſeaſes which produce this Symptom.*

For to determine what can be the Cauſe of this Agitation in the immediate Organ, we muſt examine the Diſtempers in which theſe Noiſes are found; theſe Diſtempers are Inflammations and Abſceſſes in the *Tympanum* and *Labyrinth*,

*rinth*, and the Diſeaſes of the auditory Paſſage. Inflammation and Abſceſſes in the *Tympanum*, and in the *Labyrinth*, neceſſarily cauſe Vibrations in the *Lamina Spiralis*, and in the Semi-circular Canals, either by the Tenſion of the Membranes, or by the Vapours which perſpire, and are mix'd with the Air in the *Tympanum*. Sharp Humours, Worms, extraneous Bodies, the Contraction of the Paſſage which ſucceeds the Swelling of the Glands, and in general every thing that cauſes Pain, and the other Symptoms in the auditory Paſſage, which I have before deſcribed, agitate the Membrane of the Paſſage, and the *Membrana Tympani*, which is ſufficient to communicate this Agitation to the immediate Organ.

*Sometimes the Noiſe in the Ear proceeds from an external Impulſe; As when we ſtop our Ears with our Hands.*

The ſecond ſort of Noiſe in the Ear is that in which we perceive a true, but an internal Sound. It is thus, we perceive a Buzzing when we ſtop our Ears; this Noiſe is caus'd by the Friction of the Hand, or by the Preſſure which rumples the Skin and the Cartilages, whoſe Particles may occaſion Agitations in this Place; the Elaſticity of the inclos'd Air, and the Vapours which inceſſantly proceed from Bodies, may alſo contribute to them,

them, when thoſe Vapours which proceed from the Hand, join'd with thoſe which come from the Membrane of the Paſſage, being confin'd, ſtrike upon the *Parietes* of the Cavity, and produce Vibrations; which though they are very ſmall, yet they form a true Sound, which becomes ſenſible from the Proximity and Continuity of the Parts, and alſo by the help of the Reflections which are form'd in this inclos'd Cavity.

*The Diſeaſes which cauſe this ſort of Noiſe in the Ears, are, The Commotions of the Cranium.*

The Commotions of the *Cranium*, and the Diſtempers which contract the Paſſage, may cauſe ſuch ſort of Noiſes in the Ear, if we ſuppoſe that the Shocks the whole *Cranium* receives, are communicated to the immediate Organ only by the Continuity of the *Os Temporale*; I mean, at the very Time of the Commotion: for as for thoſe which afterwards ſucceed, they muſt be attributed to the Diſorder of the Spirits, as we ſhall ſee in the Sequel. In the ſame manner, the ſwelling of the Membrane of the Paſſage may, in contracting it ſelf, produce a like Effect. Beſides this, it often happens that we perceive a Pulſation in the Inſide of the Ear, which makes us believe that we hear ſomething beat, and this Pulſation is ſometimes ſo ſtrong, that other

*The beating which we imagine we hear in the Inſide of the Ear is caus'd by The Contraction of the auditory Paſſage.*

People

People may hear it. I have made an Obſervation upon this, of a Lady of *Picardy*, who upon the leaſt violent Exerciſe perceiv'd ſo troubleſome a Pulſation, that it ſeem'd to her that ſhe had a *Pendulum* fix'd to her Head, and this Pulſation was alſo heard by thoſe who came near her. Now this beating is nothing elſe but that of a dilated Artery, becauſe it always perfectly agrees with the beating of the Heart; and this Perception of an internal Sound, appears to me abſolutely like that Symptom which is obſerv'd in imperfect Suffuſions. Thoſe Perſons who are ſeiz'd with this Diſorder, ſee Motes and Flies flying before the Objects; theſe Motes and Flies are nothing elſe but the viſcous and groſs Particles which begin to be amaſs'd in the aqueous Humour, which by their Motion agitate the *Retina*, and neceſſarily produce a Senſation. But, ſay they, if theſe are true Noiſes, and if the Organ diſtinguiſhes them ſuch as they are, why are they put in the Number of tinkling Noiſes in the Ear? I anſwer, that in reality theſe Noiſes are perceiv'd ſuch as they are, but that the Hearing is deprav'd in miſtaking theſe Noiſes as coming from ſome external Object, in the ſame manner that thoſe who have a Cataract beginning to be form'd, imagine theſe

*And by the Pulſation of a dilated Artery.*

theſe Appearances of Motes and Flies to be exernal Objects, and put out their Hands to catch him.

*The immediate Vibration of the Extremities of the nervous Fibres, to their Origin in the Brain, may cauſe all the Appearances of Noiſes.*

Beſides this, I imagine there may be a Perception of a falſe Noiſe without any Defect in the Organs of Hearing: Which happens every time that the Parts of the Brain, where the Filaments of the auditory Nerve terminate, are mov'd and agitated in the ſame manner that they us'd to be vibrated by Objects. What induces me to believe this, is, that I take notice of a great Number of Diſeaſes of the Brain which are accompanied with a Noiſe in the Ear: As for example, Deliriouſneſs, Phrenzy, Vertigoes, and thoſe Perſons which fall into Epilepſies and Swoonings, perceive theſe buzzing Noiſes in their Ears, which are as the Præcurſors of Paroxyſms. As there is an irregular and extraordinary Motion of the Spirits in all theſe Diſtempers, it is much eaſier to imagine that the agitated Spirits may ſtrike upon the Extremities of the auditory Nerve, and ſo by this means cauſe a Senſation of Noiſe, than to imagine that there is a Defect in the Organs of Hearing. This manner of explaining the Noiſe in the Ear, appears to me reaſonable enough; and methinks we may add, that

that as the Motion of the Spirits is very irregular and diſorder'd in all theſe Diſtempers, ſo the Sounds and Noiſes in the Ear muſt in this Caſe be very confus'd and very different from the Sounds which we commonly hear. I ſhall without doubt be told, that this is a falſe Imagination, and not a Symptom of the Ear. I agree to it, and this is what I alledge: As it is thought that we can never hear without the Ear is ſtruck upon, we attribute all Noiſes to this Organ; nevertheleſs it is indifferent whether the Fibres of the Nerves be ſhaken next the Ear, or next the Brain, there will ſtill ariſe the ſame Senſation from it: and this is caus'd in the ſame manner as in the Vertigo, in which we know that the circular Motion of Spirits alone produces the ſame Effect as if the viſible Objects had really this rotatory Motion; or in frantick Perſons, who fancy they ſee Motes which are not in reality, which is caus'd only by the Agitation of the Fibres of the optic Nerve in the Inſide of the Brain. As they alſo attribute the Symptoms of Suffuſions and Phrenzy to a deprav'd Imagination, we muſt attribute the Noiſes in the Ear, which ſucceed the Diſtempers of the Ear, to the ſame Cauſe, although they very often don't

*Which are not ſo much a Symptom of the Diſeaſes of the Ear.*

don't in any manner depend on the Indiſpoſitions of the Organ of Hearing.

*As of thoſe of the Brain, which produce a ſecond ſort of Noiſe in the Ear.*

We may after this manner lay down two Sorts of Noiſes in the Ear, one of which proceeds from the Diſorders of the Brain, the other from the Diſorders of the Ear; thoſe which ſucceed the Diſorders of the Ear are, as aforeſaid, either true or falſe; and of theſe ſome are call'd Tinklings in the Ear, others Whiſtlings, others Buzzings, others Murmurings, *&c.* And in general we may ſay, that the hollow and buzzing Noiſes are produc'd by a ſlow Vibration, and the Whiſtlings and Tinklings by a cloſe and ſtrict Vibration, which is confirm'd by the remote Cauſes of theſe Symptoms: Colds, for example, and Suppurations, in which the Membranes are relax'd, commonly produce a Buzzing; and Inflammations and Pains in the Ear, in which theſe Parts are commonly tenſe and dry, Whiſtlings and Tinklings. We muſt alſo believe, that all theſe Noiſes make the ſame Impreſſion upon the *Lamina Spiralis*, and upon the Semi-circular Canals, as grave and acute Sounds.

The Cure of the Noiſe in the Ear generally depends upon the Diſeaſes of the Brain,

Brain, or of the Ear which produce it. To this I add, that in the Whiſtlings and Tinklings we muſt make uſe of very nigh the ſame Remedies, as thoſe which have been deſcrib'd in ſpeaking of the Pain proceeding from Heat, and of the Tenſion of the *Membrana Tympani*; and that in the Buzzings we may make uſe of thoſe which have been preſcrib'd for the Pain which is occaſion'd by Cold, and for an Obſtruction proceeding from a Catarrh. After which, it will be no difficult matter to chuſe the moſt convenient, if we conſider the Circumſtances which may afford us the neceſſary Indications for the Cure.

*The Cure of the Noiſes in the Ear, is the ſame as that which is us'd for the Diſeaſes from which they are produc'd.*

*FINIS.*

A

# GENERAL TABLE

OF

# The Organ of Hearing.

PART the Firſt, containing the Structure of the Organ of Hearing.

THE *external Part of the Organ of Hearing call'd only the Ear,* Page 1. *is compos'd of a Cartilage,* 2. *of Skin, of Fat, of a nervous Membrane, of two Muſcles,* id. *of Arteries,* 4. *of Veins,* 5. *and of Nerves,* 6. *The Hole of the Ear is divided into two Parts,* 1ſt. *The cartilaginous Part, which is broke off in many Places,* id. *and cover'd with a Skin, adorn'd with many little Glands,* 8. *and is connected to the* Os Temporum *by a Ligament,* id. 2dly, *the bony Part,* 10.

*The cartilaginous and bony Part form the auditory Paſſage*, id.
*The external Part of the* Organ *of Hearing is ſeparated from the internal, by the* Membrana Tympani, id.
*The firſt Cavity of the internal Ear call'd the* Tympanum *or* Drum, 16. *has five remarkable Things in it, 1ſt. Two Paſſages, one of which paſſes into the Palate*, 18. *the other into the* Cavernulæ *of the* Proceſſus Mammillaris, 22. *2dly. Two* Apertures *or* Feneſtræ, id. *3dly. Four little Bones, the* Malleus, 25. *the* Incus, 26. *the* Stapes, 27. *the fourth little Bone*, 28. *4thly. Three Muſcles, two of which belong to the* Malleus, viz. *the External*, 29. *and the internal Muſcle*, 30. *and one to the* Stapes, ib. *5thly. A Branch of a Nerve*, 31.
*The ſecond Cavity of the internal Ear call'd the Labyrinth, is divided into three Parts*, id. *1ſt. The* Veſtibulum *which has nine* Foramina, 32. *2dly, The three* Canales ſemi-circulares, viz. Canalis ſemi-circularis Superior, 33. Inferior, id. Medius, id. *3dly, The* Cochlea, *in which two Things are to be taken notice of*, viz. 39. *1ſt, The ſemi-oval Canal*, id. *2dly, The* Lamina Spiralis, id. *Which is fix'd to the Canal by*

*by a very fine Membrane*, 40. *and which divides the Canal into two*, id. *and 3dly, The Arteries and Veins of the* Cochlea, 41. *and of the* Veſtibulum, id. *4thly. The implanted Air*, 42.

*The other Parts of the Organ of Hearing, are the Canal of the auditory Nerve*, id. *The* Nervus Auditorius *is divided into two Branches*, viz. *The* Portio Mollis, 43. *which is divided into three Branches, the largeſt of which is diſtributed into the Axis of the* Cochlea, id. *The two other Branches into the* Veſtibulum, *and into the ſemi-circular Canals*, 49. *the* Portio Dura, 50. *which produces as it paſſes out of the Cranium, a Ramification which is expanded over the back part of the Ear*, 51.

*The* Chorda Tympani *is a Nerve which is a Branch of the fifth Pair*, 53. *which is join'd to the Trunk of the* Portio Dura, id.

*The ſecond vertebral Pair furniſhes a Branch to the Ear*, 55.

*There are many particular Things in the Ear of a* Fœtus, 57. *1ſt. That part of the auditory Paſſage which is bony in Adults, is nothing but a Membrane in the* Fœtus, id. *2dly, There is a Circle which is not entire*, 59. *it is hollow in the Inſide like a Gutter*, 60. *This Cir-*

*cle is united to the bony Canal in Adults*, id. *it has the ſame Plan in the* Fœtus *as in the Adult*, 61. 3*dly*, *The Aqueduct is almoſt entirely membranous*, id. 4*thly*, *The* Membrana Tympani *is cover'd with a mucilaginous Matter*, id. 5*thly*, *The ſuperior Semi-circular Canal, and a Portion of the Inferior, are viſible without any Diſſection*, id. 6*thly*, *There is a* Foſſa *and* Foramen *in the* Os Petroſum, 62. 7*thly*, *The ſcaly Part of the temporal Bone is ſeparable from the* Proceſſus Mammillaris, *which is very minute*, id. 8*thly*, *The* Officulæ *and the Labyrinth are pretty nigh the ſame ſize in the Adult, and in the* Fœtus, id.

*The Trunk of the* Portio Dura *has two principal Branches, which are divided into many Ramifications*, 63. *The Ramifications of the firſt Branch are diſtributed to the Muſcles of the Forehead, Temples and Eyelids, and paſs into the Orbit*, id. *They alſo go to the Muſcles of the Noſe and Lips*, id. *And to all the Integuments of the Face*, 64.

*The Ramifications of the ſecond Branch are diſtributed to the Muſcles which are under the Jaw*, id.

*The fifth Pair furniſhes a Branch to the* Portio Dura, 65.

# A General Table.

OF

# The Organ of Hearing.

PART the Second, containing the Uſe of the Parts of the Ear.

*THE mechanical Structure of the Organs of Hearing, ſerve to diſcover the Uſe of them*, Page 67.

*The external Ear performs the Office of the Trumpet, which deaf People make uſe of*, 68. *Its Folds ſerve to augment the Force of the Air, which acts upon the Organs by the Refractions which they cauſe*, 69.

*The Muſcles of the external Ear ſerve to contract and dilate it*, id.

*The Obliquity of the Paſſage is proper to preſerve the* Membrana Tympani *from the Injuries of the Weather, and to render the Vibrations ſtronger by doubling its Refractions*, id.

*The Wax ſtops extraneous Bodies, which might impair the* Membrana Tympani, 70. *it may alſo be prejudicial to the Ear,*

*when it is too thick and in too great quantity*, id.

*The* Membrana Tympani *is neceſſary for the Preſervation of the other Organs*, 71. *It is extended by the Muſcles of the* Malleus, 72. *The Will is not the Cauſe of theſe Muſcles acting, but the different Diſpoſitions of the Objects*, 73. *and according to the Occaſions which concur*, 74. *The* Membrana Tympani *is more or leſs relax'd according to the Diverſity of Sounds*, id. *Which it does in putting on their Characters, by mechanical Motions which are difficult to explain*, 75.

*The Agitation of the* Membrana Tympani *is communicated to the other Organs of Hearing, not ſo much by the Help of the Air, which is in the Cavities of the Ear*, id. *as by the Aſſiſtance of the little Bones, which agitate the Labyrinth, and the Air which is inclos'd in it*, 76.

*The Muſcle of the* Stapes *ſerves to extend the Membrane, which is fix'd to its* Baſis, 77. *and to extend the* Stapes *it ſelf*, id.

*The Paſſage of the* Proceſſus Mammillaris *affords a Paſſage to the Air when it is over-preſs'd in the* Tympanum, 78.

*The Aqueduct ſerves to bring the Air from without to it, and to renew that which*

*is in the* Tympanum, id. *and not to supply the Office of the* Membrana Tympani, 79.

*The* Feneſtra Ovalis *communicates the Vibrations of the Air to the Labyrinth*, 80.

*The* Feneſtra Rotunda *communicates them to the* Scala Inferior *of the* Cochlea, 81.

*The immediate Organ of Hearing conſiſts of two Parts, which compoſe the Labyrinth*, id. *the firſt of which is the* Cochlea, id.

*The* Lamina Spiralis *is eaſily vibrated*, id. 1*ſt. Becauſe of its Subſtance*, id. 2*dly. Becauſe it is very much extended*, 82. 3*dly. Becauſe in dividing the Semi-oval Canal into two* Scalæ, *it receives Pulſations from the upper and the under one*, id. 4*thly. Becauſe its ſpiral Figure is the Cauſe of its being vibrated in many Places*, 83. 5*thly. This* Lamina *receives all the different Vibrations of the Air, becauſe of its unequal Figure*, id.

*The ſecond Part of the immediate Organ comprehends the* Veſtibulum *and the three Semi-circular Canals*, 84.

*The* Cochlea *is not to be found either in Birds or in Fiſhes, the Semi-circular Canals alone perform the Office of the immediate Organ in theſe Animals*, 85.

*There are Nerves and Membranes which*

*are*

*are the Cauſe of theſe Semi-circular Canals, forming part of the immediate Organ*, id. *Their Windings ſerve to augment the force of the Air, by the Refractions which they cauſe*, id. *Theſe Canals receive the different Characters of Tones as well as the* Lamina Spiralis,, 86. *becauſe they are made like Trumpets*, 87. *and their Subſtance is eaſily vibrated*, id.

*It is by the Communication of the auditory Nerves with thoſe of the Voice, that the Sympathy between the Voice and the Hearing is caus'd*, 88. *and by the Communication of the ſecond vertebrall Pair, that the Affinity that there is between the Tones of Hearing and the Motions of the Body are produc'd*, 89. *and that of the Pulſe*, id.

OF

# A General Table.

OF

# The Organ of Hearing.

PART the Third, containing the Diſorders of the Organ of Hearing.

*THE Knowledge of the Diſtempers of the Ear depends upon that of its Parts, which are affected,* Page 90.

*The Diſorders of the auditory Paſſage which cauſe extreme Pain, and remain in this Part, proceed from,* 91. *the Solution of Continuity,* 92. *caus'd by the Wax, which is in the Inſide of the auditory Paſſage,* 93. *The external Cold increaſes the Acrimony of it by the Obſtruction of the excretory Ducts of the Glands,* id. *which render the ſaline Juices more pungent,* 94. *by Heat, which looſens and diſſolves theſe ſaline Juices,* id. *or by the ſharp, ſaline and ſerous Humours, which ſometimes come out of the Glands of the Ear,* id.

*The*

*The different Solutions of Continuity cauſe the different Senſations*, 95. *of pungent Pain*, id. *of Eroſion*, id. *of Tenſion, of Weight, of Pulſation*, id.

*This Pain is very violent*, 96. *becauſe the Membrane of the Paſſage is compos'd of a fine nervous Texture*, id. *and receives a great number of Nerves*, id. *and is fix'd cloſe upon the Bone*, id. *and connected with other very ſenſible Membranes*, 97. *And this often cauſes an acute Fever*, 98. *by the Agitation of the Spirits*, id. *and by the Fermentation of the Blood*, 99. *A Watchfulneſs*, id. *Delirium*, 100. *Convulſions*, id. *and Swooning*, id. *A Hiſtory upon this Subject*, 101. *Remarks upon this Hiſtory*, 102.

*Remedies to be us'd for the Pain caus'd by Cold*, 104. *for the Pain proceeding from Heat*, 105. *for the Pain caus'd by ſerous Humours*, 106.

*The Cauſes which produce an Inflammation in the auditory Paſſage are*, id. *the Obſtruction of the Glands*, 107. *the Acrimony of the Wax*, id. *which cauſe Abſceſſes and Ulcers, which are difficult to cure*, id. *We ſometimes meet with Worms in the Paſſage*, 108.

*The*

*The Causes of the Suppuration and the Flux of Blood, which apparently does not come from the Brain*, 109.
*Cure of the Inflammation*, 112. *Abscess*, id. *Ulcer*, id. *Worms*, 113. *and Fluxes of serous Humours*, 114.
*The third Disorder of the auditory Passage is Obstruction, it is occasion'd by*, id. *extraneous Bodies*, id. *2dly. The retain'd Wax*, 115. *which petrifies sometimes*, id. *and causes a sort of Deafness easy to cure*, 116. *3dly. By a Membrane*, id. *4thly. By fleshy Excrescences*, 117. *5thly. By the Glands which surrouud it becoming tumified, which is commonly accompanied with a Relaxation of the* Membrana Tympani, id.
*Cure of the Obstruction caus'd by extraneous Bodies, and the Extraction of them*, 118. *which is perform'd by the Scoop, or the* Terebra, *when they are inclos'd in the cartilaginous Passage*, id. *or when they are contain'd in the bony Passage, it is effected by an Incision into the back part of the Ear*, 119. *From whence we extract Shot with the* Tenebra, id. *and Fruit-Stones with* Hildanus *his Scoop*, id.

*Cure*

*Cure for the Obſtruction proceeding from the Hardneſs of the Wax*, 120. *For the Membrane which ſtops up the Paſſage*, id. *for Excreſcences, of which we muſt extirpate as much as we can by the Ligature*, 121. *and conſume the Remainder by Cauſticks*, id. *which muſt be very carefully us'd, for fear they ſhou'd hurt the Membrane of the Paſſage*, 122.

*Cure of the Obſtruction proceeding from the Glands being tumified*, 124.

*The Diſeaſes which the* Membrana Tympani *is liable to, are Relaxation*, 126. *too great Tenſion*, id. *Schirrouſneſs*, 127. *and Rupture*, id. *or at leaſt diſunion from the Bone, to which it was before united*, 128.

*Theſe Cauſes do not occaſion an entire Privation of the Hearing at firſt, but only ſome time afterwards*, 129.

*Cure of the Relaxation*, 130. *and of the Tenſion*, id. *the Schirrouſneſs and Rupture are incurable*, id.

*The Diſeaſes of the* Tympanum *and of the Labyrinth, are* Caries *of the Bone*, id. *which may cauſe Deafneſs*, 131. *Inflammation of the Membranes*, id. *and Abſceſs of the Membranes*, id. *Inflammation*

*flammation of the* Lamina Spiralis, *which may grow carious*, 132.
*Cure of the Caries*, id.
*Cure of the Inflammation of the Membranes*, 133.
*The Diſeaſes of the auditory Nerve are Obſtruction and Preſſure*, 134. *which may proceed from Tumours happening upon the Brain*, id.
*It is difficult to know whether the Deafneſs proceeds from any Fault in the Nerve, or from any Fault in the Organ*, 135.
*The Noiſe in the Ear is a Symptom, the Cauſes of which are difficult to explain*, id. *the Ancients attributed it to the implanted Air*, 136. *It is more reaſonable to believe, that it is commonly produc'd by the Vibration of the immediate Organ*, 137. *which is produc'd by Cauſes inclos'd in the Membranes of the Ear*, 138. *which may be attributed to the Diſeaſes which produce this Symptom*, id.
*Sometimes the Noiſe in the Ear proceeds from an external Impulſe, as when we ſtop our Ears with our Hands*, 139.
*The Diſorders which cauſe this ſort of Noiſe in the Ear, are the Commotions of the Cranium*, 140.

*The*

*The Beating which we imagine we hear in the Inside of the Ear, is caus'd by the Contraction of the auditory Passage,* id. *and by the Pulsation of a dilated Artery,* 141. *The immediate Vibration of the Extremities of the nervous Fibres to their Origin in the Brain, may cause all the Appearances of Noise,* 142. *which is not so much a Symptom of the Diseases of the Ear,* 143. *as of those of the Brain which produce a second sort of Noise in the Ear,* 144.

*The Cure of the Noises of the Ear, is the same as that which is us'd for the Diseases from which they are produc'd,* 145.