

A treatise on the physiology and pathology of the ear : containing a comparative view of its structure, functions, and various diseases : observations on the derangement of the ganglionic plexus of nerves, as the cause of many obscure diseases of the ear : together with remarks on the deaf and dumb / by John Harrison Curtis.

Contributors

Curtis, John Harrison, 1778-approximately 1860.
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Publication/Creation

London : Longman, Rees, Orme, Brown, Green, and Longman, 1836.

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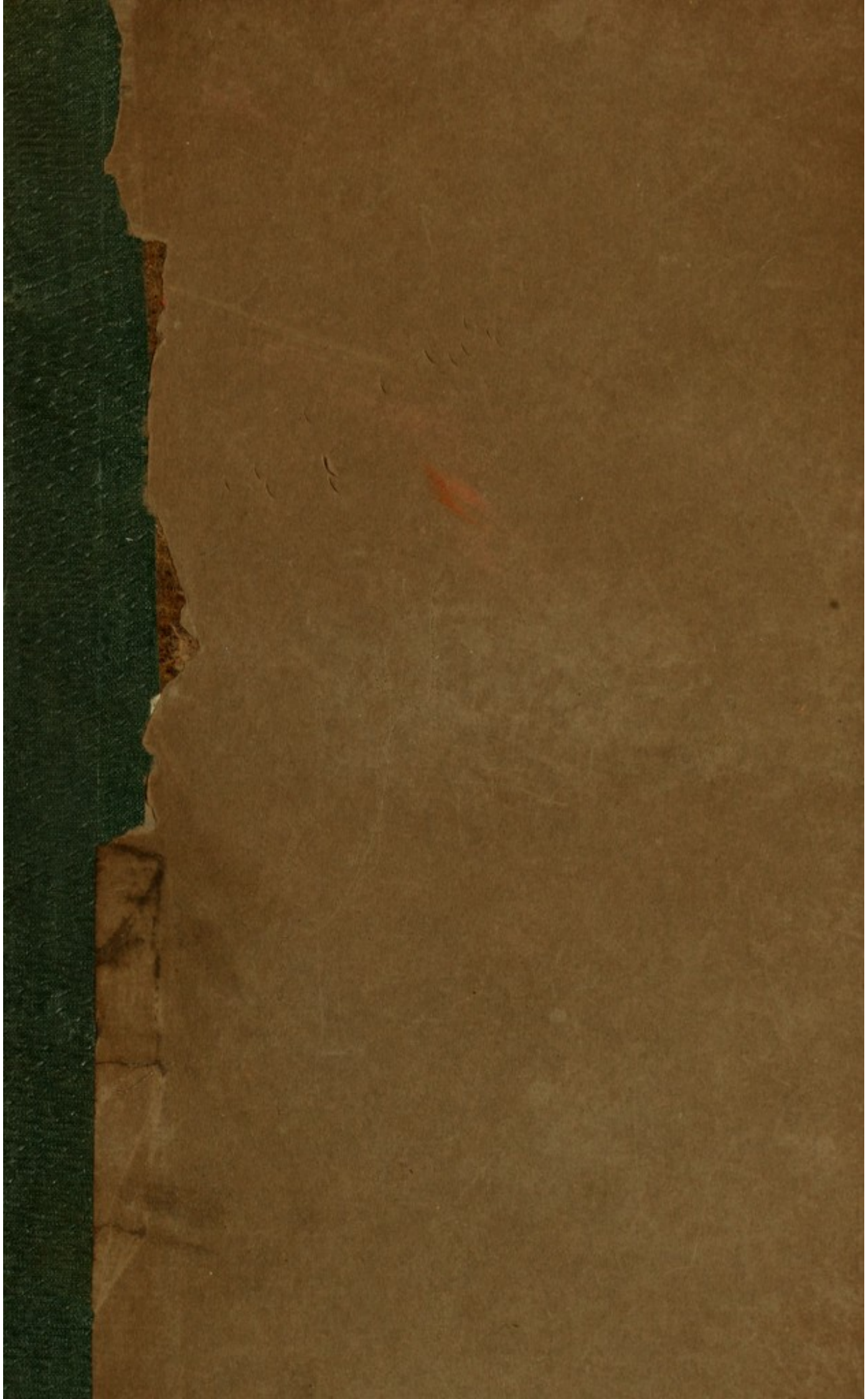
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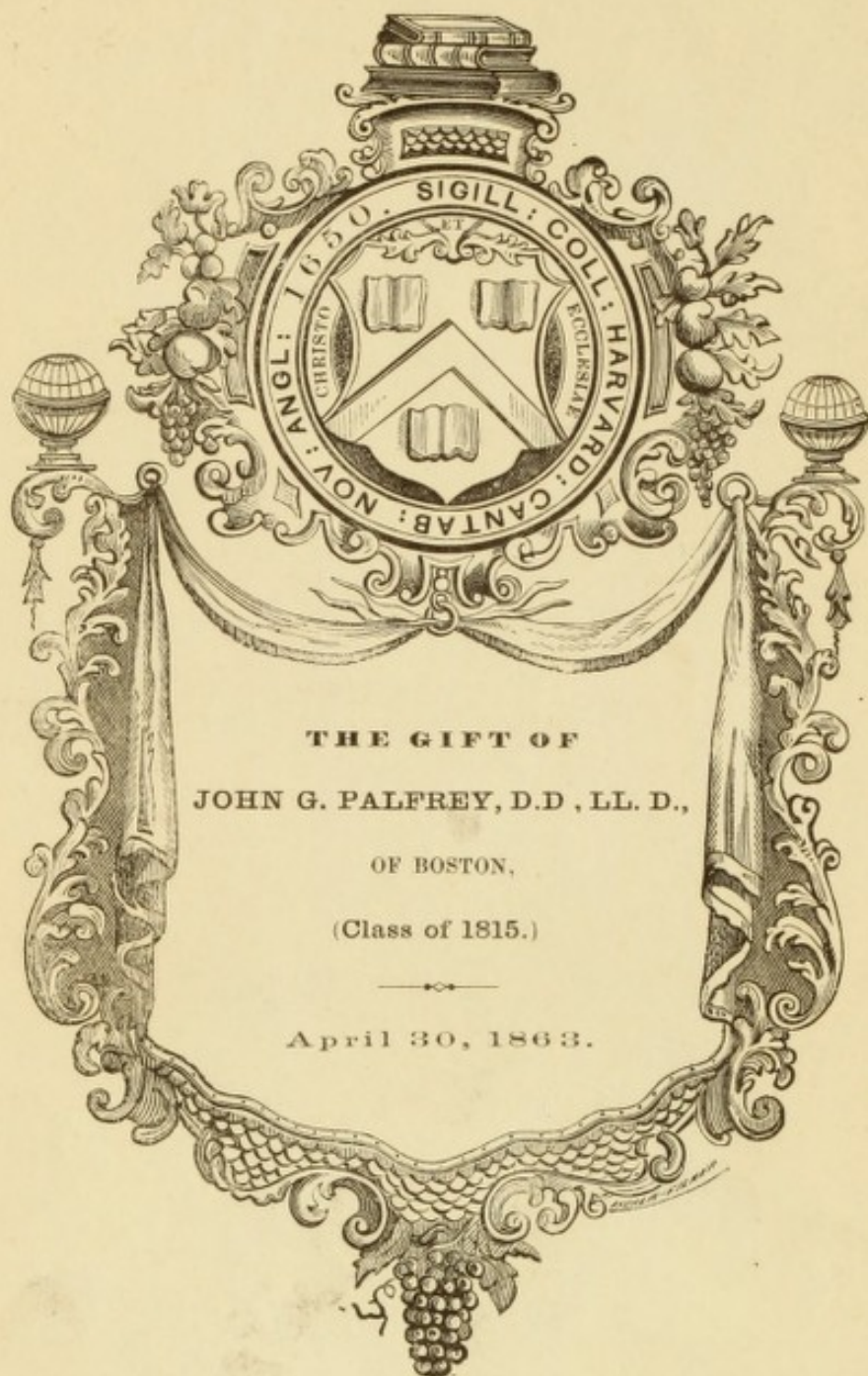
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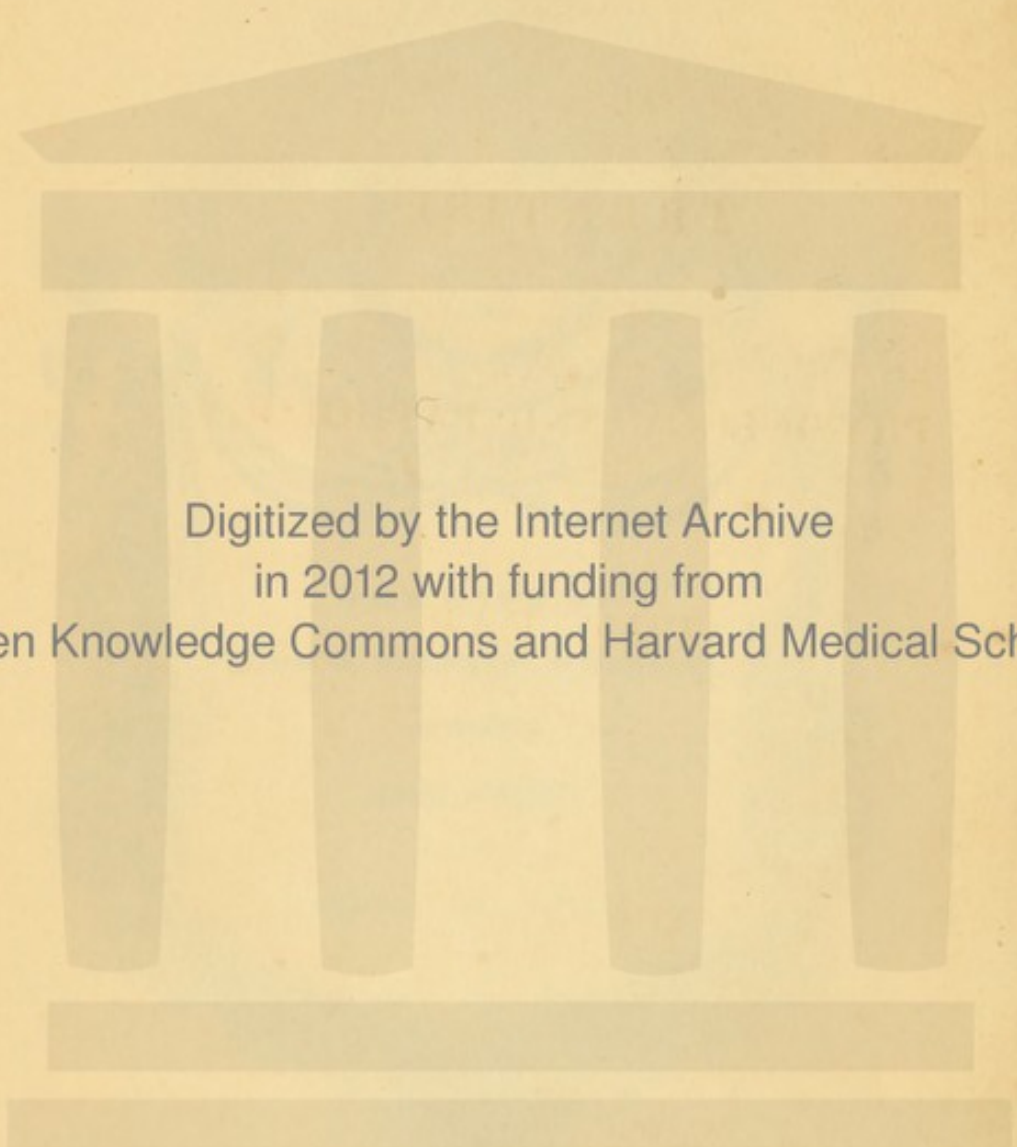
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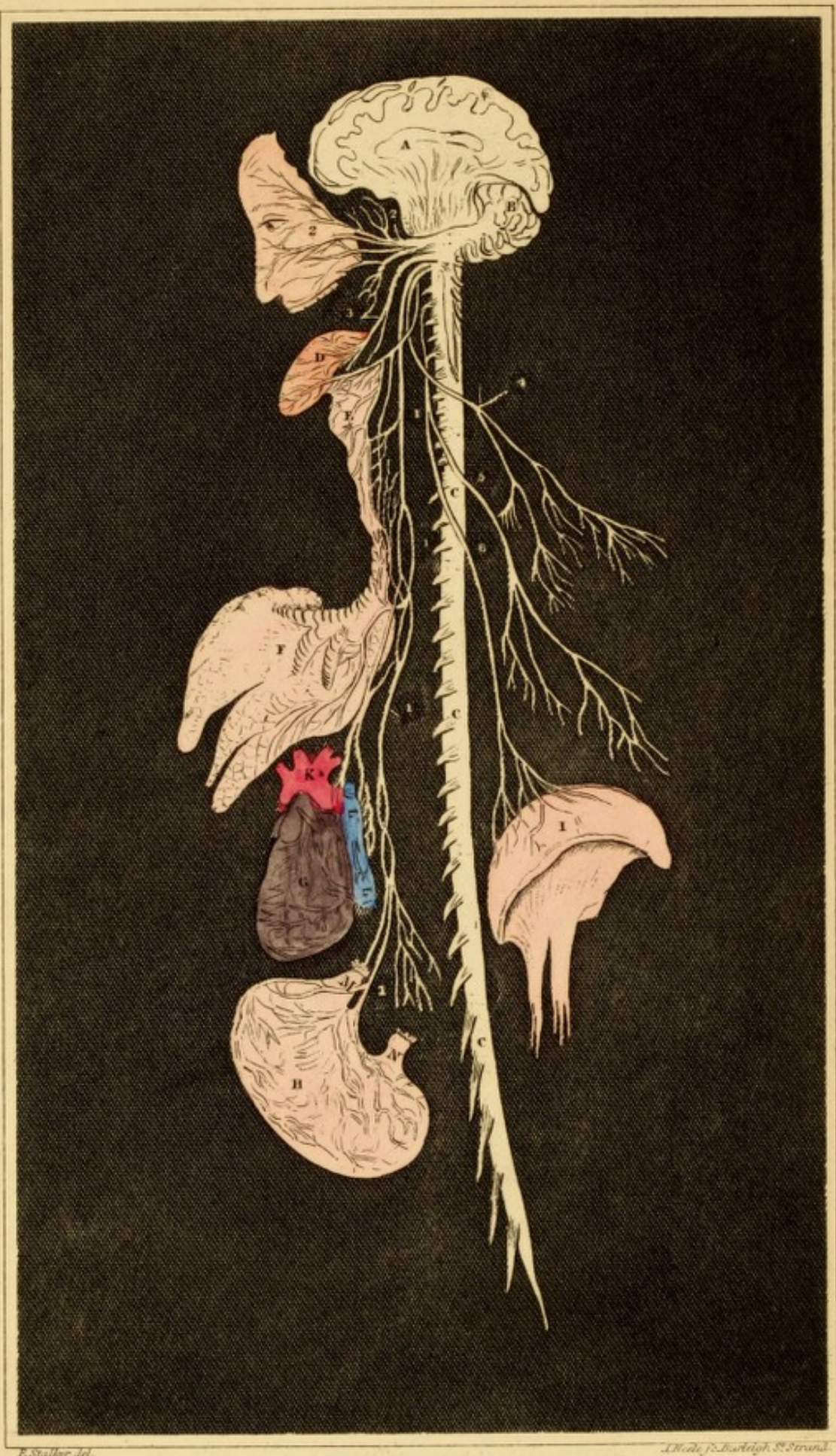


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A
TREATISE
ON THE
PHYSIOLOGY AND PATHOLOGY
OF
THE EAR.

LONDON:
PRINTED BY ROBSON, LEVEY, AND FRANKLYN,
46 St. Martin's Lane.





THE ORGANS OF SENSATION,
With the Distribution of the Nerves.

Engraved for M. Curtis's Treatise on the Ear, June 1836.

*The Editor of the
North American Review
From the Author.*
© TREATISE *With sentiments
of regard.*
ON THE *J.H.C.*
PHYSIOLOGY AND PATHOLOGY

OF

THE EAR:

CONTAINING A

COMPARATIVE VIEW OF ITS STRUCTURE, FUNCTIONS, AND
VARIOUS DISEASES;

OBSERVATIONS ON THE
DERANGEMENT OF THE GANGLIONIC PLEXUS OF NERVES,
AS THE CAUSE OF MANY OBSCURE DISEASES OF THE EAR.

TOGETHER WITH

REMARKS ON THE DEAF AND DUMB.

Sixth Edition.

By JOHN HARRISON CURTIS, Esq.

Aurist in Ordinary to His Majesty, and their Royal Highnesses the Duchess of Kent and the Princess Victoria; Oculist; Surgeon to the Royal Dispensary for Diseases of the Ear and the Deaf and Dumb; Lecturer on the Anatomy, Physiology, and Pathology of the Ear and Eye; Author of a Treatise on the Physiology and Diseases of the Eye, and of an Essay on the Medical Treatment of the Deaf and Dumb; Fellow of the Medical Society of London; Member of the Royal Institution of Great Britain, and of the Zoological Society of London; Corresponding Member of the Medico-Chirurgical Society of Berlin, and of the Philosophical Society of Leipsic, &c. &c.

LONDON:

PRINTED FOR

LONGMAN, REES, ORME, BROWN, GREEN, AND LONGMAN,
PATERNOSTER ROW.

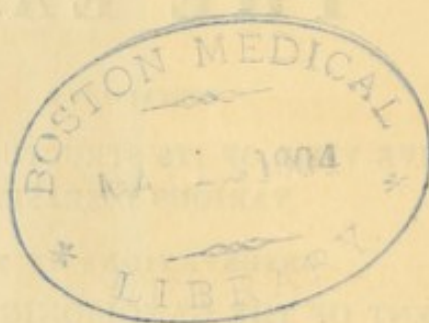
1836.

1863, April 30.

Gift of

Hon. John G. Palfrey,

(Class of 1815.)



TO
HIS MOST EXCELLENT MAJESTY
KING WILLIAM THE FOURTH ;
IN TOKEN OF
THE AUTHOR'S GRATEFUL SENSE OF
HIS MAJESTY'S GRACIOUS CONDESCENSION
IN APPOINTING HIM
AURIST IN ORDINARY TO HIS ROYAL PERSON,
AND BECOMING THE PATRON OF THE
Royal Dispensary for Diseases of the Ear,
A SIXTH AND IMPROVED EDITION OF
THIS WORK
IS MOST RESPECTFULLY DEDICATED, BY
HIS MAJESTY'S
MOST OBEDIENT AND MOST DEVOTED SERVANT AND SUBJECT,
JOHN HARRISON CURTIS.

TO
HIS MOST EXCELLENT MAJESTY
KING WILLIAM THE FOURTH

IN COMPLIANCE
WITH THE ACTING SECRETARY'S ORDER
HIS MAJESTY'S CHANCERY COMMISSIONER
IN THE GREAT SEAL
AGAINST IN ORDINARY TO HIS ROYAL TERROR
AND PROSECUTION THE TITLES OF THE

Special Commission for the State of the
the King and the Secretary of the State

THIS WORK
THE MAJESTY'S
THE MAJESTY'S

THE MAJESTY'S
THE MAJESTY'S

THE MAJESTY'S
THE MAJESTY'S

PREFACE

TO

THE SIXTH EDITION.

IN presenting to the public the Sixth Edition of this work, the Author cannot refrain from expressing his satisfaction at the success with which his efforts have been crowned, notwithstanding the unwillingness with which new views on any scientific subject are listened to, and the prejudice with which they are usually received: still, convinced of what his plans are capable of accomplishing when fairly tried, it has been his aim to pursue a straightforward course—to endeavour, in the first place, to do all the good in his power to suffering humanity; and, in the next, to advance science in his peculiar department to the utmost of his ability. It is, therefore, with peculiar gratification that he casts a retrospective glance on his labours during the last twenty years; con-

scious that during that period he has been the means, however humble, of throwing more light on the ear and its diseases than had been done by the most gifted of his predecessors. Not that he would arrogate to himself the praise of having effected what, had they been placed in his circumstances, they would have failed to accomplish; but simply from the fact, that he has had opportunities of seeing diseases of the ear to an extent that has never fallen to the lot of any other practitioner in this country. His office of Surgeon to the Royal Dispensary for Diseases of the Ear, and that of Aurist to His Majesty and other branches of the Royal Family, have brought under his notice upwards of 20,000 persons, from the highest to the lowest, affected with diseases of the ear. This mass of experience and practice he has assiduously endeavoured to turn to the best account, and has embodied, from time to time, the results in this work, together with the views of the most celebrated British and Continental writers.

He has but a few words to say as to

what may be expected from this edition. It has been carefully revised throughout; in every part of it such additions have been made as appeared necessary; new Plates and Illustrations have been added; — one shewing the organs of sensation from their origin to their termination; another giving a view of the great sympathetic nerve, traced from its rise in the stomach through its various ramifications till it reaches the brain; and others being drawings of the Author's improved hearing-trumpets.

On the whole, he trusts it will be evident to the candid reader, that he has not neglected to avail himself of the time that has elapsed since the last edition to render this work still more worthy of the patronage it has received, as well from the profession as from the public in general.

Were this the place, he might mention several other of his publications having the same end in view as this volume: such as, a Map of the Ear, shewing its internal, intermediate, and external structure, together with the bones *in situ*; a Chart of

its principal diseases, containing the latest and most approved nosological arrangement of their classification, seat, symptoms, and causes, together with the modes of treatment adopted by the Author. These two publications, insignificant as they may appear to some, have cost him much more time and study than one would readily imagine; but satisfied as he is of their utility to students and junior practitioners, he can never regret the time thus employed. His only hope is, that all his works may subserve the great object he has in view, viz. the amelioration of the sufferings, and the promotion of the comfort and happiness of his fellow-creatures.

JOHN HARRISON CURTIS.

Soho Square, June 23d, 1836.

DESCRIPTION OF PLATE I.

- A Cerebrum.
- B Cerebellum.
- C C C Spinal Marrow.
- D The Tongue.
- E The Larynx.
- F The Lungs.
- G The Heart.
- H The Stomach.
- I The Diaphragm.
- L L The Venæ Cavæ.
- M The Cardia.
- N The Pylorus.

- 1 1 1 Par Vagus or Pneumo-gastric Nerve.
- 2 2 Facial Nerve.
- 3 Glosso-Pharyngeal Nerve.
- 4 Superior External Respiratory Nerve.
- 5 Inferior External Respiratory Nerve.
- 6 Phrenic or Internal Respiratory Nerve.

CRITICAL NOTICES
OF
FORMER EDITIONS OF THIS WORK.

"The Diseases of the Ear are more intricate than those of any other organ of sense; every thing, therefore, new on the subject has a claim to attention, particularly when it is written with a laudable view of imparting information to deaf persons. We agree with the author, that an attention to one branch must acquire a facility of discrimination and a nicety of treatment; for the man who performs the same operation every day, will do it with more expertness and success than one to whom it only occurs in the course of months."—*Antijacobin Review*.

"It is certain that many cases of deafness are susceptible of relief by judicious treatment. Perhaps the disposition now prevalent to seek for the cause of many local diseases in disorders of remote parts of the system, especially in the gastric organs, has led to the greatest improvement in the treatment of this as well as in many analogous affections. This indication is well followed by Mr. Curtis in all cases of deafness. Excepting those of an organic nature, expressly local, his attention is directed to the state of the constitution; and many cases of what are vaguely termed *nervous deafness*, of several years' standing, have been perfectly relieved. He has applied the principles above inculcated in an active and judicious manner, and the results of his experience appear to have been particularly favourable."—*London Medical and Physical Journal*.

"The number of editions through which Mr. Curtis's work has passed is a sufficient proof of its value. We perceive he has enriched the present edition with those facts and observations connected with his subject which have recently been published in this country and on the continent. The cases which illustrate the work are instructive."—*London Med. Repository*.

"Mr. Curtis, whose perseverance commands our applause, has published a second edition of his Treatise on the Physiology and Diseases of the Ear. It had been determined that diseases of the ear were incurable, but Mr. Curtis has published a series of cases sufficient to prove this an error; and we congratulate the public on his success, as no diseases are more afflicting than those of this important organ."—*Monthly Magazine*.

"This work concludes with a detail of the most successful methods of treatment, as exemplified in the cases of about sixty persons, who have been either partially or entirely recovered from that distressing state of distance and seclusion which the loss of hearing had occasioned. To those who are suffering under the painful privation to which his pages refer, we doubt not Mr. Curtis's work will prove particularly acceptable."—*New Monthly Magazine*.

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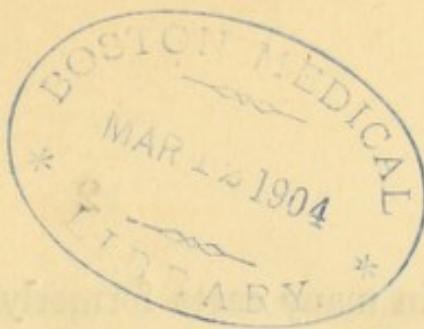
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INTRODUCTION.

THE improvements in medicine and surgery have, of late years, been great and important, but more particularly in surgery. In proportion as civilisation advances in any state, the number of diseases is augmented, and the medical profession acquires greater respect and is held in higher estimation, from its more extensive utility.

In former times, surgery, the most ancient branch (for external accidents always precede internal disease in savage life), was simple, and of very limited extent. As knowledge increased, this department gradually enlarged; and in point of science and principle, as it is now cultivated, it stands even on a firmer basis than medicine. For the benefit of society, it has been subdivided by its professors into various departments; and this, by calling for a more minute attention to particular subjects, has enlarged our views of them, and made us capable of affording effectual

relief in many cases formerly considered beyond the reach of the healing art.

One circumstance that for some time retarded the progress of surgery, was the cultivation of anatomy by the early physicians: for instance, the great and invaluable discovery of the circulation of the blood by the immortal Harvey, (which entirely changed the system of medicine then in vogue)—and also the discoveries of Glisson, and others of those days—had the same tendency. The physicians presided at that period in the dissecting-room, and of course took the lead in whatever related to surgery, as well as medicine; but the increase of clinical practice to the physician induced him at length to abandon the dissecting-room. As soon as this took place, anatomy naturally fell into the hands of the surgeon, to whom it was at last solely confided. No sooner had he acquired this pre-eminence, by having the field of anatomy left to himself, than what had hitherto been regarded as little better than a manual art, expanded in its turn into an extensive branch of science, and admitted of divisions equally numerous and varied as those of the department of medicine.

The consequence of this has been, that

many surgeons, anxious to improve their part of the profession, have, of late years, limited their practice to certain portions, or to the diseases of particular organs,—a circumstance which has been productive of the highest benefit to the community; and although some have entertained different opinions on this point, it has arisen, perhaps, more from self-interest than from any doubt of its utility: for every division clearly simplifies; and where a subject is extensive and complex, simplicity and perfection in any of its parts can never be otherwise obtained.*

This minute division of surgery began with diseases of the teeth, which were exclusively treated by certain individuals under the name of dentists, who now form a numerous and respectable body of practitioners.

These were followed by others, who, under the designation of aurists and oculists, devoted their attention entirely to diseases of the ear and eye; organs which, from the intimate connexion of their structure and the delicacy and minuteness of their parts, require, in the treatment of their diseases, both a skilful hand and an accurate knowledge of their anatomy.

* Lord Bacon.

The perfection to which these branches have attained best proves how appropriately the divisions have been made. The advantage which has resulted to mankind from the exercise of the oculist's profession as a distinct branch, is incalculable; and the treatment of diseases of the eye is now conducted with a success unknown in former times.

The same happy results have attended the profession of the dentist. The teeth are essential to the appearance and symmetry of the countenance; without them, that contour and harmony of features is wanting, which the face ought to possess; yet they are liable to more speedy decay than the other parts of the body, from their greater exposure to external causes, which act upon and destroy their enamel and osseous substance. When deprived of the teeth, not only is the beauty of the visage impaired, but the food being no longer sufficiently comminuted, digestion is imperfectly performed, and stomach complaints, with a decay of general health, are too often the consequence.

The hand of the artist has here been the assistant of nature; and the artificial substitutes are similar in their effect to the organised productions originally implanted: nay, to such

perfection has the art of man been carried, that in cases of certain complaints, where the palate or bony arch of the mouth has been destroyed, and the unhappy sufferer been rendered incapable of uttering and articulating,—so nicely has mechanism supplied the defect, that no trace of it could be perceived, either in the articulation, or in the reception of the food.

These facts clearly demonstrate the advantage of subdividing the objects of professional pursuit or study,* and diligently directing the attention to organs intimately connected; it is applying to medical science what experience has proved to be so successful in the mechanical arts.

If we take, for instance, the construction of a watch, there are no fewer than twelve different and distinct departments in its manufacture; and it is only through that subdivision of labour, by which each artificer attends to the construction of a single wheel or other appendage, that this useful article is brought to its great exactness, perfection, and cheapness. The same plan is extended to all the leading branches of produc-

* Vide Dr. Stewart's work on the Advantages of the Division of Medical Labour.

tive industry in England, of which its manufacturing towns afford the most striking examples; and this is a system, the utility of which has been strongly enforced and reasoned upon by the late celebrated Dr. Adam Smith, in his "Wealth of Nations." Indeed, this subdivision and minute attention to one branch may be considered as the great safeguard of our manufactures: perfection and cheapness are united by it to such an eminent degree, as will stand the rivalry of any other nation, till the same extent of population is employed as in this country, and of course the same perseverance to *one object*. This fact no reasoning can refute, and the *principle of it is interwoven with our very nature*.

The mind of man, it is obvious, though capacious, and possessed of very extensive powers, cannot embrace the whole circle of science, or retain it with that exactness which is necessary to excellence; he must select a part of the circle, if he wishes to shine, and must direct his chief attention to that subject alone.* How-

* A memoir of the author will be found in the European Magazine for April 1819, which will shew that he enjoyed the most ample opportunities of medical improvement; first under his father, an eminent physician in the country, and

ever, I do not intend by this observation to convey an idea, that the student should endeavour to become acquainted with the department he selects merely as a mechanical art, or that he should not travel beyond its bounds: on the contrary, his professional education should be so conducted as to instruct him, in the first place, in the general principles and scope of every part of it; this being attained, and his general studies completed, *then*, and *not till then*, he should select some particular branch of his profession; which, from his previous acquirements, he will then understand better; he will be able to improve and illustrate it by comparison

brother to the late celebrated botanist, Mr. W. Curtis; and next under the different lecturers of the metropolis: after which he obtained his qualifications as a surgeon from the Royal College of Surgeons, in London, and was appointed one of the medical officers to the Royal Hospital at Haslar, near Portsmouth, where he served nearly six years. While there, he had the honour of being presented to his present Majesty, then Duke of Clarence, on the occasion of his inspecting that establishment; when his Royal Highness was graciously pleased to express himself in terms of approbation of his zeal and ability. In consequence of the favourable opinion entertained of his exertions, he was promoted to the rank of a principal medical officer to the dépôt of prisoners of war at Forton, which contained nearly five thousand prisoners. Since he commenced practice, he has confined himself to his favourite study, the diseases of the ear and eye.

with the other branches he has studied, and to make them all bear on this favourite or leading topic. His previous acquirements may be thus considered in the light of scattered rays, which will be all brought to this central point or focus.

In estimating the different senses, how important is that of hearing to man! it is the grand medium which connects him with society, and which extends information and intelligence far beyond what the eye, or, indeed, any of the other senses, can do. Through this faculty he is enabled to conduct the great and complicated business of life. By it his harangue is heard in the senate, and his commands in the field. It forms the means of communication for almost all sentiment and expression.

The organ of voice, the pre-eminent distinction of man, is even useless, unless its powers are excited through the agency of this sense; and where hearing is defective in early life, *dumbness* is generally the consequence.*

* "According to Blumenbach, nothing is so strong a picture of the social necessity of man, as a person dumb because born deaf. It is the ear which connects man with the moral world,—the *conditio sine quâ non* of his progressiveness,—that which distinguishes a society from a herd." — *London Medical Gazette*.

A remarkable instance of the leading influence of this sense is recorded in the French Memoirs, and quoted by the Count de Buffon; in which the want of hearing seemed even to prevent the very development of the mind.

“ A young man, of the town of Chartres, aged twenty-four, who had been deaf from his birth, began all at once to speak, to the astonishment of every one who knew him.

“ He informed his friends, that for three or four months before, he had heard the sound of bells; and that he was extremely surprised at this new and unknown sensation.

“ Some time after, a kind of humour issued from his left ear, and then he heard distinctly with both. During these three or four months, he listened to every thing; and, without attempting to speak aloud, accustomed himself to utter softly the words spoken by others. He laboured hard in acquiring the pronunciation of words, and in learning the ideas annexed to them. At length, thinking himself qualified to break silence, he declared he could speak, though still imperfectly. Soon after, he was interrogated by some able divines, concerning his former condition. The principal questions turned upon God, the soul, and moral good and evil; but of

these subjects he seemed to have not the *smallest* conception. Born of Catholic parents, and having attended mass, been instructed to make the sign of the cross, and to assume all the external marks of devotion, he yet comprehended nothing of their real import. He had formed no distinct idea of death, and existed purely in an animal state: wholly occupied with sensible objects, and with the few ideas he had acquired by the eye, he drew no conclusions from them. He did not want ability; but the understanding of a man, when deprived of the intercourse of society, has so little exercise or cultivation, that he thinks only when sensible objects intrude themselves on his mind. The great source of human ideas is the reciprocal intercourse of society."—Vol. iii. page 283.

Thus, the defect of hearing appears to have locked up, as it were, the mental and rational powers; a strong proof of the necessity of intercourse with society, to give the mind information and its proper feeling, and to rouse its energies. The same thing is further confirmed by the account given of a savage boy found in the woods of Ardennes, in France, and who, from the want of this social intercourse (which can only take place through the influence of

hearing), possessed neither the powers of language, nor any other feelings or ideas beyond those of brute animals.* An account of this case was published some years ago, by Dr. Reid, of the Royal College of Physicians.

In estimating the value of the different senses, the best criterion is the opinion of such persons as have been partially deprived of them.

A blind man, who has been for years in that state, when desired to say whether he would prefer the restoration of his sight, on condition of losing his hearing, has been heard to remark, that he considered himself happy, though blind, since he was still able to converse with his friends.

This is generally the case, and it is amazing to what perfection hearing has attained in some instances of early blindness; apparently a beneficent provision of nature to supply the deficiency of the other sense. A remarkable instance of this kind is related of the late Justice Fielding, by Dr. Darwin.†

* For an account of the Deaf and Dumb, vide the author's Essay on the subject, shewing the necessity of medical treatment in early infancy, with observations on congenital deafness.

† See his *Zoonomia*.

The situation of the ear is more internal, and its powers are more concentrated, than those of the eye; its nervous expansion is less, and the bodies which act upon it are denser and more solid than those of light; hence the sensations conveyed by it are limited, though more durable than those of the eye.

If experience and improved knowledge have shewn how much can be done to rectify the imperfections and diseases of the eye (as I have exemplified in my Treatise on that organ)—the same experience, and the same ardent desire of improvement, cannot fail to be equally successful in those of the *ear*.

Yet the ear, though the most important of all the senses, has hitherto obtained but little attention from medical men. The diseases of most organs are well understood, together with the means of repairing their defects; but the imperfections of hearing having been almost totally unattended to by the regular profession, their treatment has, for the most part, fallen into the hands of empirics. But these times of ignorance are fast passing away, and the public mind is gradually becoming open to conviction, and disposed to examine the claims and encourage the practice of those members of the profession who

have a right to present themselves to notice as the alleviators of human misery;* and I am happy to see that several respectable practitioners have of late taken up this neglected branch of practice; although it is to be observed with regret, that others have attempted it who are not of the profession, and who are consequently wholly ignorant of the subject; and that these pretenders have had the effrontery to condemn a practice of which they could form no correct idea. Such intrusions are to be met with in every department of science, and are highly injurious to the well-being of society.

* A very striking peculiarity of medical superstition is the desire which prevailed, in early times, of attributing to uncommon and unnatural causes, events for which common and natural ones will sufficiently account. In this spirit, Soranus, who lived in the time of Galen, informs us, that Apollo was the inventor of medicine, Esculapius the improver of it, and that Hippocrates brought it to perfection. The same writer says, that the aphthæ of children were readily cured by honey: but instead of accounting for this fact by a reference to the medical virtues of the honey, he gravely explains it by stating that the honey had been hived near the tomb of Hippocrates. Pliny (lib. xvi. cap. 44), tells us, that the British and Gaulic Druids, who were both physicians and priests, were accustomed to cut the mistletoe with a golden knife, when the moon was six days old; and after being consecrated by various rites, it was esteemed as an antidote to poisons, &c.

Some of these men, instead of giving any information to their readers on the subject of which they profess to treat, fill their pages with slandering their superiors.

In looking back on the history of medicine and surgery, it is satisfactory to observe the many and important improvements effected in them within the last thirty years, and the benefits thereby conferred on mankind. During this period, one formidable disease has been almost eradicated; and vaccination alone has caused a very considerable diminution in the bills of mortality. From our increasing knowledge of the nature of febrile contagion, and its action on the human frame, infection is now subdued with wonderful certainty and celerity; and the dreadful ravages of continued fevers have become nearly unknown in this country. The experience furnished by the late war has also been productive of the most beneficial results in the cure of typhus fever, in which venesection is now carried to an extent that would have alarmed our forefathers.—One instance of prompt and successful treatment, of which I was myself a witness in His Majesty's Royal Naval Hospital at Haslar, I may here mention, as illustrative of the vast improvements that have recently taken

place in practice, as well as on account of its being highly creditable to the talents and professional skill of the medical commissioners and other officers of the king's hospitals. When the troops returned from Walcheren, Corunna, &c., two hundred patients were admitted in twenty-four hours; many of them in a dying state, labouring under pneumonia, dysentery, &c.; yet, in the brief space of a fortnight, the majority joined the ranks, and were fit for duty.*

Another source of the recent advances of medicine has been the valuable discoveries, by the celebrated Magendie, Manec, and other physiologists, of the functions of the ganglionic plexus of nerves, of which so little was previously known; and of the great sympathetic nerve, which, by its communication with the most important parts of the body, exercises a powerful influence on the organs of sense, especially on the ear and eye, the derangements of

* The Hospital at Haslar is one of the largest in Europe, and, at one time, contained 2000 patients: none are better regulated, or have had more operations successfully performed in them. Among the many eminent men who have served there, may be named, Drs. Lynd, Hope, Maginnis, Babington, Sir R. Hunter, Johnson, Thomson, James Clarke, Jones, Messrs. Vance, Scott, Price, O'Reilly, &c.

which are often the cause of that species of deafness called nervous, and whose origin is connected with the semilunar ganglion and solar plexus. And if to these discoveries we add, that surgical operations hitherto unheard of, or at best considered as wholly impracticable and hazardous, are more commonly, successfully, and safely performed, we think we shew some of the grounds on which the rapid advances of medicine in general, and of surgery in particular, are to be accounted for.

It has, unfortunately, been laid down as a maxim, that the diseases of the ear are incurable, because they are out of the reach of the eye. But for this opinion there is no just foundation; and it might, in fact, have been said with equal propriety of the other organs, such as infections of the brain, stomach, liver, &c., on which we daily see such admirable cures performed. Indeed, there can be no doubt, that experience, accompanied by an ardent desire for improvement, will be attended with the same success in this as in other branches of medicine.

But to such an extent has prejudice been carried on this subject, that in cases of deafness in early childhood, where much might have been done, and the misfortune of settled disease

averted, no attempt even has been made to ascertain the defect, nor the smallest means of relief tried, from the fallacious idea that the sufferer will outgrow the disease, or that, as life advances, the organ will acquire an acuteness and increased powers, which it does not possess at an earlier period.

No opinion deserves more to be condemned, or is more hostile to the health of the community. There are, indeed, diseases of such a nature as to be incapable of relief; but they are of the constitutional class, and depend on a general fault of habit; they are not local, or affections of one part. Thus, scrofula, or king's evil, as puberty advances, and the system gains greater tone and firmness from the changes which take place at that period, loses much of its virulence and morbid action; so that, to a certain degree, the constitution may be said, as it acquires strength, to outgrow the disease; but even here it is found that, unless medicine lend its aid, many are lost before the arrival of this salutary time of life.

This popular prejudice may be considered as one of the causes that impede the progress of medicine, since it prevents patients from applying to a practitioner in the early stage of a

malady. The idea that nature commonly cures diseases, though, to a certain extent, proper enough to be entertained by a professional person, should be opposed as a general opinion; tending, as it does, to create a want of confidence in a science which is justly considered as of the utmost importance to the human race.

Diseases of the ear, like those of other parts, are often constitutional; and a general treatment of the system will, therefore, influence the malady of the particular part. Thus, a certain well-known disease, in its constitutional form and ultimate stage, attacks the ear, and deafness is produced by this specific cause.

The same course of medicines that removes other constitutional symptoms has an equal effect on this organ; and if deafness be the only disease, the employment of internal medicines, according to the regular method observed, will remove the complaint.

If a derangement of any principal organ take place, it will produce a sympathy in other parts of the machine, and an attention to the state of this organ will relieve the symptoms arising from sympathy: hence the antiphlogistic treatment succeeds even in cases of apparent weakness, by rousing and invigorating the action of

the deranged organ, the benefit of which is soon extended to the rest of the system.*

It is curious to remark, that though the structure of the ear has engaged the attention of the most ancient anatomists and medical writers, little advantage, in a practical point of view, has been derived from their researches. We find, on examining the early authors, that Alcmeon in particular, an illustrious Crotonian philosopher, studied this organ: he lived shortly after the time of Hippocrates, who flourished four hundred years before the birth of Christ.†

* “ The attention of individuals should be directed to slight beginnings of the more serious diseases, which, in the business of life, are often overlooked, or confounded with states really trivial. Disordered structure is preceded by disordered function, and great disorder of function is often for a long time preceded by slighter degrees of it; and we almost always find, that when the more severe affection occurs, its obstinacy is proportioned to the length of time it has been preceded by the slighter symptoms, by which the part is weakened before the disease is established, and, in the same degree, the tendency to change of structure increased.”—
PHILIP.

† Hippocrates may indeed be considered the father of physic, no less than of medicine, though the more intricate and various nature of physic renders it probable that his knowledge of it was neither very extensive nor profound. The human body he thought to consist of three substances,

Aristotle frequently quotes the anatomical opinions of Alcmeon; and in Scaliger's edition of his works, the Stagyrice expressly confutes the notions of Alcmeon. Aristotle himself treats on the ear more correctly, for we find him dividing the external ear into a *pars innominata* and *lobus*, which he says are wholly composed of cartilage and flesh; the inner part he likens to a shell, from which there is no passage into the brain, but one into the cavity of the mouth, meaning the tube which Eustachius claimed the credit of discovering.* Without entering further

solids, fluids, and spirits, which are formed by the union of the four primary elements. The quality and quantity of these elements contained in each particular system, as well as the degree of heat, cold, moisture, and dryness, natural to it, are what give to it its peculiar habit or idiosyncrasy, and form the four temperaments: these influence both the moral and corporeal character of the individual, and render him, according to his peculiar temperament, obnoxious to those diseases which more readily attack one habit of body than another.

* Physiology may be said to have been almost at a standstill from the days of Hippocrates till the time of Aristotle, whose genius and researches were of a nature greatly to advance it as a science. Aristotle was the first among the ancients from whom comparative anatomy and natural history received a commanding impulse; and as his opportunities of gaining information were extensive, so he appears to have

into detail, it may be sufficient to observe, that the following is a list of ancient authors who have treated on the ear.

The remarks of Ingrassius may be found in Galen, *Libr. de Oss.* p. 57.* In Nemesius's work, who flourished, according to Mercurialis, in the times of Gratian and Theodosius, about 150 years after Galen, we learn that he wrote on the senses, and in cap. x. *de Auditu*. The following may also be consulted:—Bernardus Gordonius, p. 291, *de Aure*; Bartholomæus An-

made, on the whole, a very profitable use of his advantages, though, perhaps, looking at their results with the lights of the present day, hardly such as *we* should be led to expect.

* From the era of Aristotle to that of Galen is another long blank in the science of physiology. Galen was the ardent eulogist and professed disciple of Hippocrates; and, concurring with him in all fundamental points, he tells us that his chief object was to explain and generalise his principles. But although he begins in the spirit of simplicity so remarkable in the old man of Cos, yet he soon wanders into the mazes of subtle hypothetical reasoning and imaginative speculation. He admits of the four elements, and their qualities; but his nice distinctions and complex combinations, when applying them to pathology and physiology, are such as entirely to change the character of the doctrine of Hippocrates. His great merit consists in his accurate knowledge of the anatomical structure of the body, in which he far outstripped all his contemporaries.

glicus, *de quinque Sensibus, in totidem capitibus*; Nicolaus Nicolus, Serm. 3, tract. prim. cap. v. *de Sensu Auditûs*; Johannes Matthæus de Gradi-
 bus, *de Anatomiâ Auris*, c. 103; Johannes Anglicus, otherwise Johannes de Gadisden, *de Anatomiâ Aurium*; and Alexander Achillinus, who first gave the names of malleus and incus to the two bones of the ear: Jacobus Berengarius, commonly called Carpus, also notices these bones, adjacent to the tympanum, which move, he says, by the percussion of the air, and thus cause sound. Nicolaus Massa likewise ascribes their discovery to Achillinus, vide Epist. v. —Folius, Cassebohm, Mery, Rivinus, Valsalva, C. Placentini, Buchner, Morgagni, &c. &c., have also written on the ear, but these are authors of a more recent date.*

When we revert from the ancients to the moderns, we remark with regret that the published works on the ear are comparatively few in number, and very incomplete. The first author among the French who treated the ear scientifically was Duverney; his work appeared in 1683: but the earliest printed book on the

* For an enlarged account of authors, both ancient and modern, who have written on the subject, see my Essay on the Deaf and Dumb, pp. 12—15.

anatomy of the ear that I have seen, is by Julius Casserius, a Paduan, published in 1600, and entitled *De Vocis Auditúsque Organis Historia Anatomica*, containing numerous fine plates. It shews that, since his time, little additional information has been obtained on the structure of this organ; for several of what are now considered to be the discoveries of Hunter, Bell, Blumenbach, and others, in its comparative anatomy, may be found here. In our own time, Dr. Monro, of Edinburgh, was the first who published an accurate treatise on the Anatomy of the Ear: this was followed by the work of the late Mr. Saunders, which, besides its anatomy, elucidated also its diseases, and introduced into the department of acoustic surgery considerable improvements.

Since the first edition of this treatise appeared, in 1817, many works have been published on the ear, in France, Italy, Germany, &c.; amongst which may be mentioned those of Weber, Malatides, Majendie, Lallemand, Deleau, Alard, Itard, Saissy, &c., to the latter of whom I am indebted for many judicious observations: much useful information on this highly important subject has also lately appeared in the various medical journals. As it

may be interesting to the reader to know what is doing on the Continent, I have interspersed in this edition such extracts from these works as appeared to be most useful.

The present publication is necessarily concise; but any gentleman desirous of further investigating this interesting subject, may have the opportunity, by attending the lectures of the author, and the practice of the Royal Dispensary.

And now, before bringing this introduction to a close, I would just remark, that as the main purpose of this treatise is to awaken attention to the first symptoms of disease, and to enable the general reader to distinguish them, I have avoided, as much as possible, technicalities of language, as well as all speculative doctrines; and have endeavoured to state the facts which have come under my own observation in the plainest language, and deduced from them their obvious inferences. To search after truth,* and to state it in the clearest manner, I consider to be the only legitimate objects of all inquiry, whether physiological, pathological, or of whatever na-

* "Whenever it is thoroughly discussed, truth will not fail to come like tried gold from the fire; like Ajax, it requires nothing but daylight and fair play."—LAWRENCE.

ture; convinced that free discussion will be the means not only of confirming what is true, but, at the same time, of overturning what is false.

A TREATISE,

ETC.

CHAPTER I.

ON THE STRUCTURE AND USES OF THE DIFFERENT PARTS OF THE EAR.

IN its general structure, the organ of hearing resembles a cavern, that form being best fitted for receiving and reflecting sound.

So essential is this cavernous shape of the external ear to the reception and transmission of sound, that we are told the celebrated tyrant of Syracuse, Dionysius, had a cavern, corresponding to the shape of the human ear, formed in a rock, in which he confined his state prisoners; and from the strong vibration, and echoes of the sound, he was enabled to hear the secret conversations they held, and condemned or acquitted them accordingly. It is even said, that the slightest movement, or the faintest sigh of the prisoners, reached from the

depth of the dungeons to the chamber of their oppressor.

In the different tribes of animals, the appearance, manner of formation, and appendages of the ear, are liable to considerable variety.

In man, the ear is more perfect in its structure than in any other animal; and it is of more importance to him than to any other order of beings.

All animals, as far as we know, possess this sense; although it was formerly doubted whether fishes were endued with it, until the fact was discovered by Mr. John Hunter: the inquiry was afterwards prosecuted at considerable length by the late Professor Monro, of Edinburgh, in his work on the organ of hearing in fishes. Thus, the modern researches and discoveries in comparative anatomy have sufficiently proved that fishes, as well as other animals, possess the sense of hearing.

In favour of comparative anatomy, Haller, the father of physiology, justly observes, that the situation, figure, and size of parts, must be learned from man; their uses and motions from animals. Cuvier,* we find, has distributed the

* In the "Annales du Muséum."

animal kingdom into four divisions, being a regular gradation, from complicated to simple, through the whole series; beginning with man, and terminating with insects found in a drop of fluid. The *first* division consists of the vertebralia, which extends from man to the eel or serpent. The *second* is the mollusca, which comprises from the cuttle-fish to the barnicle or oyster. The *third* is the articulata, extending from the crab or lobster to the earth-worm or leech. The *last* is the radiata, comprising from the star-fish, or medusa, to an animalcule of infusions. The external ear and tympanum do not extend beyond the vertebralia; nor do they exist in all the animals belonging to this division.

The impressions received by the organ of hearing are conveyed through the medium of air, which acquires, from the action of the body communicating sound, a tremulous motion or vibration; and as these motions or vibrations succeed each other, sound is impressed or directed to the thin membrane stretched obliquely across the auditory passage, where it produces a similar motion, and excites the sense of hearing, with a mysterious yet most efficient precision; a certainty of result invariably corre-

sponding to the consecutive causes of noise. In all animals the ear is divided into an external and internal part, and the difference in the structure of the organ of hearing is greater in the internal ear than in the external. In quadrupeds, also, the difference is much greater than in the other classes of animals; but whatever differences or varieties of structure are met with, this we may lay down as a general rule, that the animal is better calculated by it for its particular circumstances and mode of life. The sense of hearing may be considered as one of the most powerful means of preservation that animals possess, by its indicating the approach of danger, as well as being the means of the re-union of individual families, or the congregating of great numbers of a species for defence or migration: it also guides most animals to their prey: hence it is an organ that few of them are without.

The ear is most perfect in the red-blooded animals, and it gradually diminishes as we descend in the scale of animation; thus, membranes analogous to the ear are discovered in some of the white-blooded animals, and several others which are sensible of sound, though the organ in them has hitherto been but imperfectly

ascertained. On examining the external ear in quadrupeds, it is commonly found to resemble the oblique section of a cone, from near the apex to the base. Hares, and other animals exposed to danger, and liable to be attacked by man and beasts of prey, have large ears, which are particularly directed backwards, while their eyes, at the same time, full and prominent, warn them of any danger in front. Rapacious animals, on the contrary, have their ears inclining forwards, as may be observed in the lion, the tiger, the cat, and others.

External ears are only met with complete in the four-footed mammalia; and even in this class there are exceptions, particularly amongst those that live in the water, or under ground; thus, they are wanting in most of the seals, in the walrus, duck-billed animals, and the mole: on the other hand, though it has been denied that the marmota, or *mus citilus*, possesses them, yet such is the fact. A similar error has been committed in considering as doubtful the ears of a species of German bat, on account of their enormous size; and Haller has been, according to Blumenbach, led into a mistake, in designating their ears as an accidental monstrosity. Indeed, the essential parts of the external ear

agree very much with those of man, though this general form is varied considerably; in very few but the quadrumana are they like those of the human subject, though this is the case in the porcupine.

In the human ear the external cartilage is stronger in its structure, and more elastic, than that of any other animal in proportion to its size. In some, as the opossum, the external ears are merely membranous; and in such as dive frequently under water, the external passage of the ear is furnished with a valve, which is closed when they become immersed; of this structure the water-shrew is a striking example.* In like manner, the external opening, or meatus, varies considerably, with respect to its length, breadth, and erection, in the different genera of animals. In the duck-billed, it is not only very long, but singularly tortuous.

In all the perfect animals, or mammalia, it may be almost unnecessary to state, that they uniformly possess a membrana tympani, a tympanum with its Eustachian tube opening from that cavity to the throat; but in the cetacea there is an exception, for, instead of the throat,

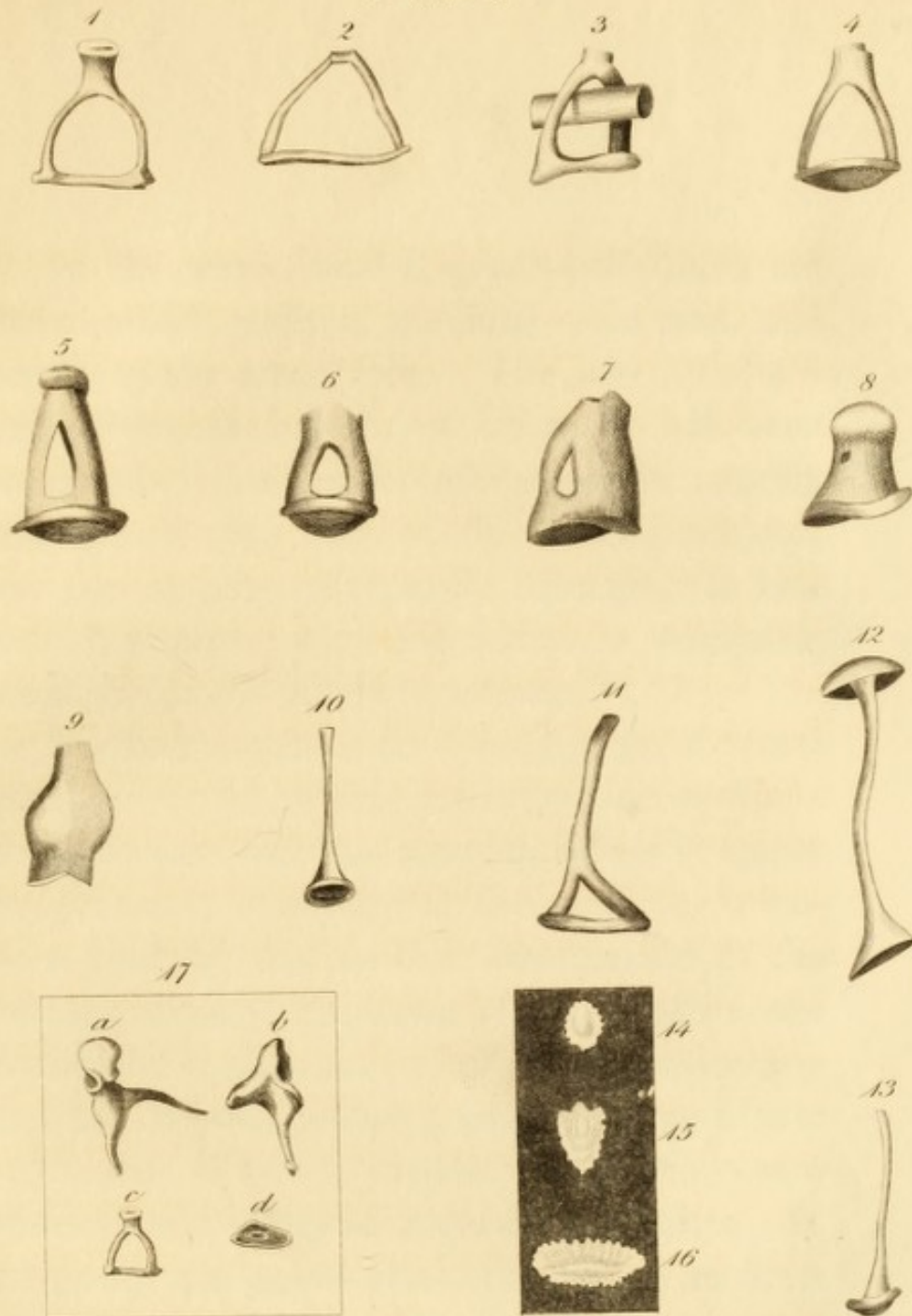
* Brunelli.

it opens in the blowing valve.* The membrana tympani is, on its outer surface, somewhat concave, being slightly depressed in the middle.

All animals of the class mammalia possess the two fenestræ, the ovalis filled by the bone of the stapes, and the rotunda, at which commences the scala tympani of the cochlea. In the horse and ass, again, different from man, the Eustachian tube does not directly open into the larynx, but into a sac, situated in the lateral parts of the lower jaw; and this formation is peculiar to that class only. In most of the four-footed mammalia there is connected with the tympanum another cavity, which, from its situation and appearance, may be compared to the mastoid cells in the temporal bone of man; nay, in several animals, this organ appears to be merely a bony cavity, as in the dog, martin, squirrel, hare, and some bisulca. In *circopithecæ* only a partial development of this structure is discoverable; while, on the other hand, in horned cattle, and in the pig, the cavity is parted off into cells by numerous plates of bone, resembling in some degree the divisions in a ripe poppy-head.

* Blumenbach.

Plate 2.



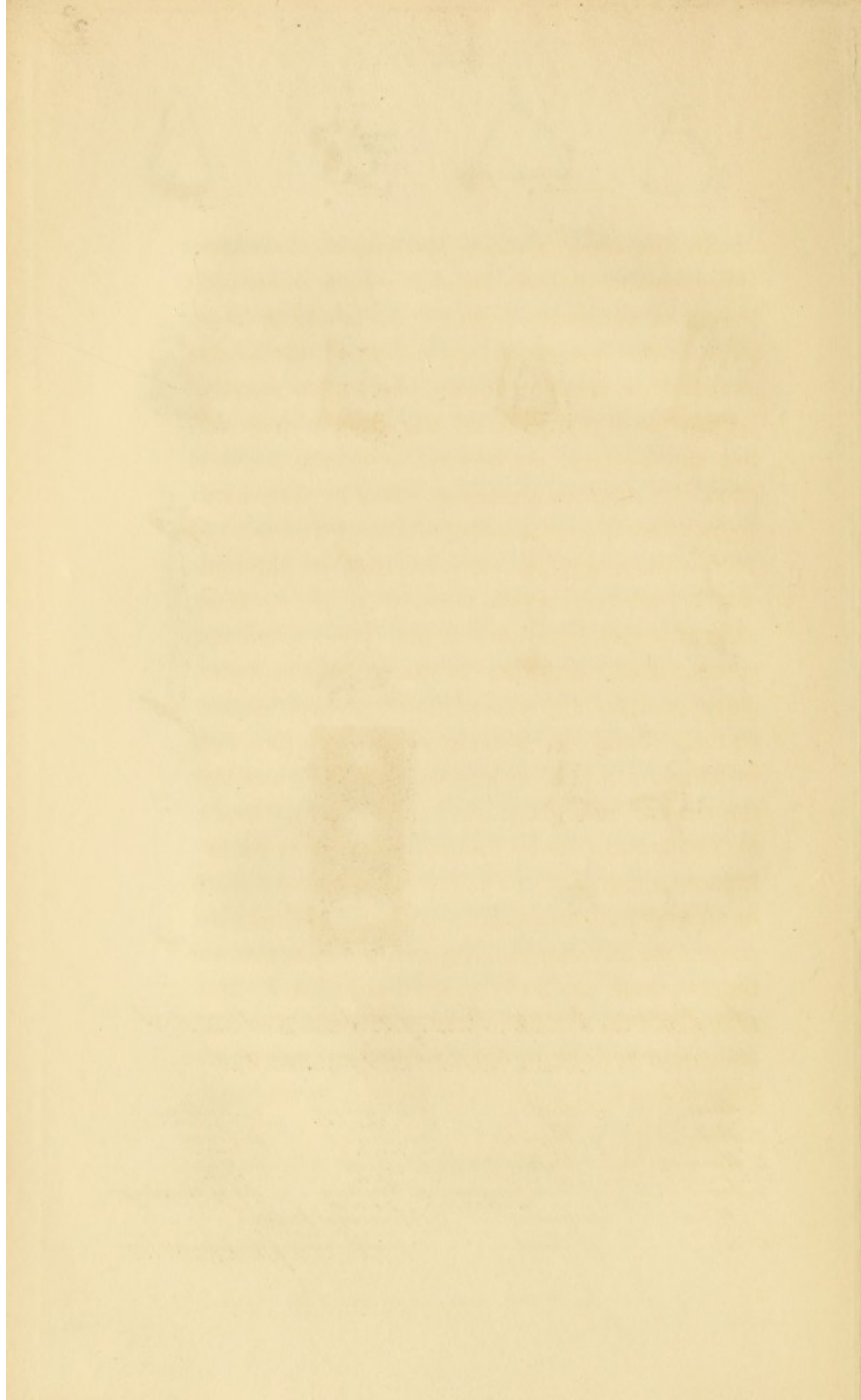
The Stapes or Stirrup Bone of the Ear, in Man and various Animals considerably magnified.

1. Man	7 Seal	13. Serpent	a. Malleus
2. Mole	8 Porpoise	14. Turbot	b. Incus
3. Marmot	9 Walrus	15. Brill	c. Stapes
4. Tiger	10 Ornithorynchus	16. Whiting	d. Os Orbiculare
5. Horse	11 Goose	17. Ossicula Auditus	
6. Pig	12 Turtle	Small bones of the human Ear	

London, June 1st 1836 Engraved for M^r Curtiss Treatise on the Ear.

J. Neale sculp.

Burleigh St. Strand.



In the warm-blooded quadrupeds there are three ossicula auditûs, the same as in man, and nearly of the same form. The labyrinth is a part of the ear which, as far as it has been examined in the four-footed mammalia, exactly corresponds with that of the human subject; but the cochlea, exclusively belonging to this class, has often a turn more than in man, with some differences of less importance.*

To the mammalia alone belongs the external cartilaginous ear, which is wanting in the whole class of birds; but this seeming defect is amply compensated, especially in those of the rapacious kind, by the peculiar arrangement of the feathers round the opening of the meatus; and in addition to this, several of them, particularly the tribe of owls, possess a kind of valve, situate at the orifice, which consists partly of a membranous, and partly of a muscular texture. In its form, the membrana tympani of birds is convex on its outer surface, and the tympana of the two ears are so connected together by the air-cells of the cranium, that they have but one ossiculum auditûs, by which the membrana tympani is connected with the fenestra ovalis, and

* Lawrence.

thus supplies the place of the malleus and stapes of the mammalia; the part corresponding to the malleus being usually of a cartilaginous structure, without any tensor tympani.* The Eustachian tubes also have one common opening on the arch of the palate, and the labyrinth is conspicuous by large canals projecting from the cranium. There is likewise a want of the cochlea here, and, instead of it, birds possess a short, obtuse, and hollow process of bone, directed obliquely backwards from the vestibulum, and, like the cochlea of the mammalia, parted off into two scalæ, one of which terminates at the fenestra rotunda, where it receives a portion of the auditory nerve, in the same manner as the cochlea does in other animals.

In addition to the remarks already made on the Eustachian tube of the cetacea, we may observe, that certain peculiarities in other parts of the organ distinguish this class, and that, from their deviating so widely from warm-blooded animals, they deserve particular atten-

* " Sir E. Home observed the same kind of communication, by means of the cells of the cranium, in the elephant."
—*Philosophical Transactions*.

tion. Their want of an external ear is well known; the opening of the meatus is uncommonly small; and in the dolphin and porpoise the bony part is but weakly attached to the skull, and in the common whale is entirely separate. The tympanum and bulla ossea consist of a hard bony substance, formerly erroneously called lapis manati, or tibernis: in the same class, the ossicula auditûs and the labyrinth, especially the bony canals, are remarkably small,—one reason why they were long overlooked.

The structure of the organ of hearing in the amphibia displays much greater variety than in the two former classes, but there is still more diversity in the last class. Turtles, frogs, and most of the species of the lizard kind, possess, besides the semicircular canals, a tympanum and Eustachian tube like the warm-blooded animals. In the turtle, the membrana tympani resembles a cartilaginous mass, externally covered by the common skin, or teguments; their single ossiculum is also very like that of birds. In frogs, a large membrana tympani is conspicuous; their Eustachian tube, which is short, consists of a wide opening at the fauces; they have also two cartilaginous ossicula, and a rudiment of vestibulum appears, composed of those soft stony

substances which assume a more conspicuous form in lizards and serpents,* and in the three following orders: amongst all the amphibia, a sort of external meatus is found only in the solitary instance of the crocodile. This animal, in common with the lizard, exhibits also the ossicula, and the stony concretions in the vestibulum already noticed. Besides the want of a tympanum, the foramen ovale in the salamander† is closed merely by a portion of cartilage, and its vestibulum consists of a soft stone. In serpents‡ there is neither tympanum nor Eustachian tube, with very few exceptions, as, for instance, the blind worm (*anguis fragilis*); but they have a kind of rudiment of an ossiculum.

In some genera of cartilaginous fishes, viz. the skate, shark, and lamprey, a tubular appendix of the vestibulum appears, continued backwards and outwards, representing, as it were, the rudiment of a tympanum; but this form of structure is confined to them. Pro-

* Comparetti.

† Scarpa.

‡ Voice is attributed to such animals only as have lungs; lungless animals are either dumb; or, at most, sound, not voice, is attributable to them. The hissing to the rattlesnake is voice, his rattling is only sound. Some fishes have sound, none voice.

fessor Weber has lately furnished some information respecting the organ of hearing in the bony fishes; and, from his investigation, it seems that they possess large ossicula,* which may be compared to the malleus, incus, and stapes; and these are situated at the anterior cervical vertebræ.

In fishes provided with a swimming-bladder, the bones are so connected with that part of the organ as to render it highly probable that this bladder assists the sense of hearing: three large canals, seen projecting into the cavity of the cranium, form their internal ear; there are found also two or three neatly formed stones in the vestibulum, exactly opposite to the termination of the auditory nerve: in several of the bony fishes they are white, resembling porcelain, and in their texture very dry and brittle. A remarkable peculiarity distinguishes the internal ear of fishes from that of the three other classes of red-blooded animals, namely, that it continues to grow as long as the fish lives, and thus, by being in the direct ratio of the bulk of the fish, shews its age.

* For a full description of the organ of hearing in fishes, see *Monro, J. Hunter, Weber, Camper-Klein, Kobrecter, Scarpa, &c.*

Though there can be no doubt that several insects possess the faculty of hearing,* yet the organ of this sense is very uncertain. A part, indeed, may be distinguished in some of the larger kind of the genus cancer, and this part appears to be analogous to the vestibulum of the former classes; for a small bony tube is discovered on the palpæ; at each side of the root a firm membrane closes its external opening, having a membranous lining, on which is expanded a nerve, whose origin is at a common branch of the antennæ or feelers. From this circumstance it might be conjectured that the antennæ themselves are organs of hearing, were not the supposition refuted by the fact, that some insects have no true antennæ, and still possess the sense of hearing in an exquisite degree; a strong proof of which is instanced in spiders; and experiments on other insects also demonstrate, that the sense of hearing is not weakened by removing the antennæ. With regard to hearing in worms, it is in the sepia only that any thing has hitherto been discovered resembling an organ of this nature.

Animals formed for hearing sounds distinctly from a low situation, as the ground for example,

* See the works of Lehman and Schelver.

such as slow hounds and others, have either long ears hanging down, or flexible ones, since they move the head with more difficulty than man. Fowls, again, differ from quadrupeds, in having no external ear; but, in place of it, there is a tuft of very fine feathers over the passage to the ear: this covering easily admits sound, and at the same time prevents any insects or external matters, which might prove a source of injury, from getting into it. To them an external ear would have been inconvenient, as causing an obstruction in the course of flight, and in passing through thickets, or other nearly impervious places. In the auricular passage of the fowl, as in that of man, there is secreted a liquor to lubricate it, and which, from its adhesiveness and disagreeable pungency, prevents the entrance of insects. When compared with the ears of other animals, theirs is also rather of a cartilaginous consistence than real bone; hence any tremulous motions impressed on the air are communicated in this class merely by the spring and elasticity of these cartilaginous parts, which do not require, in order to render the membrane of the ear tight, the same power or action of the muscles as in man. In their internal ear the semicircular canals appear very

distinctly, and can be demonstrated with facility.

In the different classes, we find that fishes, as before noticed, have a complete organ of hearing, as perfect as that of the other classes; the element in which they exist has also been proved to be one of the best mediums for the transmission of sound.* It is well known that the ear of the whale kind strongly resembles in its structure that of man. On dissecting the head of the skate, we find a bag placed behind the eyes, containing a fluid, and a soft cretaceous substance; these are its vestibule and cochlea, similar to the internal parts of the ear in man: upon this bag is distributed a part of the auditory nerve, resembling what is termed the *portio mollis*, or branch of the seventh pair of nerves, in the human subject; there are likewise semicircular canals, which form an important part of the internal ear, and are filled with fluid. In the cod species, the place of this soft cretaceous substance is occupied by a hard crustaceous stone; but there seems no appearance of an external passage, as in the skate.

* Vide Edinburgh Philosophical Journal.

The ear of the whale kind has been minutely examined by Drs. Tyson and Cowper, and still more accurately by Professor Monro. A small round hole is the aperture to a long external opening or meatus, which terminates in a concave membrana tympani, connected at the base with a chain of small bones, as in the human subject, and having also a cochlea or internal ear, with semicircular canals. The tympanum is remarkably large at the bottom, and communicates freely with the other cavities. There is also a tube, similar to the Eustachian, which gradually enlarges as it approaches the tympanum. Thus, while the whale floats on the surface of the ocean, the several parts of his ear receive the same impression as that of man; and, peculiarly to fit him for occasionally diving deep, not only is the external meatus small, but it is also capable of being shut at pleasure: this power is particularly conspicuous in the largest whales, in which there is a small hard body within the meatus, upwards of an inch in length, attached by its small end to one side of the passage, and serving as a valve to shut the ear when the animal is submerged; thus preventing over-distension and rupture of the membrane of the tympanum.

Nor is the ear in the skate less perfect than in the whale. The two orifices at the upper and back part of the head are the external meatus, and form a passage into a sac or vestibule, which again communicates with a smaller one, and at the same place with a common canal. These sacs are filled with a soft cretaceous matter, which seems to pervade every part of the internal ear, and appears to be necessary to render the impression complete. All these cavities are furnished with nerves, larger in proportion than those in the human ear; and the only parts wanting are the membrane and cavity of the tympanum, which are not requisite when sound is conveyed through another medium than air.

In the cod the whole organ seems to consist of three semicircular canals and a sac of considerable size, in which is lodged a hard crustaceous stone, over which is expanded a considerable nerve, in a neat and elegant manner. A viscid humour is likewise every where present, and is apparently essential to hearing in this species of fish.

In the sea-tortoise, the frog, and other amphibious animals, the structure of the ear is peculiar, there being no external meatus, but an

expanded Eustachian tube at the back part of the roof of the mouth, near the point where the under and upper jaws articulate.

The most novel information on this point is derived from the researches of M. Desmoulins on the nervous system of fishes in M. Majendie's *Journal de Physiologie*. M. Desmoulins found that in all fishes, the ray and the squalus scyllium excepted, the acoustic nerve is separated and distinct from the fifth pair, and never anastomoses with the first branch of the pneumogastric nerve by its posterior filament. Scarpa was therefore wrong in asserting generally the contrary to be the case.

In all the other organs of sense, with the exception perhaps of hearing, the nervous substance is brought into direct contact with the blood by means of a vascular tissue, spread over a larger space, and more abundant, in proportion to the quantity of nervous matter.

The proportion of nervous matter necessary for the least of the sensitive functions is greater than what is requisite for muscular excitement, according to the ratio of the surface at the termination of the nerve; a sensitive surface needing much more nervous substance than the best-supplied muscular surface of equal extent.

The solidity of muscular substance requires a similar proportion of nerve. The ratio of the solidity of nerves to their extent of surface is also determined by the energy of the sensation, or of the movement intended.

M. Majendie infers from these facts, that the structure and mechanical state of every sensitive organ depends on a maximum of development of the nerve; of the vascular tissue in contact with the nervous expansion; and of the enlarged portion of the cerebro-spinal axis, where the nerve is inserted.

In the various species of fishes, nerves, though similar in structure, have different functions; while, on the other hand, nerves whose structure appear to differ, always exercise functions of the same kind. When there is a difference of function, therefore, we must not infer that there is also a difference of apparent structure in the nerves. As to different nerves, when they are developed to the maximum, their structure has always been found to be uniform. The difference of function, then, is dependent on the structure and mechanical state of the expanded parts of organs. It follows, that the mechanism of the nervous action, whatever it may be, has a similar character with regard

to all the nerves, in the space intervening between their terminations in the organs and their insertions in the cerebro-spinal axis.

In farther prosecuting our inquiries,* we find that in articulated animals the nervous system is reduced to a knotted cord, and the organs of sense are gradually extinguished;—the sympathetic nerve solely belongs to this department; and in the class of articulated, the true spinal marrow is to be found only in the mammalia and more perfect animals. This nerve is the most general, and is, in fact, the original of all nerves, although variously modified in the different classes. In worms and insects it consists merely of vertebral ganglia, without the coeliac ganglia of mammalia and birds. In the acephalous mollusca, the latter exist without the former; and in snails, single ganglia of both kinds: all these lower animals have no spinal marrow.

* We may here take occasion to remark, that the physiologist who is acquainted with natural history generally, possesses a sure defence against doubtful notions and the sophistical quibbles of verbal distinctions. An hypothesis perfectly convincing and satisfactory to those destitute of this knowledge, is by him immediately seen to be fallacious and unsupported.

On the whole, the organ of hearing is, as I formerly observed, so constructed in every class as to be peculiarly adapted to the mode of life and other circumstances connected with the situation of the animal. Man, who is the noblest of all, and must hear sounds equally from all quarters, has his external ear large, and placed in a vertical manner, turned somewhat forwards; animals, however, have in general a greater power of motion in the external ear than man; hence it is furnished with more muscles, and they can direct or apply the cone of the ear readily to the sonorous body, without moving the head. From this it would appear, that in them it is necessary to collect sound more strongly, and that the internal ear does not receive the impressions with the same facility as in the human race.

I shall now proceed to describe the human ear, which consists of three principal divisions, viz. an external, intermediate, and internal ear. The different parts of the first division, or external ear, are called by anatomists the helix, antihelix, tragus, antitragus, lobe, *cavitas innominata*, *scapha*, and *concha*. In the middle of the external ear is the *meatus*, or passage, which varies in length in different individuals. The

external or outward ear* is designed by nature to stand prominent, and to bear its proportion in the symmetry of the head, but in Europe it is greatly flattened by the pressure of the dress;† it consists chiefly of elastic cartilage, formed with different hollows or sinuosities, all leading into each other, and finally terminating in the concha, or immediate opening into the tube of the ear. This form is admirably adapted for receiving, collecting, and retaining sound, so that it may not pass off, or be sent too rapidly to the seat of the impression.

* For a more particular and minute view of the different parts, see the author's new and improved Map of the Ear, exhibiting its internal, intermediate, and external structure, with the bones *in situ*, together with the principal nerves and blood-vessels in its immediate vicinity.

† A judicious painter will be attentive to the beauty of the human ear; for, when well formed, it constitutes a material feature in the appearance of the head, but if concealed will greatly affect the likeness, of an individual. The ancients were very observant of the shape and size of the ear; and Martial classes large ears among the list of deformities. Ælian, giving a description of Aspasia, tells us that her ears were short; and Suetonius, speaking of the person of Augustus, particularly mentions the beauty of his ears. By the Athenians, it was esteemed a mark of nobility to have the ears pierced; while, among the Hebrews, it was, on the contrary, characteristic of servitude.

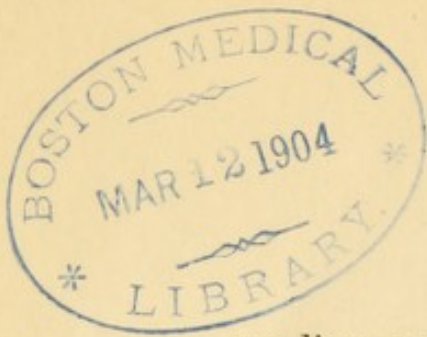
There have been a few cases of men who had the power of moving the external ear in a manner similar to that of animals;* but these instances are very rare, and rather deviations from the general rule; nor did it appear that such individuals heard more acutely: a proof that this structure would be of no advantage to the human subject.

The next division is the intermediate ear; it consists of the tympanum, mastoid cells, and Eustachian tube. The tympanum contains four small delicate bones, viz. the malleus, the incus, the stapes, and the os orbiculare, joined to the incus. The intermediate ear displays an irregular cavity, having a membrane, called the

* The difference in the shape of the ear in different races of men is not such as to form a distinguishing characteristic in any of them: though it is well known that the ears stand out farther from the head, and are somewhat movable, in savages. The lobulus among some tribes is frightfully lengthened by artificial contrivances; such as making a slit through almost its whole length, loading it with ponderous ornaments, knives, &c. The Brazilians, we are told, insert gourds in these slits, gradually enlarging the aperture until capable of admitting a man's fist, so that their ears lie upon their shoulders. Practices of a similar nature prevail in the Asiatic and South Sea Islands. The author himself witnessed an extraordinary instance of this elongation of the ear in a New Zealander in this country a short time since.

membrana tympani, stretched across its extremity; and this cavity communicates with the external air through the Eustachian tube, which leads into the fauces or throat. The membrane of the tympanum is intended to carry the vibrations of the atmosphere, collected by the outward ear, to the chain of bones which form the peculiar mechanism of the tympanum.

The third division of the organ is the internal ear, which is called the labyrinth; it is divided into the vestibule, three semicircular canals, and the cochlea, the whole being incased within the petrous portion of the temporal bone. The internal ear may be considered as the actual seat of the organ: it consists of a nervous expansion of high sensibility, the sentient extremities of which spread in every direction, and in the most minute manner inosculate with each other, and form plexuses, by which the auricular sense is increased. Here, also, sound is collected and retained by the mastoid cells and cochlea. To this apparatus is added a fluid, contained in sacs and membranes; and as it is in large quantities in some animals, there can be no doubt that it is intended as an additional means of enforcing the impression; the known influence of water, as a powerful



medium or conductor of sound, strengthens this idea.

The internal ear of man, therefore, has all the known varieties of apparatus, which are only partially present in other classes of the creation; and its perfection is best judged of by considering the variety or form of the internal ear of other animals. The internal ear of some animals consists of little more than a sac of fluid, on which is expanded a small nervous pulp; and according as the creature lives in the water or is partially exposed to the air, it has an external opening with the ear, or otherwise.

In all animals the internal ear is composed of a nervous expansion, contained in a hollow or cavity, and assisted in its impression by a sac and fluid also present there.

Hearing may be defined, the function intended to acquaint us with the vibratory motions of bodies: it is the exercise of that faculty, or sense, by which we appreciate and estimate all vibrations from sonorous bodies, which vibrations are termed sounds. Sound is conveyed by the atmosphere in straight lines to an almost incredible extent: these lines have received the appellation of sonorous rays, and are increased

in proportion to the elasticity of the body through which they pass, while the denser the body is, the more they become diminished in strength. The true seat of hearing is in that part of the organ which is formed by the *portio mollis* of the seventh pair of nerves, the pulp of which is beautifully distributed upon the *ampullæ* of the membranous semicircular canals, as well as upon the *barbula*, and the *zona mollis* of the cochlea.*

The manner in which hearing takes place may be thus simply explained. The rays emanating from a sonorous body are directed to, and arrive at the ear, where they become concentrated, in consequence of its peculiarly elastic structure; and in this concentrated state they pass along the external auditory foramen, to the *membrana tympani*, on which they excite a vibration: this vibration of the *tympanum* is communicated to the *malleus*, in immediate contact with it; the action of the *malleus* conveys it to the *incus*, and the latter again to the *os orbiculare*, whence it next reaches the *stapes*.† The basis of this last bone is extended within the *vestibulum*, in that part where, placed as a

* William Hunter, M.D.

† M. Baillie, M.D.

centre, it faces the common channel of the membranous semicircular canals, as well as the orifice of the scala vestibuli. In consequence of this situation, the vibrations on the stapes are extended to the water of the labyrinth; and the undulations, directed from this part as from a centre to a circumference, strike first the alveus communis, and are next extended throughout the liquor of the labyrinth surrounding the membranous semicircular canals, agitating by undulations their whole surface; and this of course affects the nervous expansion spreading over all these parts.* One scala of the cochlea opens into the vestibulum, and the other begins from the fenestra ovalis; and being both filled with the water of the labyrinth, and communicating with each other at the apex of the cochlea, the sonorous vibrations are in this manner communicated also to the scala of the cochlea: besides this, between the scala of the cochlea, in a middle point as it were, is placed the zona mollis, where the nerve is also extended, and the sonorous undulations take place.† It is by these varied actions of the different parts on the auditory nerves, that the latter are en-

* Robbi.

† Buffon.

abled to convey the vibrations to the sensorium, by which the mind is informed of the existence of sound, and is enabled to calculate its import, and judge of its difference or degree; for gravity, or acuteness of sound, depends only on the number of vibrations given at the same time.

Of all the species of deafness, that termed nervous, affecting the delicate nervous expansion of the ear, is the most serious.

In consequence of the little success that has attended the practice in nervous deafness,*

* " In physiology, as in the physical sciences, we quickly reach the boundaries of knowledge, whenever we attempt to penetrate the first causes of the phenomena. The most we can accomplish is to make gradual conquests from the territories of ignorance and doubt, and to leave under their dominion those objects only which our reason has not reached, or is not able to reach. The great end of observation and experiment is to discover, among the various phenomena, those which are the most general. When these are well ascertained, they serve as principles, from which other facts may be deduced. The Newtonian theory of gravitation is a most splendid example. The only object of uncertainty which then remains is the first cause of a small number of facts. The phenomena succeed each other, like the generations of men, in an order which we observe, but of which we can neither determine nor conceive the commencement. We follow the links of an endless chain, and, by holding fast to it,

I have thought that in such constitutions the quantity of air admitted by the external ear is too great; and in order to produce an equal balance between it and that admitted by the mouth, or through the passage of the Eustachian tube, have lately been induced to adopt, successfully, a new mode of practice, pursued on the Continent, and which I shall have occasion to mention in a subsequent part of this treatise.

Such being the structure necessary to the collection and reception of sound, the latter, it is observed, reaches the ear at equal distances, and in equal time. The common velocity of sound is at the rate of 1142 feet in a second, or about 13 miles a minute. A knowledge of the velocity of sound is of great use in determining the distance of objects at sea; for if a ship fires a gun, the light of which is seen 20 seconds before the report is heard, it is known to be 20 times 1142 feet, or about $4\frac{1}{3}$ miles, off.

Sound is transmitted with as much velocity when it traverses a large space, as when it

we may ascend from one link to another; but the point of suspension is not within the reach of our feeble powers.”—

LAWRENCE.

pervades a smaller one: whether it be by night or by day, whether the sky be rainy and hazy, or unclouded and serene, its celerity is not in the least impeded. Nor does the degree of noise produced by sound at all affect its rapidity; it being equally quick from a cannon as from a musket; but its speed is of course increased when it proceeds in the same direction as the wind, and diminished in like manner when it goes against the wind.

All sound is conveyed in waves or vibrations; and where these meet with a hard, regular surface, they, on striking against it, become reflected. If the ear be placed in the course of these reflected vibrations, it will perceive a sound similar to the original one, which will appear to proceed from a body situated in the same position and at the same distance as the reflecting medium or obstacle, and exactly as the original sounding body was before.

This sound is properly termed an echo, or a reflected sound, thrown upon the ear by the obstructing body.

Reflected sounds, like reflected rays of light, may be deflected, that is, magnified or turned off, by contrivances similar in principle to those employed to increase the powers and extent of

vision. Thus, where there is an elliptical cavity, sound uttered in one focus or point of it will be heard much magnified in the other focus: of this effect of sound in domes or vaults, the Whispering Gallery of St. Paul's Cathedral is a striking instance. The speaking-trumpet, so useful at sea, is constructed on this principle: it is in form a hollow parabolic conoid, having a perforation at the top, to which the ear is applied in hearing, and the mouth in speaking. This principle of reflected sounds is similar in the ear itself. From the hard bodies situated in the internal ear, the sound is evidently reflected back to the other parts, so that the organ may be said to combine both principles, viz. that of receiving the impressions first directly, and then indirectly, by the reflection of the sounds which strike on its harder or bony parts, thus applied a second time, as it were, to the auditory nerve. This idea is strengthened by the circular shape of the canals, where the sound striking on one focus is magnified as it extends to the other; and in man the canals bear a larger proportion to the cochlea than they do in the quadruped or whale.

The same may be said of the cochlea, and all the internal parts of the organ, which are

certainly formed for this reflection and reverberation of sound. Indeed, it is only by comparing the structure with the parts we know, that a just idea can be formed of the peculiar and intricate fabric we behold, as we cannot suppose any part of the mechanism to have been made in vain.

Besides the effect of the hard and bony parts of the ear in increasing the power of sound, the tension of the different membranes seems also an essential requisite. Thus, various muscles are so situated as to put the parts on the stretch, that the sound striking upon them, like the parchment of a drum, may, from this tension, have its influence augmented.

The tension of the tympanum may be compared, even more properly than to a drum, to the strings of a violin, or musical instrument; and as the state of tension and relaxation in the violin is found to produce such a variety of sound, so, in the same manner, a variety of circumstances will equally affect the tension and relaxation of this part of the organ of hearing, and consequently vary its powers of impression.

The four bones of the ear act mechanically, in consequence of the power of their muscles, which strike like the key of an instrument,

and produce a percussion of sound on the tympanum.

The knowledge of reflected sounds has not, until lately, been taken advantage of, in applying the principle to the construction of artificial means for assisting hearing; the only object hitherto attended to having been, to increase the collection of sounds, by extending the canal of the auricle or external ear, in the form of trumpets and cones: but if the farther power of reflected sound were admitted into these instruments, as I have now attempted to do, on the plan of the speaking-trumpet, a twofold advantage would ensue, both in a greater collection of the vibrations, and in their more powerful and repeated application to the organ.*

Indeed, in constructing such instruments, we may observe that the length is the great point; for, as in mechanics the powers of the lever are increased by its length, so in acoustics the strength of the impression conveyed to the ear will be in proportion to the length and

* Besides this instrument, the author, in order to give every possible assistance to deaf persons, has, at much pains and expense, invented a variety of ingenious mechanical contrivances on improved acoustic principles, some of which are unique of their kind.

straightness of the tube through which it is conveyed.

Besides the superiority of the structure of the human ear over that of other animals, its nervous texture internally is of a more delicate and sensible nature. Thus, its nerves are even more acute or sentient than those of the other parts of the body. All the nerves of the internal ear present the appearance of a soft pulpy substance, but are never seen in the form of a firm cord; and in the flexible and membranous parts they shew even a change of colour, like what the optic nerves undergo on entering the eye-ball to form the retina: the term retina, or net-work, is here properly applied, from its reticulated appearance.

The auditory nerve also, where it enters the internal passage of the ear, is accompanied by a larger artery than most of the other nerves, to heighten its sensibility; for increased circulation has every where this effect: it also forms into plexus, or combinations, for the same purpose.

Though the use of the Eustachian tube, in conveying sound by the mouth, has been doubted, yet a simple experiment will convince us, that it is not without influence in this respect: thus, if

a deaf person be about to converse with another, and a wire or other medium of communication be made to pass to the mouth of each, by placing its extremity between the teeth, the deaf person will hear the conversation better than he could do without such assistance. This fact certainly shews that part of the vibrations of sound is carried along the wire into the mouth, and applied to the ear, through the Eustachian tube in the throat; while a part also reaches the ear externally, and is collected in the auricle in the usual manner. M. Itard denies this, on the ground that the sounding body is not heard when applied to the tongue; but he forgets that the tongue is a non-conductor of sound, in consequence of its being soft, while the teeth are good conductors. This assertion is still farther proved by deafness occurring from obliteration of the passage of the Eustachian tube, caused by diseases in the throat, particularly ulcerations from a well-known specific cause.

The Eustachian tube, therefore, besides preserving the balance of air between the external and internal ear, has also an influence in conveying sound; and while the meatus externus admits its application one way, we may conclude that the aperture of the Eustachian tube, to a

certain degree, admits it the other way; so that it may be considered as an accessory means to increase the impression, by driving the vibrations of sound in different directions to one point: hence persons generally hear best with the mouth open, the orifice of the Eustachian tube being then most expanded. It has also been observed of deaf persons, that they hear best when riding in a carriage; probably from the air being brought with stronger impressions to the ear.

In fact, this opening between the ear and the throat is of great consequence, and much advantage may be taken of it in the treatment of deafness. In nervous deafness, I am persuaded, as I have already stated, that too great a quantity of air is often admitted to the ear, as appears from the confused noises complained of, when it does not act with sufficient energy to allow of the impression being made. By lessening, therefore, the action of the air on the external passage, and causing it to pass more forcibly by the internal, I am convinced that deafness may be cured.

With the acuteness and caution which distinguished all his investigations, the late Dr. Wollaston discovered the very singular fact, that

there are many persons who never felt any defect in their hearing, and who yet cannot hear certain sounds which others perceive distinctly.

It is well known, that individuals affected with slight deafness hear sharp sounds much better than those which are grave and low; they distinguish the voices of women and children, from their acuteness, with greater readiness than they do the lower tones of men. This fact is practically acted upon; as it may be remarked, that those accustomed to speak to deaf people use a tone of voice shriller than usual, in preference to one merely louder.

This partial deafness may be artificially produced by shutting the mouth, stopping up the nose, and exhausting the air in the Eustachian tube by a forcible attempt to draw breath by expanding the chest. When this is carefully done, so that the exhaustion of the air behind the drum of the ear is as complete as possible, the external air is felt strongly and even painfully pressing on the drum; and the ear becomes insensible to low sounds, though shrill ones are as easily perceived as ever.

When the ear has been brought into this state, it will remain so for some time, without continuing the painful attempt to breathe, and

even without stopping the breath; for, by suddenly discontinuing the effort, the end of the tube will close like a valve, and prevent the air from getting into the drum. The act of swallowing will open the closed tube, and restore the ear to its wonted feeling.

When the ear is thus exhausted, if we try to listen to the sound of a carriage passing in the street, the rumbling noise cannot be heard, though the rattling of a chain, or a loose screw, remains as easily distinguishable as before. At a concert the experiment has a singular effect; for as none of the sharper sounds are lost, and most of the louder ones are suppressed, the former are in consequence so much the more distinctly heard, even to the jarring of the keys of a bad instrument, or the scraping of catgut unskillfully touched.

In the healthy state of the ear there does not appear to be any strict limit to our power of perceiving grave sounds. On the contrary, if we turn our attention to the opposite extremity of the scale, and, with a series of pipes exceeding each other in sharpness, examine the effects of them in succession upon the ears of any considerable number of persons, we shall find a very distinct and striking variation be-

tween the hearing of different individuals, whose ears are in other respects perfect.

The suddenness of the transition from distinct hearing to a total want of perception occasions a degree of surprise, which renders an experiment on the subject, with a series of small pipes, among several persons, rather amusing. Those who enjoy a temporary triumph, from hearing notes inaudible to others, are often compelled, in their turn, to acknowledge to how short a distance their superiority extends.

Dr. Wollaston found that one of his friends was quite insensible to the sound of a small organ pipe, which was considerably within the range of his own ear. He also remembers a relation to have said that she could never hear the chirping of the hedge-cricket. Two ladies of his acquaintance likewise told him that their father was unable to hear the chirping of the common house-sparrow. This is the extreme limit to acute hearing that he has met with, and he believes it uncommon: to be deaf even to the chirp of the house-cricket is not usual; although it is by no means rare to meet with people who cannot perceive the shrill squeak of the bat.

The range of human hearing comprised between the lowest notes of the organ, and the

highest *known* sound of insects, includes more than nine octaves, the whole of which are distinctly perceptible by most ears. Without indulging in improbable conjecture, it may be inferred from these facts, that insects, such as flies and crickets, whose powers appear to commence where ours end, have the faculty of hearing sharper sounds than any of which we are sensible; and that there may be other insects which produce and hear sounds so sharp as to be beyond our conception.

In the next place, when we examine the nervous texture of the internal ear, designed for receiving the impression, we cannot but conclude that nature has formed these nerves, as I have before remarked, more acute or sentient than others. Nay, they often acquire a morbid acuteness where there is no disease. This is particularly the case after childbirth; and so acutely sensible is the organ in this state, that there are many instances in which a sudden noise has produced syncope and immediate death; and as no traces of disease were discoverable on dissection, extreme sensibility was, without doubt, the sole cause.

From the same cause, namely, its acuteness or delicate feelings, the powers of the ear are

also liable to suspension; and perhaps this is its state in that deafness which often takes place after engagements, both by sea and land, when the tremendous noise acting upon it exhausts and destroys its energies.

Proceeding farther in our examination, we find that the nerves of the tympanum and other parts of the ear, where this exquisite sensibility is *not* so much required, display the natural texture as firm cords, which are consequently a less sensible substance. All these circumstances shew that hearing, or the impression of sound to produce it, requires a higher degree of organisation than the other senses, and a more complex mechanism.

In order to judge properly of the parts more essential to the organ, we must call to our aid the discoveries made by dissection.

With respect to the external ear in man, wherever it is completely removed, whether by accident or design, deafness ensues; but its partial removal is not attended with this imperfection. The external ear, therefore, or something in its form to collect sound, is a necessary portion of the organ.*

* Some naturalists, and even physicians, formerly thought that the loss of the external ear caused barrenness and im-

When we proceed to the internal ear, we find that a partial destruction of the membrane of the tympanum is not necessarily accompanied with deafness; but its total removal is always so. This partial destruction is proved to exist in some persons by their being able to make the smoke of tobacco pass through the throat, by confining the mouth and nose, in consequence of its entering the Eustachian tube, and thus going out of the external ear, which could never take place without an opening or perforation of the membrane of the tympanum.

Ulcerations of the ear in childhood frequently destroy a part of the membrane of the tympanum; yet the child, as it grows up, continues to hear, without any perceptible inconvenience; but, in order to hear with ease, it seems necessary that the membrane of the tym-

potency; and this foolish and groundless notion was the reason why the ears of thieves and other miscreants were cut off, that they might thus be prevented from procreating children, who, it was thought, would probably inherit the vices of their parents. There are also some curious English enactments which order the ear to be cut off for various misdemeanours, such as fighting in a churchyard, workmen combining to raise their wages, &c. &c. By a statute of Henry VIII., any person maliciously depriving another of his ear, was to pay heavy damages to the sufferer, and a fine of 10*l.* to the king.

panum, even though partially destroyed, preserve a certain degree of tension; it being the medium by which sound is impressed on the organ; in the same manner as beating the parchment of a drum gives expression to that instrument.

As a proof of this, there are cases of partial deafness recorded, in which persons could only hear when a strong sound, such as that of a bell, was applied to the ear; and in one case of this kind, related in the French Memoirs, it appeared, on dissection, that the sole cause of the deafness was a highly relaxed state of the membrane.

Yet not only may the membrane of the tympanum be partially destroyed, and hearing still be preserved, but the small bones of the tympanum have likewise been lost in certain cases, or come away from ulceration, through a constitutional or other cause: but it appears that, in such cases, the stapes was, in most instances, left, and thus the openings of the fenestra ovata and rotunda were preserved, which prevented the escape of sound from the labyrinth and internal parts.* Where the stapes

* Robbi's Encyclopædia of Anatomy.

is removed by opening the internal ear, deafness unavoidably ensues.

With respect to the Eustachian tube, its aperture into the throat seems indispensable to hearing; and wherever closed, from malformation or disease, deafness is the certain consequence. I have already mentioned that its obliteration in the throat sometimes happens from a particular disease; which is a strong reason for early attention to such complaints:* but the same thing is apt to occur from a catarrh or common cold, if violent and long continued.

Dr. Robbi of Leipsic, who has done me the honour to dedicate his valuable *Encyclopædia of Anatomy* to me, and also to translate the first edition of this treatise, as well as another of my works on the ear, into the German language, makes the following remarks:—"Every obstruction of the meatus may properly be considered an ordinary cause of deafness; for the air penetrating through this canal into the tympanum,

* The poison of these maladies has a peculiar action on the nervous system; hence, when the disease lurks in the habit, there is often a dulness and inaptitude of all the nerves to receive impression, particularly those employed in the more active organs.

receives, together with the sounds taken up by the mouth, a considerable part of the sound passing through the exterior passage, and carries it again farther into the labyrinth, through the membrane of the fenestra rotunda: consequently, not only every sound formed in the mouth must be immediately lost, through the obstruction of the Eustachian tube, but also the reception of sounds penetrating into the passage will at the same time be diminished."

He also cites a case from Valsalva, in which "a man, who had a swelling of the throat on the left Eustachian tube, lost his hearing instantly when a tent was put into it; but if the tent was taken out of the mouth, the hearing was again restored. We can from this very easily perceive, that the swelling always gets larger by the introduction of the tent, and that the cartilaginous extremity of the tube lying near it is consequently pressed together.

"Diseases of the throat, as swelling of the palate, violent cold, and inflammations of the tonsils, are frequent causes of deafness, by which an obstruction of the Eustachian tube is produced, if they have not been duly attended to; and consequently, if such affections have previously existed, there is good reason to suspect

that the source of the deafness originated in such an obstruction.

“ But,” Dr. Robbi proceeds, “ besides this, there are still some other and more certain marks, by which the obstruction of the Eustachian tube can very easily be distinguished from other causes which relate to the acoustic nerves. Patients who labour under this disease have by no means that disagreeable feeling of the impression which is usually derived from the air forced by the tubes upon the membrane, when they fetch breath forcibly: the mouth and the nose being shut up, they have a perpetual tingling in the ears, and it appears to them that there has been a sound without the ear, which they think they have heard; but the cause of this is the air still shut up in the tympanum; and the best idea one can form of it, is by passing two fingers into the exterior passages, and thus preventing the possibility of this air escaping. When the two conduits are stopped, the patients either do not hear at all, or hear but imperfectly, and open their mouth: when they wish to hear distinctly, they incline the ear to press it forward, by putting the hand behind it, the better to receive the sounds of the vibration. Such persons hear better where there is much noise than in quiet places.

“ They have also a louder voice than before. If the passage be artificially and entirely shut, then the hearing is wholly lost ; but this is only the case when both the tubes are stopped. If the air included in the tympanum breaks violently through the Eustachian tube, it seems to the patients as if they heard a sound somewhat like the noise of the firing of cannon ; and they afterwards recover their hearing spontaneously, or at least they hear better for a time.

“ Judicious as the operation of puncturing the membrane of the tympanum may be, we ought by no means to proceed to it immediately ; but when all other remedies have been found useless, and it can be proved with certainty that the disease is merely an obstruction of the tube, it may be performed. Many means have already been employed, with more or less success, for curing obstructions of this kind ; consequently, if it be but in the anterior part of the tube, and we find only an accumulation of glutinous matter, it may be alleviated by frequent yawning, gargling, loud speaking, and coughing, by a strong blowing of the nose, sneezing, &c. ; as the cartilaginous and membranous parts of the tube, being very easily shaken by all motions of this kind, are thus

freed from their slimy accumulations. But the best remedy for curing a slight obstruction of the Eustachian tube consists in keeping the mouth and nose closely shut, and then forcing the breath from the lungs. The air compressed in this manner in the mouth and nostrils is obliged to gain an issue, which it finds no where easier than in the opening of the tube. The air penetrating with violence towards this tube, the obstruction is divided and removed by the pressure, during which the patient feels a considerable noise or cracking in the inside of the ear.

“ In cases where mucus obstructing the Eustachian tube is movable and lies deeper, an injection is usually made into those canals, which is effected through the nose or mouth, sometimes through the pierced congenital inspissation of the cerumen, and sometimes through the exterior passage, or through the pierced tympanum. For this purpose a silver tube is used, which must be introduced with great caution into the mouth or nose, and into which is screwed a syringe filled with warm water or any mild fluid. But the introduction of such tubes is extremely difficult, and cannot be effected in many cases, on account of the particular irritability of the parts.”

The following, according to Dr. Robbi, is Lentin's method of cure:—Let the orifice of the tube be touched with a bit of sponge which has been dipped in some stimulant fluid, and fastened on a bougie having a pierced tin plate at its extremity: this will powerfully assist in dissolving the hardened matter in the canal, and be of great use before the employment of injections. Experience has shewn that injections through the inspissated cerumen are often fruitless, and sometimes even productive of bad consequences; yet they are certainly to be preferred to piercing the tympanum. If we suspect caries, or an exfoliation of the interior of the petrous portion of the bone or its cavities, perforations of the inspissated cerumen are very advisable.

The secretion of the ceruminous glands in man is of the greatest consequence to the organ of hearing, and should always be kept in view in judging of its diseases. From the moment these glands are formed, even before birth, as may be seen on dissection, their secretion is poured out, and accordingly in infancy an accumulation is frequently found in the ear: it varies in quantity in different individuals, according to habit of body and other circum-

stances, as do the other secretions, which are, in a certain degree, influenced by constitution, mode of life, and a variety of other causes. As an accumulation of this secretion in early life is a very frequent source of deafness, it should, in all cases, be strictly inquired into.

Though hearing is more perfect in man than in any other animal, it is not so at the period of birth—an infant hears at first but very imperfectly: this arises, in part, from the passage, or meatus externus, being covered with a viscid mucus, or discharge from the ceruminous glands of the ear, in a similar manner as the meconium fills up the intestines. On the removal of this original layer, or deposition, the sense soon appears equally perfect as at any future period of life. Much advantage may be taken of this circumstance, in the treatment of deaf and dumb children in early infancy.

In all dissections of old persons who have been deaf for years, on examining the internal ear, it has been found totally dry and void of the secretion, or fluid, which ought to be met with in its sacs and membranes. Such a state is frequently the result of age; yet it may be induced by various causes, especially fevers, of which deafness is often a consequence.

M. Portal remarks, that the greater the degree of softness preserved by the acoustic nerves, the fitter they are to preserve the impressions of sounds. Hence it happens that, in young people, in whom the substance of the nerves and brain is softer, and the water of the vestibule more abundant, clear, and limpid, than in advanced age, the membranes of the fenestra rotunda and ovalis are more flexible, and hearing more sensitive and fine, than in old people, in whom the substance of the brain and nerves is more compact, and the membranes harder and more solid.

We are unacquainted with the means by which the water of the labyrinth is secreted or excreted, for no lymphatic vessels have yet been found: all we know is, that the two canals discovered by Cottugno are full of it; though we cannot doubt that this aqueous liquid is renewed, and that hearing is the result of the impressions upon the acoustic nerves, through the medium of the water of the labyrinth.

I have endeavoured to shew that the air is the great medium through which sonorous bodies act on the ear; and that its entire exclusion prevents our hearing sound, however strong: on the same principle, the condensation of air in-

creases the force of sound, in proportion to the degree of condensation.

Water, likewise, is an equally effectual medium with air, and a bell rung under water is heard with the same distinctness as if rung in the air. This effect is strongly conspicuous in echoes or reflected sounds; for where the sound has to pass over a lake or sheet of water before it reaches the hard or obstructing body, it is much stronger than in another situation: a famous instance of this is familiar to travellers, in the echo of Portici in Italy.

The well-known experiments of Professor Monro on this subject deserve also to be noticed. He rung a bell under water at various distances, and found the transmission of sound as distinct as through the air, and often stronger and graver.

From this general view, then, of the organ, the parts strictly essential to hearing are,—

First, An external ear;* for, whenever this

* The external ear can only be considered as accessory in its functions to the internal; and it was thought by the Count de Buffon, that hearing could take place without it. This he deemed to be proved by the instances of dogs, and other animals, which, from the whim of their owners, being occasionally deprived of the external ear, suffer no defect of hearing from the operation. And though this may be true in young animals, and while the expansion of the auditory nerve

part is completely removed in man, deafness is the consequence.

Secondly, The membrane of the tympanum, which may be partially injured, but cannot be entirely lost without producing deafness.

Thirdly, The stapes: all the small bones of the ear may be removed without causing deafness; but the stapes is the only one that prevents the escape of sound from the internal ear.

Fourthly, The aperture of the Eustachian tube, as preserving the access of air through the throat to the tympanum, and its renewal and change in the organ; and that this is a necessary and essential part is evident from the structure of the ear in the tortoise and frog, which have no external ear, but an enlarged Eustachian tube, placed at the back part of the roof of the mouth.

on the internal ear possesses its full powers to receive the impression of sound, yet it is clear that in the human subject such a loss would be severely felt; a fact which is confirmed by the advantage of artificial means in collecting the sound, and strengthening the power of impression. Besides, in cutting off the external ear in animals, part of the muscles still remain; and by a natural instinct, the animal acts with the remaining portion with more energy, and applies it more eagerly and forcibly to the sonorous body than before their partial removal; which entirely overthrows Buffon's assertion.

Fifthly, The presence of a fluid in the internal ear, which is necessary to heighten the acuteness of impression, and to render it effectual.

It now remains to notice in what manner the impression on these parts comes to be made, or how the tremor from sonorous bodies is brought in contact with the nerves of the internal ear. In man, quadrupeds, and birds, besides the impression communicated to the nerves of the ear by the bones of the head conjointly, a distinct impression may be conveyed to them in three different modes :—

1. By the structure of the parts, regulated by their muscles, which connect the membrane of the drum with that of the foramen ovale.

2. By the action of the air contained in the cavity of the tympanum, which air must communicate its tremor in two ways ; first, by motion from the membrane of the tympanum ; and, secondly, by tremor of the external air communicated to the orifice of the Eustachian tube.

3. Through the medium of a watery liquor in the cavities of the vestibule, semicircular canals, and cochlea, which transmits the tremor from the membrane of the oval and round foramina to the portio mollis, or nerve of the internal ear.

M. Ribes, in a paper in Majendie's Journal, says he found the watery liquor filling only about one-half or two-thirds of the labyrinth; and in individuals who had heard perfectly during life, there was merely enough to lubricate the interior of the concha, the vestibule, and the semicircular canals. The aqueducts of the vestibule and concha give passage to vessels, to be distributed in their cavities, and these vessels are often found gorged with blood in persons who have died of apoplexy.

Such as I have endeavoured to describe it, is the complex and minute structure of this important organ;—and when we attend to the intricacy of its parts, to the delicacy of its texture, and to the numerous windings and sinuosities it every where displays, we are struck with wonder and admiration at the nicety of its mechanism, and cannot be surprised that the least change should produce in it a deviation from the healthy state.

When we farther contemplate the varied organisation of the ear in the different tribes of animals, we shall find it in all of them admirably fitted for their different situations and characters; and by a comparison of the various tribes, we shall see the reason for its apparent difference

of structure in each. Thus, the whale, though it would seem to be amphibious, has the same formation of heart and lungs as man, and is therefore obliged to breathe frequently and regularly, and to live chiefly near the surface of the ocean. Hence its ear is constructed to receive sound from the air by an external meatus.

But in the real amphibious tribe, in which only part of the blood passes through the lungs, and which possess the power of breathing at pleasure, or of plunging under water and ceasing from breathing for a length of time, the ear is so adapted as to receive the first impression either from air or water. By means of an expanded Eustachian tube, air is introduced into the cavity of the tympanum when they breathe, and through it also the impression is conveyed from the atmosphere (to which their ears are generally exposed) to the bottom of the ear, with more force than it would have been by the medium of a watery fluid passed into the cavity of the tympanum.

In fish, as they both live and breathe in water, not only is the impression of sound on the surface of the ear transmitted, but it is also conveyed by the same medium to the bottom of the ear.

Semicircular canals, similar in shape and situation to those in quadrupeds, are conspicuous at the bottom of the ear in all fish; but these are much larger and more extensive in their surface, to compensate for the less forcible impression made on them by the water, than in man and quadrupeds by the air.

Along with these semicircular canals there are also sacs, which resemble the cochlea in man, and supply its place in the same manner as a short straight tube does in birds. The stones or hard bodies in the ears of fish likewise serve, as do the bones in the human ear, to render the impression more forcible on the nerves spread over the membranes containing them. In several fish, too, which have an external meatus, the sound is conveyed by a watery viscid liquor to the semicircular canals and sac that contains the cretaceous or stony matter.

Thus, the more we contemplate the varied structure of this sense, the more shall we be convinced that it is the work of the infinite power of the Supreme Being, who has adapted every creature for its condition. All our researches in anatomy serve to point out this fact, but none more strongly than an investigation of the different organs of sense. A nervous

expansion we find to be the universal medium on which the impressions are made, and through which they are conveyed. Such being the case, all the senses may be considered as in a manner resembling each other, and differing only in their peculiar modification, or what may be termed the auxiliary organisation of the parts that transmit the effect to the mind.

CHAPTER II.

OF THE DISEASES OF THE EAR.

I SHALL now proceed to examine the leading diseases of the ear, or those imperfections which either impair or produce a total loss of hearing. For the clearer understanding of their nature, they may be classed according to the different parts of the organ in which they are seated; and may thus be divided into, diseases of the auricle, or external ear; of the tympanum, or drum; and of the labyrinth, or internal ear. For a nosological arrangement of them, I beg to call the attention of the reader to the following classification, which I published separately some years ago, so as to shew at one glance the seat, symptoms, causes, and treatment of each disease, in order that my views and mode of treatment might be more generally known to the profession.

MORBI AURIS HUMANÆ :

DISEASES OF THE HUMAN EAR.

Order I.—*Morbi Auris Externæ : Diseases of the External Ear.*

Genus I.—DEFECTUM.

The Auricle Defective.

- Species 1. *Auricula deficiens.* Auricle wanting.
 2. *Auricula plana.* Auricle flat and thin.

Genus II.—IMPERFOSSUM.

Imperforated Meatus Auditorius Externus.

- Species. *Meatus deficiens.* Meatus wanting.

Genus III.—DEFORMATUM.

Faulty Shape of the Meatus Auditorius Externus.

- Species 1. *M. perminutus.* Meatus very small.
 2. *M. peramplus.* Meatus very large.
 3. *M. tumidus.* Ceruminous glands and integuments tumid and thickened.

Genus IV.—IMPEDITUM EXTERNUM.

Obstruction of the Meatus Auditorius Externus.

- Species 1. *Impeditio ab extraneis.* From extraneous bodies.
 2. *Imped. ab induratis.* From indurated wax.
 3. *Imped. polyposa.* From polypi.
 4. *Imped. ab excrescentibus.* From excrescences.

Genus V.—IMPERFECTUM.

Imperfect Secretion of Wax.

- Species 1. *Im. quantitate.* In quantity.
 2. *Im. qualitate.* In quality.
 3. *Im. utrisque.* In both.

Genus VI.—INFLAMMATUM EXTERNUM.

Inflammation of the Parts comprehended in the External Ear.

- Species 1. *Inflammatiō, auditu permanente.* Inflammation without diminution of hearing.
 2. *In. aud. diminuto.* Inflammation with diminution of hearing.
 3. *In. suppurata.* Inflammation with diminution of hearing, accompanied by discharge from ulcerous eruptions.

Order II.—*Morbi Auris Intermediæ: Diseases of the Intermediate Ear.*

Genus VII.—INFLAMMATUM INTERMEDIUM.

Inflammation of the Parts comprehended in the Middle Division.

- Species 1. *Inflammatio intermedia simplex.* Inflammation without diminution of hearing.
2. *In. in. febrilis.* Inflammation with diminution of hearing, and fever.
3. *In. in. febrilis et clausa.* Inflammation with diminution of hearing, fever, and closure of the Eustachian tube.
4. *In. in. purulenta.* Puriform discharge from the tympanum; great diminution of hearing, fever, and sometimes accompanied with polypi or fungi.

Genus VIII.—SPASTICUM.

Spasmodic Pain felt suddenly in the Tympanum.

- Species. *Spasmus subitus.* Sudden acute pain in the tympanum.

Genus IX.—IMPEDITUM INTERMEDIUM.

Obstruction of the Eustachian Tube.

- Species 1. *Obstructio tubi Eustachii ab ulcere.* From ulceration.
2. *Obs. ab adhæsione.* From adhesion.
3. *Obs. a strictura.* From stricture.
4. *Obs. ab induratione.* From induration.
5. *Obs. polyposa.* From polypus.

Order III.—*Morbi Auris Internæ: Diseases of the Internal Ear.*

Genus X.—INFLAMMATUM INTERNUM.

Inflammation of the Parts comprehended in the Internal Ear.

- Species 1. *Inflammatio labyrinthi.* Inflammation in the labyrinth; deafness, and fever.
2. *Inflammatio labyrinthi et cerebri.* Inflammation in the labyrinth, cerebrum, and its membranes, accompanied with total deafness and fever.

Genus XI.—INFIRMATUM.

Debility of the Auditory Nerve without Inflammation.

- Species 1. *Cophosis imperfecta.* Imperfect hearing.
- a. *Atonica.* From decay.
- b. *Organica.* From previous injury or disease.
2. *Paracusis* (wrong hearing). False hearing.
- a. *Imperfecta.* Sounds perceived, but not accurately, or in the usual way. It varies
- a. From dull hearing.
- b. From too exquisite hearing.
- c. From external sounds doubled from internal causes.
- d. From sounds not being heard unless another loud sound be joined with them.
- b. *Imaginaria* (imaginary sounds, tinnitus, &c.)
- Sounds excited by internal causes.

Genus XII.—INHABILE.

Incapability of the Auditory Nerve for Sensation.

- Species 1. *Surditas congenita*. Deafness at birth.
 2. *S. atonica*. From a paralytic affection of the nerve.
 3. *S. organica*. From destruction of internal parts of the ear.

The varieties of dumbness are—

- a. *Mutitas congenita*. From congenital deafness.
 b. *M. infantilis*. From early loss of hearing.
 c. *M. organica*. From loss or injury of the tongue.
 d. *M. atonica*. From injury of the lingual nerves.

DISEASES OF THE EXTERNAL EAR.

The diseases of the external ear, like those of other parts, partake of the nature of its structure; and as this is neither important, complex, nor extensive, they are, generally speaking, simple and confined: indeed, as a cartilaginous basis with a cutaneous envelope, the external ear is subject to the same affections as other exterior parts; and the chief of these, requiring the more particular attention of the surgeon, are inflammation, and that herpetic eruption which occurs so frequently in children.

I. *Of Inflammation.*

I may remark on the subject of inflammation, that it has been so often and so ably investigated, that little of absolute novelty can now

be expected respecting it: what I have done in the following pages, is, chiefly, to give a description of those symptoms that have come under my own observation.

The invariable effect of inflammation is to enlarge the bulk of the part it attacks, and when this is a solid structure, which does not readily yield to the distension, the inflammation is thereby aggravated. This is what happens in *otitis*, or ear-ache: on account of the dense nature of cartilage, the pain is vehement and excruciating, and fever is the usual consequence of such painful excitement, although, like tooth-ache, it rarely meets with sympathy: hence it is apt to be neglected on its first attack, and not unfrequently proves fatal, after evincing symptoms of cerebral affection. On dissection, collections of pus have sometimes been found in the cavity of the tympanum, and the dura mater inflamed, thickened, or softened, and detached from the internal surface of the skull.

M. Lallemand, the celebrated professor at Montpellier, in his anatomical and pathological researches, remarks that acute *otitis* is rather more frequently seen before than after puberty; but both sexes, and all temperaments, seem equally exposed to its causes. External *otitis*

is often produced by some cutaneous affection extending to the mucous membrane of the meatus externus—more particularly in variola. In such cases, the inflammation very readily spreads to the interior of the ear, often inducing caries of the bones, permanent deafness, or fatal affections of the brain itself. Among the accidental causes, cold suddenly applied to the ear through the medium of a stream of air is one of the most common. Internal otitis very frequently takes place in the latter stage of fevers—not, he observes, as a critical turn of the disease, but because fever is, in fact, inflammation of the brain, and the ear, being so contiguous an organ, is oftener found to suffer than any other.

External otitis is less formidable than internal, and is distinguished by the suddenness of the discharge after the pain has commenced. On the second or third day, the lining membrane of the meatus externus is red, tumefied, and covered with pus, or a puriform secretion. In internal otitis, on the other hand, the lining of the meatus continues dry for several days, and at length the discharge comes on all at once, and is very profuse; in such cases making its way through the Eustachian tube, and continuing to flow through that channel.

Internal otitis is often accompanied by symptoms similar to those of inflammation of the brain or arachnoid membrane—with which, indeed, it is not seldom complicated, so as to render the diagnosis extremely difficult. Thus, in otitis, the pain is not always confined to the ear, but sometimes extends to the whole head, being more or less violent, lancinating, and compressive. The connexion of the portio dura of the auditory nerve with so many other nerves may explain the spasmodic affections, and many other symptoms accompanying inflammation of the internal ear.

As to the cure of this affection, the *methodus medendi* differs in nothing from that found effective in other inflammations, and if acute, it may, in general, be completely cured, without any vestige of it remaining; but the case is different with chronic, it being seldom indeed that those who have been long subject to it wholly recover their hearing. If the attack be slight, moistening the part constantly with a cooling lotion, low diet, and saline purgatives, are the most proper remedies: but where the disease is more acute, leeches must be applied to the inflamed organ; and in order to procure relief from pain, an anodyne draught may be administered at bed-time.

The success of resolution, or subduing inflammation, is known by the gradual abatement of pain; but should the preceding means fail of producing the desired effect, then suppuration must be promoted, and the former plan laid aside, substituting, in its stead, warm applications and poultices to the ear. In some constitutions, however, it may be observed, that so rapid is the process of inflammation in this part, that suppuration is unavoidable.*

My own experience confirms the remark of an excellent writer, namely, that when suppuration occurs, the pus is generally vacated between the auricle and mastoid process of the temporal bone, or into the meatus auditus. In the first instance, the abscess heals without much difficulty, from the ready exit the matter finds; but in the latter case, the aperture by which it escapes into the meatus is sometimes so contracted, that the pus accumulates, and forms a source of painful excitement. The contact of matter in the contiguity of a bone, also, is apt to occasion caries, and consequent exfoliation; hence it becomes an object of the utmost importance to prevent such occurrences; in order to

* Dr. Kennedy of Glasgow, in his observations on practical pathology, recommends emetics in cases of otitis.

which, a free opening must be made in the sinus, and its orifice enlarged, or, what is perhaps better, the point of a lancet may be thrust into the abscess behind the ear, the dependent situation of which will permit the easy discharge of the matter, as soon as it is secreted.

The time of teething is the period when this disease is most apt to occur in young children; and hence its acuteness may be accounted for, which often requires the palliative powers of opium to lull the intense pain it occasions. It is more frequent in scrofulous subjects than others, which points out the propriety of early resolution.

II. *Herpes.*

Another disease of the auricle, more frequent than the former, is herpes. This consists in a vesicular eruption set upon an inflamed base. Usually, from the situation of the part affected, and its being handled, the vesicles are broken, a copious foetid discharge takes place, and a troublesome and tedious ulceration ensues: this, when it has continued for some time, induces a thickening of the cutis covering the external ear and lining the passage, which, together with the inspissation of the discharge in the meatus,

so narrows the entrance as to cause a temporary deafness, from the obstruction offered to the free ingress of sound to the tympanum.

Though the principle of the treatment be to correct the constitutional acrimony, yet the state of the part, at the same time, requires a primary attention. The inspissated matter is to be removed, by properly syringing the passage with soap and water ; and, to do this completely, the choice of a syringe is a matter of consequence. One of a moderate size will answer the purpose best, the power of which is not too great ; and the operation should never be trusted to any but a skilful hand. After thoroughly cleansing the ear, an alterative injection is to be employed, instead of the soap and water ; and the constitution should be corrected by alterative medicines, in small doses, until health is restored.

The period for a cure may extend from two or three weeks to as many months, according to the circumstances of the case, in respect to its severity and constitutional nature ; and, in order to be successful, this treatment should be continued in a regular and steady manner.

III. *Morbid Septum of the Passage.*

Congenital malformations occur occasionally in new-born infants to such an extent as to deserve the appellation of monstrosities.* Less degrees of this preternatural formation, being of minor importance, are not usually thus designated: of this kind are septa where there ought to be apertures. These are met with in various openings, and are at times discovered in the external ear. A septum is found to extend across the meatus, which necessarily excludes

* The following case is recorded in the *Zeitschrift die Geburtstunde*:—

“ A female, thirty-six years of age, of a good constitution, and mother of four children, fell during the sixth month of her fifth pregnancy, and struck the abdomen on the edge of a tub; she experienced a violent pain in the abdomen, and the movements of the child became much less than they had previously been. After about a fortnight they became as strong as before. In November, 1827, she was delivered of a child, which was regularly formed with the exception of the left ear, the helix of which was pushed anteriorly, and had in its middle a deep incision, which also traversed the antihelix and tragus, and continued over the cheek towards the nose, where it terminated. The meatus externus was obliterated; behind the ear there were four lenticular depressions. In 1829 the child was in good health, and heard quite well with the right, but not with the left ear.”—*Lancet*.

the vibration of sound on the tympanum from without ; hence deafness is the natural consequence. This extraneous formation is also the effect of disease, and is produced, though seldom, by the ulcerative process ; but it more frequently arises from a diseased tympanum than from any other cause, where the suppuration is copious, and much matter has been forced out into the passage.

The following is the usual progress of the disease :—The patient, after a puriform discharge from the ear, feels a sudden and considerable increase of deafness, to which the original complaint has, in a certain degree, subjected him. During this primary state of deafness, he has been sensible also, on blowing his nose, of air passing at times through the meatus ; but the puriform discharge having now ceased, and the patient, on blowing the nose, being no longer able to feel air escape through the passage, the existence of a septum is undoubted. To this may be added, the sensation of a particular fulness of the tympanum.

If, under these circumstances, the person be placed in a clear light, and the ear examined, a septum will be perceived : this is to be pierced and lacerated ; which being done, the hearing

will be restored to the same degree in which it prevailed under the diseased tympanum, and before the septum had formed.

So quickly is the hearing restored, that, immediately after the operation, the ticking of a watch, which could not have been perceived before, even when close to the ear, has been heard at a considerable distance.

After the operation, much attention is necessary to prevent the closing of the sides of the aperture, and the reproduction of the septum.

IV. *Polypi of the Ear.*

All secreting surfaces are liable to excrescences, which, although their most common seat is in the mucous membrane lining the cavernous structure of the nose, are yet found also in the uterus. In like manner, the meatus of the external ear is subject to excrescences, which are usually the consequence of a diseased tympanum, and they are rarely met with but from this cause. They have been aptly compared to syphilitic warts, and, like them, they are generated by irritation.

The treatment for the removal of these polypi is the same as for excrescences else-

where. When small, they are best extracted with a pair of forceps, and the root or part to which they adhered afterwards touched with the argentum nitratum, or lunar caustic. In introducing the caustic, care must be taken not to carry it so far as to injure the tympanum; and, this caution being attended to, the treatment will generally be successful.

Where the polypus is appended to a small cervix or neck, a ligature is the preferable mode of removing it. The operation is also less alarming to the patient, and, at the same time, as effectual as the forceps or knife.

Valsalva relates a case of a gentleman who lost his hearing by a polypus in the nose, which extended to the uvula; and another of a peasant who became deaf in consequence of an ulcer on the left side of the uvula. It has been observed by a well-known lecturer, that excrescences of the nature of polypus in the nose and throat extend in a posterior direction, and frequently produce deafness.

V. *Inspissated Cerumen.*

The most frequent cause of deafness, connected with the state of the external passage,

is that arising from collected cerumen, or wax. A due secretion of the passage is absolutely necessary to keep it in a healthy condition, as well as to preserve it from external injury; but a defective, or too profuse, secretion is equally the cause of deafness; and the cerumen frequently becomes indurated and inspissated to such a degree as to cause obstinate dulness of hearing.

The natural secretion of the ear varies in different individuals, in some being copious, while in others it is sparing in quantity. How it is excreted, has puzzled physiologists to explain; but the usually received opinion is, that the fresh secretion expels the older, which process is assisted by the occasional dependent position of the ear. Where it for me to add another, and perhaps more powerful, expelling force to the above, it would be that of mastication. Any one may convince himself of this power by putting his finger into his ear and imitating the act of masticating. Nature never made a function imperfect; and in the present instance we have a happy, though subsidiary, instance of her ingenuity—where the same act that receives and prepares the food, at the same time expels the cerumen from the ear.

M. Alard mentions a case of catarrh of the ear, produced by a change in the secreted cerumen, which became acrid, and caused inflammation and a discharge of matter. It is also stated by M. Itard, that the pressure and irritation of the hardened wax will sometimes cause the skin of the meatus to slough.

I have often been surprised to see how small a portion of hardened cerumen will sometimes occasion deafness, which effect is produced by its induration, not by its bulk. When this substance has accumulated on the membrane of the tympanum, it, of course, interferes with its vibrations; and when abundant, wholly obstructs the passage.

The symptoms which chiefly mark this complaint are, that with the general sense of deafness there is combined the impression of noises in the ear, which consist either of a particular confused sound, or a heavy sensation like the noise of a hammer, and that they prevail most while eating.

On ascertaining the presence of these symptoms, and examining the ear, the cause of deafness will readily be detected.

The best method of relief is simply to syringe the passage well with warm water, which Dr.

Haygarth, and after him Fourcroy and Vauquelin, found to be the best solvent of ear-wax, and the only means necessary.

On the removal of the inspissated cerumen the patient is instantaneously relieved, and the hearing restored. Even where there is no defect or imperfection of the organ, the operation of washing it out generally produces a slight irritation, in consequence of the strong excitement occasioned by forcing the fluid into the passage; but this soon ceases, without being followed by any unpleasant effect.

This disease, however simple, has often been mistaken or overlooked, and the cause been supposed to lie deep in the structure of the organ, whilst, in fact, it arose merely from the source above pointed out. This shews the necessity, in all cases of deafness, of ascertaining, by an accurate examination, whether such a mechanical cause exists.

Dr. W. Hunter relates a singular case of a musician who was deaf for some time from the inspissation of the cerumen, and whose hearing, after its removal, was so acute that the common sound of any one conversing was too powerful for him, and caused pain; but this gradually wore off.

VI. *Accidents.*

The external passage, from its situation, is subject to occasional accidents, or other mechanical causes than inspissated cerumen acting upon it.

Thus, children sometimes get small bodies, such as peas, cherry-stones, pins, nails, &c.* into the ear, where, exciting inflammation, they often occasion considerable pain before being removed. A number of remarkable cases of such accidents will be found related by medical authors; and one in particular is recorded by Hildanus, where a bead or ball of glass lodged in the passage and produced delirium.

The great art in extracting extraneous bodies is to be cautious not to push them deeper. They are best taken out by a pair of small forceps, and a little oil may be dropped into the ear before making the attempt.

Mr. Cline was of opinion, that when the extraneous body occasioned no pain, it was better to leave it to nature, as the secretion would in time dislodge it. In upwards of forty

* A fatal occurrence of this kind lately took place at St. Bartholomew's Hospital; for the particulars of which, see the *Lancet*.

cases that have occurred to me at the Dispensary and in my private practice, I have invariably adopted this course, and have always found that the substance came away without interference. Another argument which may be adduced against the forcible removal of a foreign body consists in the fact, that should it cause irritation, supuration of the parts will probably ensue, and with the discharge the offending substance will in all probability be expelled.

Insects also at times get into the ear, and produce the most unpleasant feelings in the part, as well as great noise, and often actual pain. The best way of removing them is to destroy them, by filling the passage, by means of a syringe, with mild fluids, such as water or oil, and thus washing them out.

Several singular cases of worms having been found in the ear are related by foreign physicians. The alimentary canal has long been known to be a common seat of these parasitical animals; and Redi, Andry, Pallas, Joerdens, Brera, Rudolphi, and Bremser, have shewn that there is scarcely a part of the human body in which they have not been met with. It has been said, that the obscure and hopeless nature of these diseases renders all inquiry into them

fruitless, and therefore unnecessary ; a principle which, if acted upon, would put an end to all scientific research.

Acrid liquors are improper ; for, in endeavouring to avoid them, the insect gets deeper ; the motion of which is often so severely felt by children as to produce a state little short of delirium. After the removal of the insect, a little oil of sweet almonds is the best application, to soothe the irritated part. Even a little oil, in the first instance, will destroy the insect.

VII. *Congenital Inspissation of Cerumen.*

This is a disease more frequent than is generally supposed. All the secreting passages in children, at birth, are lined with a tenacious layer of this natural secretion ; it is seen in the bowels, in the state of meconium ; and no less in the ears, in the form of viscid wax. The reason of this is, that the parts of the concha and passage are narrow, and such an accumulation is essential to defend the tympanum from the waters of the amnios.

In every case of apparent deafness and dumbness in children, the ears should be examined, in order to see whether the defect be or be not connected with this cause.

CHAPTER III.

DISEASES OF THE TYMPANUM.

I. *Puriform Discharge from the Tympanum.*

THE first disease of the tympanum is that named, from its leading symptom, the “puriform discharge;” and of this I shall proceed at once to describe the nature, progress, and effects.

The discharge from the ear is thin and ichorous, and so virulent in its nature, as slightly to corrode a silver probe; which it stains of a yellow colour, occasionally tinged with blood, from the effects of the corrosive ulceration going on in the interior. The hearing naturally becomes impaired, from the injury produced by the disease, and in many cases is wholly lost.

The leading criterion that marks the existence of this disease is the passage of air, on blowing the nose, by the meatus externus, which, of course, can never occur except where there is a perforation in the membrana tympani. But this, although a pretty constant symptom, must not be looked upon as an absolutely necessary characteristic; for where the inflammation that

induced the suppuration has first of all obstructed the Eustachian tube, all communication between the mouth and external meatus is in consequence prevented, even though the membrane of the tympanum be pervious and ulcerated.

When, therefore, the air passes out of the external ear, accompanied with a puriform discharge, we can no longer doubt the nature of the complaint; still, as this criterion may be wanting, from the cause we have noticed, it becomes incumbent on us to examine the ear itself.

In order to do this, let the diseased side of the patient's head be turned towards a good light, so as to permit the rays of the sun to fall on the bottom of the meatus externus; which, by being extended with a proper instrument, will enable the surgeon to perceive the part morbidly disorganised, and thus to determine the nature and extent of the injury. In cases where, from some cause or other, ocular demonstration is unattainable, a probe being inserted into the ear, and passed down to the membrana tympani, the peculiar feel which this communicates, if sound or otherwise, will indicate the extent and progress of the disease. But this requires the *tactus eruditus*, or touch of experience, which practice alone can give.

The diagnosis of this disorder is simple, and, except with the herpetic affection before mentioned, it cannot well be confounded with any other. This is a matter of some importance, since in the one we may almost invariably promise a complete cure, whereas, in the latter, caution must be used in pronouncing any such favourable prognosis.

This affection of the tympanum is produced by various causes, the most frequent of which are diseases of the throat. Thus, the scarlatina maligna, or scarlet fever, combined with an affection of the throat, frequently brings on disease of the tympanum, in consequence of the gangrene, or sloughing, which takes place: even the bones of the internal ear are at times thrown off; and the patient, if he survive the fever, is left completely deaf.*

* M. Saissy observes, that the *membrana tympani* may be broken, or partly or even totally wanting. Several causes may rupture it, the most frequent of which is the erosion of the pus. Its partial destruction occasions hardness of hearing, but not complete deafness. Many examples of this, which have come under my own observation, might be cited. But the case is otherwise when the membrane is wholly wanting, because, being intimately connected with one of the principal bones of the ear, its articulation suffers when the union is defective.

The disease, also, often succeeds the ear-ache, or inflammation of the passage extending to the tympanum; and if the inflammation be not subdued by resolution, the tympanum and mastoid cells become filled with pus, or matter, which, after the patient has suffered most intense pain, is discharged by ulceration, in large quantities. During the progress of the complaint, the discharge of matter produces, for a time, a mitigation of pain; but, as the disease goes on, fresh matter is formed, and continues to ooze from the passage.

Duverney and Leschevin are of opinion that preternatural tightness of the tympanum arises from violent pains in the head, as well as from those fevers which have a tendency to produce frenzy. To these more frequent causes I think severe sore throat should be added, in which complaint the inflammation reaches to the Eustachian tube, and renders the hearing so acute that the least noise is oppressive: a north wind, also, causes pain; while, on the other hand, a south wind is agreeable. The signs characteristic of tightness of the *membrana tympani*, and those attendant on its relaxation, are, that in the former the patient hears best in damp weather and south wind, in the latter in dry weather and north wind.

The symptoms that peculiarly mark the puriform discharge are, an intense throbbing pain in the ear and head, accompanied with symptomatic fever: sometimes slight delirium also supervenes.

The pain is not always equally acute, but fluctuates in degree. Its paroxysms, or fits, are something like those of the tooth-ache; a circumstance which has too often caused it to be neglected, or improperly treated. It evidently requires the most active antiphlogistic remedies; and nothing stimulant, either in the way of general or topical means, should be employed. Hence acrid substances, and stimulating fluids, used with the idea of curing tooth-ache, certainly aggravate this disease; and suppuration, the very evil to be avoided, is thereby hastened.

The treatment here to be observed is obvious: to arrest inflammation in the first instance, when early applied to: and if this be done with energy, all the symptoms will subside. The deafness, which is always great during the inflammation, will gradually lessen; and the deposited lymph, instead of forming pus, will soon be absorbed. But if the inflammation has continued for some time, the patient does not always recover his perfect hearing, even though the resolution be accomplished; and the question is,—how far a proper secondary treatment may

obviate the imperfect state which the previous inflammation has left? The defect in this instance is chiefly caused by a deposition of lymph, and perhaps, also, from some thickening of the parts.

We know that, in other members of the body, a large quantity of lymph can be absorbed, by using the proper means for giving activity to the vessels. As the deafness after inflammation of the tympanum arises from this cause, our object should be, to prevent the lymph from organising, and any thickening of the membrane from becoming permanent, which must perpetuate the defect. Therefore, even if suppuration be formed, an opening to evacuate the matter should early be made, and the membrane thus be prevented from acquiring that state which renders it unfit for receiving acutely the impression of sound. An opening having been made, and the matter discharged, every precaution must be taken to prevent pus from again forming.

But in a vast number of cases the attack is slow and insidious, so that at first we are not aware of its true nature:—slight fits of pain, recurring at intervals, are felt, which are relieved by a trifling discharge; and it is not till after a

long time that the puriform discharge is fully confirmed.

This disease has divided the opinions of practitioners, some considering it as only trivial, and others as certainly dangerous; but any one who regards its consequences on the organ of hearing must be of the latter opinion. Its progress is rarely stopped, if left to itself, till the organisation of the tympanum is destroyed, as well as its contents, the small bones; upon which total deafness ensues.

Hence, the most judicious treatment is required to arrest its advances; yet one which is, at the same time, attended with no danger. Those, therefore, who think that it should be left to itself, are, I conceive, highly blamable.

Scarpa is of opinion, that the skin of the fenestra rotunda replaces, in such cases, the lost tympanum; and there can be no doubt that it is absolutely essential to the restoration of hearing. The fenestra rotunda is closed by the long membrane of the tympanum, and its little membrane seems to perform the office of a second tympanum; for the vibrations of sounds which join themselves with the air contained in the tympanum are received by the membrane of the fenestra rotunda, and carried into the

labyrinth with vibrations always increasing in strength. As a proof of this, there are cases in which the meatus, the tympanum, and the small bones of the ear, are injured in their conjunction, and are no longer capable of propagating sounds; and in which, nevertheless, the skin of the fenestra rotunda performs the function of all these parts. But even if the hearing be not entirely lost, through the necessary or accidental destruction of the tympanum and the interior parts of the ear, yet the inconvenience arising from the free introduction of air, and the penetrating of dust and other foreign bodies into the inside of the ear, can only be avoided by the perforation of the skin of the tympanum uniting, or by the production of a new tympanum by nature.

Those who are of opinion that the discharge should not be interfered with, consider it as being rather of a salutary nature than otherwise; but the same argument might be applied to the healing of every sore, and is a relic of the obsolete pathology of former days.

This doctrine, however, is still maintained by many respectable practitioners, though it rests on no solid or just foundation; and in all cases of this disease we should interfere as early

as possible, if we hope to preserve the functions of the organ. Of this prejudice, Mr. Saunders, to whom we are indebted for the first clear and judicious account of the disease, gives some strong instances.

Even the late Dr. Heberden, in his Commentaries, had taken up the popular but mistaken opinion, that it ought not to be healed.

Some of the most celebrated surgeons and anatomists have also entertained the same idea, on the supposition, that if the discharge were suppressed, inflammation of the brain might ensue. This, however, is more likely to happen from the disease, in its progress, passing on to ulcerate the parts, and destroy the bone; since the ulceration may thus spread to the dura mater, one of the membranes of the brain. But Nature has so provided, that as ulceration proceeds, the membranes generally thicken, and form a safeguard, which in some measure checks its progress.

In order to convey an accurate idea of this disease, it may be divided into three stages. The first consists of a simple puriform discharge, the ichor of which has been known to ulcerate the adjacent parts, and the fetor of which is very unpleasant; the second, is when it is com-

plicated with fungus, or polypus; and the third, is when a caries of the tympanum attends the discharge.

M. Alard divides puriform discharges into two species,—acute, and chronic. The former is very common among children, and is not attended with much pain. When this form of the discharge occurs, great care should be taken not to stop it suddenly, as the effects may be serious,—epilepsy, apoplexy, and convulsions, having often resulted from such practice; this caution cannot, therefore, be too earnestly inculcated.

Fabricius Hildanus relates a case of chronic puriform discharge, which continued till the entire membrane of the tympanum was destroyed; and, what is singular, he informs us that the hearing was not lost, nor even impaired, in consequence.

M. Alard regards the membrane lining the internal parts of the ear as a mucous one; hence all the diseases affecting it assume the character of those which attack mucous membranes.

M. Lallemand calls this disease otorrhœa, and states, that, however mild at its beginning, if neglected or maltreated, it generally goes on from a mucous to a purulent, and ultimately

becomes a thin sanious discharge, of that peculiar fetor which always accompanies caries of a bone. Fragments of the ossicula auditûs come away first, then small particles of the temporal bone itself; and in this case the affair is very serious.

There is another kind of otorrhœa, observes our author, more rare, more insidious, and almost unknown, namely, that which takes place through the Eustachian tube. The patient experiences a dull pain in the region of the ear, sometimes fixed, at others shifting about—sometimes constant, occasionally intermitting. He feels a tinnitus aurium—hears a continual buzzing noise, like that of a mill or water-fall—is hard of hearing, and afterwards becomes quite deaf for a time—then recovers the auditory powers, and hears the noises above mentioned. This loss and recovery of the auditory functions depend, M. Lallemand thinks, on the accumulation in, and discharge of matter from, the tympanum. The patient has a bitter taste in his mouth, foul breath, occasional nausea or vomitings of fetid matter—with expectoration of the same in violent fits of coughing. He also takes a dislike against, or even nauseates his food—loses his appetite—becomes de-

spondent, and emaciates from day to day, without the medical attendant knowing why. These symptoms are generally attributed to an affection of the stomach or lungs; and, under this impression, medicines are given, but, of course, without effect. The caries goes on, the membranes of the brain become affected, and death closes the scene.

The two following cases are related by M. Lallemand: the first shews the necessity of early treatment; the second, the impropriety of hastily suppressing the discharge.

Elizabeth Erot, ætat. 23, had had a discharge from the left ear from the age of seven, (at which period she suffered from the small-pox,) accompanied by pains in the head, which increased rather than abated with years. In the month of November (being then in a late stage of pregnancy) she experienced such severe pains in the crown of her head as to make her cry out: they were mitigated by pressure. At this period the discharge from the ear had diminished. The bowels being constipated, lavements were prescribed, and fomentations to the ear. The pains increased, with spasmodic twitchings of the arms. Her accouchement now took place, but produced no relief; and this interesting female sunk under her afflic-

tions. On removing the calvarium, the dura and pia mater were found inflamed, and in the left hemisphere of the brain there was an encysted abscess. The petrous portion of the temporal bone was carious and black.—This case is recorded by Bonetus.

The writer remarks, that the lymphatic temperament is peculiarly prone to chronic affections of the ear, and that the small-pox is a very frequent exciting cause of deafness and purulent otorrhœa. It will be observed, that as the discharge diminished, the head-ache was proportionally augmented.

The other case is that of a youth, about fifteen years of age, who had been subject to vertigo from his infancy. He learnt with difficulty, but retained what he acquired with wonderful tenacity, and appeared endowed with a good understanding. At the age of two years he became deaf of the left ear, in which a supuration and discharge were established. In 1809, being then in his fifteenth year, there appeared a small fungous excrescence at the bottom of the meatus externus, to which the unguentum nitratum was applied, with the effect of stopping the discharge in fifteen days. At this period an acute pain in the head and ear commenced. The ointment was discontinued—

the discharge returned, and the pains ceased. Some time afterwards, the ointment was re-applied, and the discharge again interrupted. On the eighth day after the cessation of the discharge, the boy was seized with such acute pain in the head, that he was forced to cry aloud, and said he should certainly go mad. In the course of a few days he suddenly became insensible, with dilatation of the pupils, slowness of the pulse, and other symptoms of cerebral compression. He died in a state of coma.

Dissection.—The vessels of the dura mater were gorged with blood, as were also those of the pia mater and arachnoid, which was quite dry on its surface. There were two ounces of serum in the ventricles. In the *left* hemisphere of the brain, a cyst was found three inches in diameter, consistent and vascular, containing thick purulent matter; the inferior extremity of the cyst rested on the petrous portion of the temporal bone, and there was a small opening of communication between the ear and the cyst, the bone being carious. The cerebral substance surrounding the cyst was yellow, and much softer than natural.*

* For further observations of M. Lallemand on this interesting subject, vide *Medico-Chirurgical Review*.

Abscess of the mastoid process forms a tumour, which is always slow in manifesting itself, and is accompanied by pulsative pains, fever, &c.: in course of time it bursts into the cavity of the tympanum, and the pus issues by the Eustachian tubes or by the ear.

The progress of the puriform discharge is uncertain: at one time it advances rapidly through its different stages; at another, years pass before it makes any considerable advances. It is evidently not a constitutional disorder, but merely an affection of the part, and, as such, can be attacked only by local means, general remedies being of no avail. Where the constitution is weakly and infirm, it may, indeed, be put into a more vigorous state by the use of tonic medicines, such as bark and other astringents, which will doubtless tend to quicken the healing of the parts; nevertheless, direct applications to the seat of the disease are the only true means of cure.

Blisters and setons are favourite remedies with many surgeons; and although they may, on the principle of derivation, act as auxiliaries, they ought to be judiciously used, and confined to habits able to bear such a drain; for if employed indiscriminately, and without attention

to this circumstance, the patient may be subjected, for a length of time, to pain and inconvenience, without the cure being in any degree promoted.

This disease, as I have already stated, is attended with various modifications of deafness, in proportion to which the degree of recovery will be found to vary. The extent of deafness, during the disease, does not always correspond with the injury the tympanum seems to have suffered; for in some cases, in which the injury of structure is apparently great, the deafness is trivial; and in others, in which it appears to be but small, the deafness is complete.

In the first stage, the inflammation and thickening of parts will evidently obstruct the passage of sound between the external and internal ear.

In the second stage, the mechanical obstruction of a fungus must still more oppose the entrance of sound, and augment the degree of deafness.

On the suppression of the discharge, in the first or second stage, there is often a remarkable increase of deafness.

Of the real state of the parts it is impossible *à priori* to decide, as, from their situation,

they cannot be seen; and it would be rash to determine how far the power of hearing may be restored, or to flatter the patient with delusive expectations: but, whatever the state of the case may be, I conceive it always proper, for the strong reasons already laid down, to make an attempt at cure; as the sufferer cannot be injured by it, and there is always a chance of doing something in the way of relief, if the disease be not advanced to its ultimate stage.

Where the discharge has continued, it partly forms a medium for the transmission of sound; and therefore, though offensive in the last stage, the hearing will be still more diminished if it be partially suppressed: thus, patients in this state hear better for a time after syringing their ears, in consequence of the fluid acting as a temporary medium for the transmission of sound.

Though cures may be performed in very old cases, yet it is chiefly to recent ones that the aurist must look for success; but as, owing to popular prejudice, the malady is often slighted or temporised with, it is generally only in confirmed cases that he is consulted: for in the early stages of the disease, when relief might

be obtained, it is commonly neglected, till, tired out with the fruitless expectation of Nature curing herself, advice is at last had recourse to.

The successful treatment of this disease, as of most others, very materially depends on instituting a strict inquiry into its causes and the period of its duration. None, perhaps, require to be traced more attentively through their different stages, nor stand in need of more varied treatment during each. I do not intend here to enter into a detail of all the means employed by the ancients and moderns; since, although many of them have been judicious and beneficial, others have been silly and improper. No one remedy can be trusted to; but the circumstances of each individual case should be studied, before any particular method is adopted.

The first stage will often yield to an injection of the *zinci sulphas*, or sulphate of zinc, used night and morning, which will frequently effect a cure in the space of three weeks or a month. It is apt, however, to leave a morbid sensibility of the ear, which occasions pain on the entrance of loud sounds. The *plumbi superacetas*, or sugar of lead, is equally useful as an injection.

In some cases the continuance of these injections has been necessary for a considerable time: this fact it may be proper to state, in order that the patient may not look for a speedy cure, and also that he may be induced to persevere for a reasonable length of time.

In the second stage of the disease, the extraction of the fungus with a pair of small forceps is to be attempted; and if these excrescences do not come entirely away, the roots should be pinched, till the whole is removed. They may then be touched with the *argentum nitratum*, as before mentioned.

The removal of the fungus, and an injection of zinc afterwards, will, in many cases, restore the hearing and suppress the discharge.

When the fungus is removed, the morbid state is then reduced to the same as that mentioned in the first stage.

In all cases where a cure is complete, the healing process seems to be effected by the extension of the cutis, or skin, of the meatus into the tympanum, and its becoming continuous with the membranous lining. This is confirmed by the dissection of persons who had suffered under this disease, in whom such a continuation plainly appeared.

After a cure, the free passage of air occasions a drying of the thinner or watery parts of the discharge; the remainder of which accordingly becomes inspissated, and produces occasional increase of deafness: but, even though this be the case, if the practitioner, when consulted, ascertains that there has been a previous discharge, he should be extremely cautious of employing any forcible means to remove it, lest he endanger the reproduction of the former disease.

M. Itard, in his work, mentions that species of deafness occasioned by a morbid secretion of the tympanal cavity. When the usual remedies have been employed without avail, he has recourse to tepid injections into the cavity of the tympanum, in order to soften and remove the substance which produces the defect of hearing. This operation, denominated by him immediate or direct medication of the internal ear, may be performed in three ways:—1st, by an opening, spontaneous or artificial, into the mastoid cells; 2dly, through the membrane of the tympanum; and 3dly, through the Eustachian tube.

The perforation of the mastoid process was recommended by Riolanus, and practised with success, about the middle of the last century,

by Dr. Jessera, a Swedish physician; and, not long afterwards, by another Swede, Professor Hagstroem. Every one acquainted with the anatomy of the parts knows the possibility of injecting the mastoid cells; at the same time it ought, in my opinion, never to be attempted until every other means has been resorted to; and then only by a person who has had experience in acoustic surgery. M. Itard relates the unfortunate instance of John Tustin Berger, physician to the king of Denmark, whose death, in 1791, was attributed to this operation, of which he had made trial on his own person.

II. *Obstruction of the Eustachian Tube.*

The next affection of the tympanum which I have to consider is, the influence produced on it by the obstruction of the Eustachian tubes.

These canals are sometimes filled with blood, mucus, cretaceous matter, &c.; and among the obstructions of the tube may also be mentioned tumefaction of the pituitary membrane furnishing these parts, provided their sides do not adhere, in which case it can no longer be considered an obstruction, but is a true obliteration: this is an important distinction.

Herholdt, a surgeon at Copenhagen, was convinced, from dissections of still-born animals, that while the foetus remains in the uterus the Eustachian tube is filled with mucus and the waters of the amnios, in such a manner as to establish an equilibrium between the exterior and interior fluids; without which, the membrana tympani would be compressed by the water in which the foetus swims. This fact throws light on a cause of congenital deafness much more frequent than is generally imagined; but the merit of discovering it cannot be conceded to Herholdt; for the celebrated Desault had observed, before him, that in the foetus, previous to birth, the cavities of the mouth, œsophagus, stomach, and intestines, as well as the larynx, Eustachian tube, external auditory passage, &c. are filled with these waters. The Eustachian tube has also been found obstructed by congealed mucus in persons who have become deaf from cold. Hæmorrhage caused by violent blows, and producing effusion of blood in the internal ear, will likewise obstruct it.

Tumefaction of the pituitary membrane, brought on by frequent and obstinate colds, sometimes gives place to momentary deafness, but which not infrequently becomes permanent

in children: persons of a more advanced age are liable to be attacked in the same way.

By obstruction of the Eustachian tube, a very great degree of deafness is produced, and air can no longer be admitted into the cavity of the tympanum, while the included portion of air is either absorbed or remains.

If it remain, it becomes condensed, and counterbalances the pulses of air excited by sounding bodies; but if it be absorbed, the membrane of the tympanum is stretched by the pressure of the atmosphere as far as its limits will admit, and in this case cannot vibrate to any considerable degree. That this last is the just opinion, is confirmed by dissection, which, in a number of cases, has shewn the tympanum filled entirely with mucus, and consequently that the air had been absorbed.

The cause of the obstruction of the Eustachian tube, as before stated, is either syphilitic ulcers, or sloughing from cynanche maligna, or putrid sore-throat.

It is on the healing of the ulcers that deafness ensues; for then the obstruction becomes complete, and the opening into the throat is, as it were, sealed up. Besides these causes, a polypus, depending from the pharynx, or other-

wise, has occasionally produced a similar obstruction; and an enlargement of the tonsils, where it becomes permanent, as in some cases, has been attended with the same effect.

This species of deafness is marked by no peculiar or diagnostic symptom, except the actual loss of hearing. There are neither distressing noises in the ears, nor any of the other sensations which indicate a diseased state of the auditory nerve, or certain morbid causes acting upon it.

The true criterion by which to distinguish this is, that some conspicuous disease of the throat always precedes it; and, therefore, the previous history of the patient is of great consequence in ascertaining it.

On examining the parts in such cases by dissection, I have found that the obstruction lies in the cartilaginous extremity of the tube. There are instances, however, in which the obstruction depends on an increasing or superabundant ossification filling up the substance of the bone; and then the disease is slow in its progress, different from the former, and its cause is not obvious.

Though this species of deafness is very formidable, yet the cure of it has in some

instances been accomplished by means of an operation suggested by Sir Astley Cooper; and to which he was naturally led by the important observation, that the sense of hearing, although rendered imperfect, is not destroyed by suppuration of the tympanum, or its partial injury from other causes: hence, as deafness is complete from obstruction of the tube, no entrance being given to the air, he very rationally supposed that, by making a small puncture in the membrane, to allow access to the air, the machinery of the ear would thereby be set in motion.

Experiment confirmed the justice of the idea; and hearing has been preserved in several instances in this way, not only by Sir A. Cooper, but by myself and others.

M. Deleau correctly observes, that the tympanum is useful, but not absolutely necessary, to hearing. Fishes and reptiles want it altogether; and individuals are frequently to be met with who have lost it in part, without the sense of hearing being at all impaired by the deficiency, but, on the contrary, the faculty has in consequence become more developed. For the first few days after such an accident, the hearing is somewhat affected by the change

of structure; yet it soon recovers its former acuteness. The accident, indeed, is something similar to the loss of one or two of the front teeth, in which case the speech is at first altered and difficult, but in a short time the person regains his wonted pronunciation.

It has been supposed that the operation of puncturing the tympanum was first performed in this country; but we find in the *Altenburg Annals of Medicine* for November 1816, a letter quoted which had been written to the celebrated Haller, and in which it is stated that M. Eli, a Parisian surgeon, had been in the habit of curing deafness by perforating the tympanum in cases where paralysis of the seventh pair of nerves did not exist.

M. Saissy regards perforation of the tympanum as the only means of cure where that membrane is thickened, cartilaginous, or ossified, or when the Eustachian tube is completely obstructed or obliterated, provided the other parts of the organ of hearing remain perfect and undiseased. M. Itard mentions the obliteration of the Eustachian tube alone, as indicative of this mode of cure.

The operation is performed by simply passing an instrument into the meatus, and pushing

it through the anterior and inferior part of the membrane of the tympanum, in which position the manubrium of the malleus will be avoided; a circumstance particularly to be attended to, lest any part of the machinery be injured.

Immediately on making the perforation, a little cracking will be heard by the patient, like the tearing of parchment, from the rapid entrance of air through the narrow aperture. In directing the instrument, care should be taken that it does not penetrate the vascular part of the membrane, so as to occasion an effusion of blood; otherwise the operation may fail of success.

When properly performed, hearing is instantaneously restored: by the perforation a new substitute is made for the Eustachian tube, and the air being thus admitted into the tympanum, the action of the membrane, and of all the connecting machinery, is, to a certain degree, re-established.

Sir Astley Cooper informed me that he has performed the operation with a common probe.

The chief obstacle to the relief afforded being permanent, consists in the great tendency of the punctured tympanum to re-unite, which, of course, causes a relapse of the complaint.

To avoid this, a larger perforation may be made; but then, as by this the membrane of the tympanum is proportionally diminished, the acuteness of the sense of hearing is lessened. A small opening is, therefore, to be preferred, even should a re-union take place. When this happens, it is generally in three or four days after the operation, though sometimes I have seen it later.

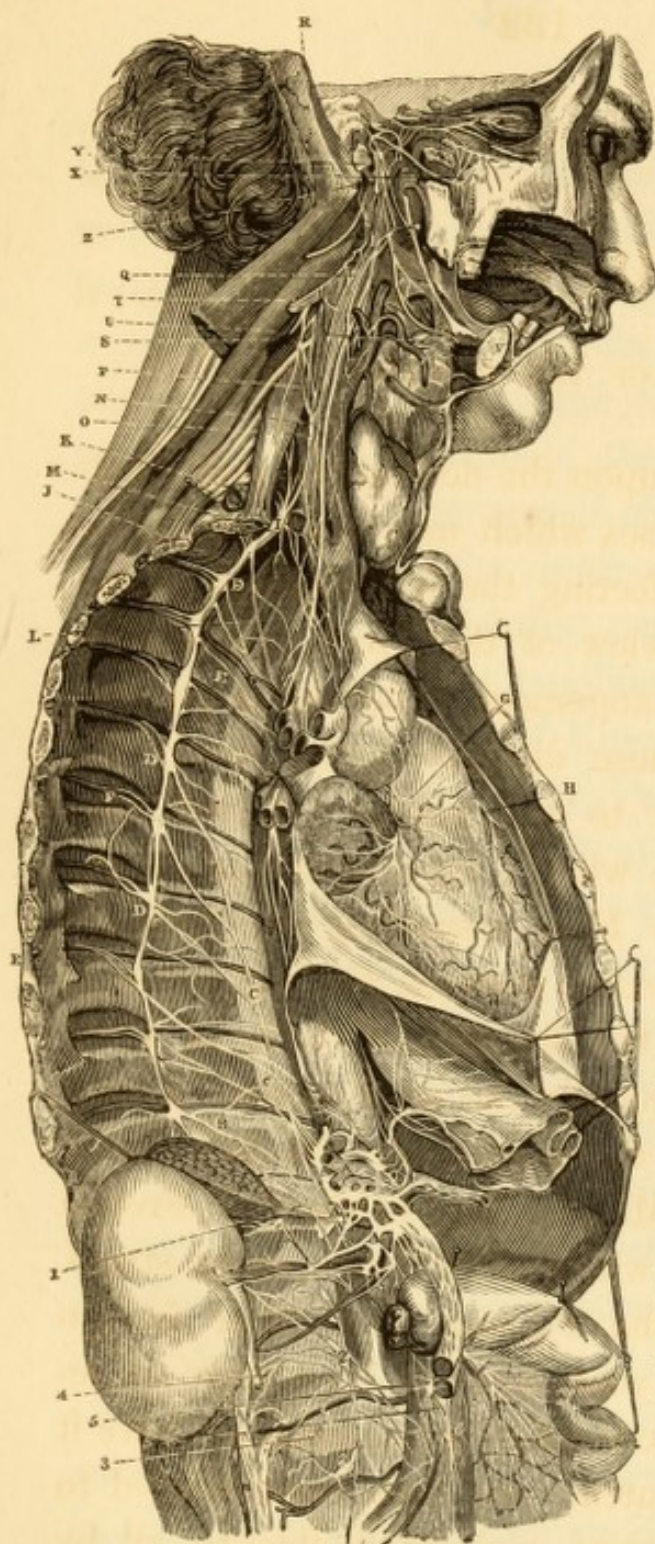
The most favourable circumstance is the sides becoming fistulous, for then the sense of hearing is certainly saved.

When re-union takes place, the operation must be repeated, which is unattended by danger. In one patient, Mr. Saunders performed it three successive times during a very short period; and then, not wishing to have occasion again to repeat it, he made a sort of laceration, by which he succeeded in preserving the opening; but the degree of hearing was, he acknowledged, lessened by this enlargement.

CHAPTER IV.

DISEASES OF THE INTERNAL EAR.

BEFORE entering upon the description and treatment of the diseases which may more strictly be considered as affecting the internal ear, I have thought that a view of the great sympathetic nerve, (from derangement of which, in my opinion, most of these diseases arise,) would not be unacceptable to the reader. It will also further illustrate what I have remarked in my Treatise on the Eye, respecting the intimate connexion that exists between the ear and eye, and shew that the diseases of both of these organs have frequently the same cause. I have reduced it from the large plate and description published by Manec, the celebrated French anatomist, with whose plate I was much struck when visiting the Parisian and other foreign hospitals a few years ago. I have only to remark, that I have taken great pains to have it accurately executed; and have endeavoured to render it interesting and intelligible to all by descriptive references.



- AAAA Semilunar Ganglion and Solar Plexus.
- B Small Splanchnic Nerve.
- C Great Splanchnic.
- DDD Thoracic Ganglia.
- E Internal Branches.
- F External Branches.
- G Right Coronary Plexus.
- H Left Coronary Plexus.
- I Inferior Cervical Ganglion.
- J Inferior Twigs.
- K External Threads.
- L Internal Threads.
- M Anterior Threads.
- N Middle Cervical Ganglion.
- O Interior Twigs.
- P External Twigs.
- Q Superior Cervical Ganglion.
- R Superior Branches.
- S Inferior Branch.
- T External Branches.
- U Submaxillary Ganglion.
- V Vidian Nerve.
- W Naso-palatine Branch.
- X Spheno-palatine Ganglion.
- Y Ophthalmic Ganglion.
- Z Tympanum, with the Internal Muscle of the Malleus.
- 1 Renal Plexus.
- 2 2 Lumbar Ganglia.
- 3 Internal Branches.
- 4 External Branches.
- 5 Ganglion of the Aortic Plexus.
- 6 Ganglion of the inferior Mesenteric Plexus.

The discoveries of those distinguished continental physiologists, Majendie and Manec, respecting the great sympathetic nerve, and the ganglionic plexus of nerves, which exert such a powerful influence on all the organs of sense, but more particularly on the ear and eye, have tended much to elucidate the diseases of the internal ear. I have myself also had the satisfaction of tracing the intimate connexion of those nerves, while, for that purpose principally, dividing the semi-lunar ganglion and solar plexus in the dissecting-room of King's College, which I did in the presence of Mr. Partridge, the able and scientific demonstrator of anatomy to the College. And I may just remark, that if the stomach be the centre of sympathy, as is now universally acknowledged, practitioners ought to bear in mind, that any derangement of nerves may produce analogous affections.

Of all the causes of deafness, that which proceeds from an organic affection of the brain is, of course, the most dangerous. In apoplectic cases, with faltering of speech and blindness, we find deafness also produced by the general affection of the head. But worst of all are those instances* in which a tumour of the brain com-

* See my Essay on the Deaf and Dumb.

presses the origin of the nerves; for here the deafness is complete, and no impression can be conveyed through the ear to the mind.

A tumour in the vicinity of the organ of hearing, however, though it run its course and prove fatal in the end, has rather a contrary effect; and even while the pupils are dilated, and there is every appearance of pressure on the brain, a morbid acuteness takes place, in consequence of the surrounding inflammation. Indeed, the auditory nerve often becomes acutely sensible in disease, or the patient has a *tinnitus aurium*, or singing in the ears, analogous to the flashes of light which sometimes affect the eyes in total blindness, and which are experienced by those who are blind from cataract.

So morbidly acute does sensation become in some persons while labouring under disease, that the least motion of the head will excite a feeling like the ringing of a large bell close to the ear.

In delirium, vertigo, apoplexy, and hysteria, the increased sensibility of the organ also becomes a painful sensation. In paralytic affections of the face, there is deafness in the corresponding ear, if the affection of the nerve be near the brain: this may be accounted for by remembering the intimate connexion that exists

between the auditory nerve and the communicating one of the face. From observing the course of the latter nerve through the temporal bone, and its connexion in the tympanum, we know why the Eustachian tube and root of the tongue are affected in violent tooth-ache and *tic douloureux*.

The ear also suffers, sympathetically, from foulness of the stomach and bowels, occasioned by various kinds of imprudences and irregularities; and the same reason may be assigned for the symptoms of hypochondriasis—that the patients are affected with strange sounds; and in the case of intestinal worms, we find that murmuring and ringing in the ears is frequently a symptom.*

Of the organic diseases of the ear, little is

* “The acute diseases which threaten the structure of the brain appear with such symptoms, that their tendency cannot be mistaken; namely, the more common forms assumed by inflammation and congestion of that organ, which, in proportion as the minute vessels are the seat of the preternatural distension, produce fever and furious delirium; in proportion as it is confined to the larger vessels, low muttering, delirium, coma, apoplexy, and those acute affections in which the cause of injury is rather in the substance of the brain than its vessels, which often assume the form of nervous apoplexy, epilepsy, or mania, in various degrees and modifications.”—PHILIP.

to be found on record. They are always preceded by permanent disorder of function, which is itself ushered in by occasional derangement. The treatment, therefore, may naturally be divided into three heads:—1st, how to hinder occasional from becoming permanent disorder of function; 2dly, how to prevent permanently disordered function from causing change of structure; and 3dly, how to correct or retard the progress of change of structure when it has already commenced.

It would seem, at times, that the fluids become so altered in their consistence as absolutely to destroy the organ, and of course cause deafness. The whole internal ear has sometimes also been found filled with a substance of a caseous appearance.

Deafness in acute fever is considered a favourable sign; as, according to the old theory, it argues a metastasis or translation of the morbid matter; or rather, in the opinion of the moderns, a diminution of the morbid sensibility of the brain. The accumulation in the vessels of the brain, or in those surrounding the auditory nerve, will also produce deafness and unusual sensations of the ear. This we find instanced in suppression of the menses,

and in hæmorrhoids, surfeits, &c.; in which it is preceded by vertigo and head-ache.

In comparing the diseases of the ear with those of the eye, we discover considerable analogy between them; but in those of the eye there is this advantage, that the transparency of its humours is a leading mark to direct us, while we possess no such criterion in the case of the ear. In judging of the diseases of the internal ear, we should always endeavour to determine whether it is in the seat of sense or in the brain that the real affection lies; otherwise our efforts to relieve will often be unsuccessful.

To effect this difficult and important diagnosis, we must make ourselves thoroughly acquainted with every thing relating to the case; such as, the patient's mode of life, the nature of the predisposing as well as exciting causes, the symptoms, and the changes induced by the duration of the disease; not forgetting to scrutinise his complexion and aspect generally.

Mr. Abernethy, in his Surgical Observations, observes, that in most cases of deafness, "there is probably a state of irritation, and a tendency to inflammation, throughout the passages of the ear. The external meatus may be unusually

sensible, the secretions being either suppressed, or discharged in an unnatural quantity. The lining of the Eustachian trumpet is thickened; and hence it becomes particularly obstructed. It must be admitted, that such a state of the organ is likely to be aggravated by a cause which maintains or produces irritation of the nose. When dulness of hearing, also, depends on a torpid state of the nerves, it may be caused by the same circumstance, which is known to affect the sensibility of other nerves.

“ Indeed, I have remarked that the hearing of many persons has considerably varied with the state of their health in general: so that I felt no surprise from the occurrence related in the following case.

“ A gentleman applied to me on account of some pseudo-syphilitic symptoms, which I told him would gradually become well. I advised him, at the same time, to be particularly attentive to the state of the digestive organs, which were generally disordered. He took five grains of the pil. hydrarg. every second or third night. The disorders for which he had consulted me were all removed in the course of two months, when I received a letter from him, saying that he thought it a duty he owed to me and to the

public to inform me, that the lenient course of mercury which I had recommended, had cured him of a considerable degree of deafness."

I shall now proceed to examine some of those diseases of the ear which depend upon change of structure: they have all been comprehended and treated under the vague, and perhaps too general, term of nervous deafness.*

* "Nerves extend from the spinal marrow and medulla oblongata to sentient surfaces and irritable parts. The first of these attachments is called their origin, the opposite their termination. The origin of a nerve is always in part from gray matter. The mode in which nerves terminate is not satisfactorily known, with the exception of the instance of the optic nerve, which expands within the eye-ball into a sheet of gray matter; and of the instances, yet more curious, in which voluntary nerves coalesce directly with fibrils of sentient nerves, a fibril originating at one part of the medulla oblongata, appearing to return under another character to attach itself again to the same part. The tendency to a reticular structure, which is met with in the composition of each single nerve, shews itself again in the manner of their distribution. In several remarkable instances, the fibrils of which adjacent nerves are composed are reciprocally thrown across from one to the other, forming what is termed a plexus. The nerves which proceed from the further side of a plexus may be more or fewer in number than those which enter it; but the essential result is, that nervous fibrils from different sources are brought together to form new trunks. What are termed

Nervous deafness is a disease that attacks all classes, and is particularly prevalent among females: it assumes a variety of appearances;

ganglia have been thought by many to be exactly of the nature of plexuses. A ganglion is a small nodule, usually flattened, of an oval or circular shape, and of a reddish-gray colour, which is found either on the trunk of a single nerve, or where two or more branches coalesce. Scarpa supposes that a ganglion is but a bed of gelatinous membrane, in which the smallest fibrils of the nerves that enter it are arranged in new combinations. Others have imagined that nervous filaments originate in the gray matter of ganglions. It is not improbable that this may be the case: but the extreme minuteness of the fibrils in a ganglion renders it very difficult to determine whether it be so or not.

“ The hard portion of the seventh rises apparently between the corpus restiforme and corpus olivare. Having emerged from the cranium, it reaches the cheek, through the substance of the parotid gland, in which it divides into many branches, that radiate to be distributed to the cutaneous muscles and to the integuments of the face. These branches are noted for their frequent reticular junctions, which have obtained for the whole the name of *pes anserinus*, and are yet more remarkable for the occasional direct continuity (resembling that between the ninth and the gustatory in the tongue) of their finer fibrils with those of the facial branches of the fifth. Not more than eight years since,—when the functions of the first, the second, and the auditory, of the third, fourth, and sixth, of the ninth and of the gustatory branch of the fifth, were understood, and described in anatomical treatises,—the functions of the greater part of the

and though one of the most troublesome affections to which the ear is exposed, yet, if taken in time, and properly managed, it is not difficult of cure. When of long standing, however, and the organ has become habituated to mistaken impressions and false perceptions of sound, it proves exceedingly obstinate. Still, even in these cases, a knowledge of the disease, and perseverance in a right course, will effect much. In the generality of cases of nervous deafness that have come under my view, either nothing has been attempted to be done, or what had been prescribed has not been followed up. Many persons, but especially those not dependent on labour for their support, are prone to neglect this malady. When accompanied with noise in the ears (*tinnitus aurium*), it is often indicative either of apoplexy or some other morbid affection of the brain, from which, at a certain time of life, there is always great danger of a fatal termination.

fifth and of the hard portion of the seventh nerves remained unknown, and lecturers on anatomy passed the subject over as one which had hitherto baffled research. It was in the year 1821 that the inquiries of Mr. Bell into the uses of the fifth nerve, and of the portio dura of the seventh, were published in the Philosophical Transactions." — MAYO.

The general symptoms by which this species of deafness is distinguished, are, various kinds of noises affecting the head, and communicated from the seat of the organ.

In nervous deafness these noises sometimes seem to resemble the rustling of leaves, at other times the blowing of wind, the falling of water, &c., all indicating a diseased condition of the cerebellum and its appendages. On the other hand, impaired hearing from hardened cerumen, (which is often mistaken for, and treated as, nervous deafness, but which is in fact a simple affection, easily removable if recent,) is denoted by a beating noise like the strokes of a ponderous hammer, &c.

There is a particular species of this deafness which represents a beating noise, like a pulse, and is much increased by any bodily exertion occasioning increased action of the heart. The cause of it is clearly connected with irritation of the arterial system; though it is uncertain whether depending on the small arteries of the labyrinth, or on the internal carotid artery, which passes close beneath the cochlea: but whichever of these it may be, it gives rise to the same false perceptions as the other species.

Tinnitus aurium consists in perceiving noises

which have no existence except *in* the ears of the individual. The difference of these noises is caused by the different nature of the sounds heard, or supposed to be heard, and by the exciting cause of the malady. The sounds are either grave or sharp. Some writers have looked upon them as distinct diseases, instead of varieties of one and the same, which they certainly are; and in proof of this, M. Itard says that we often see them successively presented in the same person, and indistinctly replacing each other in a very short time. If these noises are real, and operate in conformity to animal and physical laws, they are called "true;" but if they do not accord with the theory of sounds, they are designated "false." There are two chief causes of the true noise—the motion of the blood, and the agitation of the air. Persons predisposed to mental derangement frequently complain of such noises.*

* Of the organs of sense which become affected in those labouring under insanity, the ear has been observed particularly to suffer. Few lunatics become blind, but numbers were noticed by Dr. Haslam, of Bethlehem Hospital, to be deaf; and those who were not actually deaf, were troubled with difficulty of hearing and tinnitus aurium. Mania is to be distinguished from phrenitis by the absence of pyrexia and

All species of nervous deafness may be considered as peculiar modifications of constitutional disease, affecting the whole of the nervous system, and connected with that state which constitutes the hypochondriac and hysterical habit. The general morbid disposition is here extended to a particular sense; and it is only when viewed in this light, and the change of the constitutional affection made to form the basis of the cure, that proper principles of treatment can be adopted for the removal of the complaint. The hysterical spasm of the throat and *primæ viæ*, from the connexion and sympathy of nerves, is naturally communicated to those of the ear; and deafness is, in most cases, a constant symptom with hysterical patients. In the same manner, the sluggishness of the stomach and *primæ viæ*, so characteristic of hypo-

headache; and from delirium, by the state of the pulse, and not being conscious of external objects when roused, and even then the person soon relapses into a state of inattention; whereas in mania he is frequently sensible, and is often planning the means of preventing or revenging supposed injuries. A modern writer thinks that insanity is distinguished from delirium by the derangement of the intellectual faculties not being connected with bodily disorder, and that it is this circumstance which constitutes the distinction between the two maladies.

chondriasis, occasions a dull sensation and torpor of the auditory nerve, and produces the noise and confused impression so often complained of in hypochondriasis.

Nervous deafness may proceed from four causes: from commotion of the acoustic nerve; from convulsions; from apoplexy; and from certain fevers. In many instances, however, hearing is paralysed without any previous disease, without any known cause, and without any apparent lesion of parts.*

I cannot help remarking here that many are also deaf from sheer negligence;—they have, according to the clever, though eccentric, Dr. Kitchiner, only hearing enough to catch the sound of the dinner-bell, and sight sufficient to find a spoon;—they are accustomed never to attend when first spoken to;

* In my work on the Eye I have shewn that vitiated secretions in the abdomen, by irritating the nerves of the eye, may occasion ophthalmia, dilatation of the pupils, &c.; and nervous deafness may ensue in a similar way, having its primary cause in the abdominal nervous centre: this proves how an inordinate or morbid state of the ganglionic plexus of nerves of the stomach may gradually and imperceptibly draw the several organs within their morbid sphere, and ultimately produce diseases in which real change of structure may take place.

but answer you with a "Was that you?" "Pray did you speak?" "What did you say? eh? what? eh?"—and their idleness and inattention daily growing upon them, they become in time really deaf; not from any natural defect or from disease, but from absolute sluggishness. Such persons obviously need not an aurist. They must, if they wish to hear, rouse themselves from their lethargy, and, as Virgil has it, *arrectis auribus*, listen attentively to those who address them.

Deafness from blows or falls, occasioning commotion of the acoustic nerve, is far from being uncommon. It is rarely caused by convulsions in adults, but very frequently in childhood. It often supervenes after an attack of apoplexy; and, as all must have remarked, is very common after fevers. It is, also, not unusually sympathetic of some derangement of the digestive organs. In all which cases it is more manageable than when it arises without any apparent cause.

M. Itard mentions a case of paralysis of the labyrinthic nerve, which came on gradually and without any assignable cause, and which, after resisting stomachics, repeated emetics, and other means, yielded to large doses of

limaturæ ferri, taken before each meal. The dose was latterly increased to a drachm and a half per day; and, to assist the cure, the actual cautery was applied to each mastoid process. The result was, that from being totally deaf, the person so far recovered her hearing as to be able to converse at table, and take a part in general conversation.

In some cases, the same practitioner fumigates the ear and Eustachian tubes with ether, vinegar, tobacco, &c.

A wide field, therefore, opens here for new principles of treatment, by attacking the constitutional cause; and that much relief may be obtained by the application of constitutional means, experience daily evinces. It is from neglecting to keep this analogy in view, that nervous deafness is so formidable to most surgeons. When it arises from premature debility, occasioned by imprudence, I have generally found great advantage from the administration of quinine, bark, valerian, compound galbanum pill, sulphate of iron, &c.: but if the deafness be caused by plethora, high living, indolent habits, &c., then venesection, blisters, setons, submuriate of mercury, sulphate of magnesia, &c. are most useful.

I shall here take occasion to introduce some remarks on the nerves from Dr. Philip.

“ The nerves may be divided into two classes; those which proceed directly from the brain and spinal marrow, to the parts to which they convey the influence of these organs, and those which enter such ganglions as receive nerves proceeding from different parts of the brain and spinal marrow; whether these nerves have or have not protuberances belonging to themselves, which have also been termed ganglions, but which receive only the different fibres that belong to the particular nerve to which they are attached, and which, from the circumstances in which they are placed, must have a different, or at least a more confined relation to other parts of the nervous system. To the former, therefore, I shall, for the sake of distinction, and to avoid circumlocution, confine the word ganglion.

“ Scarpa has paid much attention to the fabric of the ganglia, and he gives the following history of it. He says, that the fasciculi of nervous filaments which enter a ganglion are separated and divided from each other, and that they are combined anew. A nervous fasciculus entering a ganglion divides into smaller

fasciculi; these divide again, and cross and intersect each other at various angles; then the divided fasciculi become again united, and as at first they divided into smaller and smaller fibres, so, when they begin to unite, they form, gradually, larger and larger bundles. At last the nerve, which entered a ganglion, emerges from it with its fibres collected into one or more fasciculi. Sometimes several nerves enter a ganglion, in which case they are all blended together, forming a complicated net-work, in which it is impossible to determine what belongs to one nerve and what belongs to another nerve. Every fasciculus, or filament, which enters a ganglion, passes through it. There is no appearance of any one terminating in it.

“It is evident, from what has been said, that the ganglions and plexuses resemble each other in their nature; and as the nerves which terminate in them come from all the most distant parts of the nervous system, some from the brain, and some from the lower extremity, and all intermediate parts of the spinal marrow, we cannot help supposing that there is some design in thus uniting nerves which arise from so many different parts of these organs. One of the

most striking differences between the ganglionic nerves, and those proceeding directly from the brain and spinal marrow, is, that even independently of the ganglions and plexuses, the former every where more freely anastomose (if I may borrow a term from the sanguiferous system); while the latter proceed in a more direct course, being less connected with each other in their progress to the parts on which they bestow sensation and voluntary power; still farther demonstrating the care with which nature blends the power of the ganglionic nerves."

But to return to the subject of nervous deafness, I may observe, that when only one ear is affected, it is in general rendered worse by the conduct of the patient himself; for when the organ of one side is injured, people hear so much better with the other, that they only attend to the more acute sensation conveyed by it, neglecting the duller. The effect of this is, that the diseased ear becomes worse, and the same consequence ensues as takes place in the eyes by squinting.

The majority of cases of nervous deafness, if the practitioner is early applied to, and the disease be in its first stage, may generally be

considered curable; and even those of long standing, if properly treated, admit of considerable relief.

Yet it is almost incredible how few persons, when threatened with deafness, can be induced to have recourse to medical advice; and even when they do consult an aurist, they place little confidence in his judgment, and seldom have much hope of cure: thus one of the first elements of success is denied to the practitioner; and his directions are either not attended to at all, or in such a manner as to give them little chance of producing their intended results. This state of mind in deaf persons has frequently been noticed: the deaf, indeed, are generally low-spirited and fretful; the blind, on the contrary, are usually cheerful. The former brood hopelessly over their misfortune; the latter confidently anticipate relief. The deaf, too, according to M. Andral, are short-lived; while daily observation shews us that the blind are remarkable for longevity.

It happens in the course of life, as it does also more quickly in those lingering diseases which are not themselves of a fatal nature, that the wear of the constitution begins to be felt most in some particular organ.

A modern author observes :—" I never knew any one die of old age ; some disease almost always destroys us before we arrive at that period at which this would take place.* The great art of preserving health and prolonging life is to observe what organ is most inclined to fail, watch the state of that organ, and correct its first deviations."

In entering on the treatment of nervous deafness, it is essential to observe, that a great similarity exists between it and that species which arises from a syphilitic cause. It is, therefore, proper to inquire minutely into the history of the individual, and to ascertain from what source the disease originates.

Several cases of nervous deafness, proceeding from the latter cause, have come under my

* What a difference has our artificial state of society made between us, in this respect, and savage nations, both in ancient and modern times ! Sallust, in his Jugurthine War, speaking of the aboriginal inhabitants of Africa, has these remarkable words : " Genus hominum salubri corpore, velox, patiens laborum : *plerosque senectus dissolvit*, nisi qui ferro, aut bestiis, interiere : *nam morbus haud sæpe quemquam superat*" —i. e. they are a very healthy race, swift of foot, able to endure fatigue : *most of them die of mere old age*, unless they fall in battle, or are destroyed by wild beasts : *for disease very seldom ends their days*.

care, both at the Dispensary and in my private practice, which yielded to a regular course of mercury, and in all of which the function of the organ was completely restored.

Again, where the connexion of the disease with the above cause is not so clear, instead of the treatment prescribed, a strict antiphlogistic course, if the constitution be able to bear it, will often prove successful; namely, powerful saline cathartics, of which the best is the vitriolated magnesia, and, in some cases, the pil. ex. aloë cum myrrhâ, joined with extr. lactucæ.* The doses should be repeated as often as the strength of the patient will admit; and in the intermediate time, small quantities of the submuriate of mercury are to be administered, to promote absorption, by taking off any thickening

* The soothing effects of the *lactuca sativa* were well known to the ancients; and in the works of their medical writers frequent mention is made of the plant. Galen, for instance, is said to have been much annoyed in his old age by a morbid watchfulness and anxiety at night, of which he completely freed himself by eating a lettuce before retiring to rest. Among the fables of antiquity, also, its sedative qualities are often alluded to; we shall notice only one, which states that Venus, after the loss of Adonis, stretched herself upon a bed of lettuces, to assuage her grief and calm her passions.

of the parts, which is apt to impede the due performance of the functions of the organ.

This practice will succeed in incipient cases ; if not completely, it will at least palliate the predominant symptom ; and it ought always to have a fair trial,—for deafness should never *à priori* be pronounced incurable.

At the same time, it must be confessed, that the diseases of the internal ear are involved in much obscurity. Dissections of several cases of persons who had been deaf during life* have proved that a total deafness may exist, without any apparent defect in the mechanism of either the external or internal ear : for, on examination, every part has appeared perfect, even the nerve and its expansion shewing no trace of morbid change ; the alteration, whatever it was, being too minute for the knife or the eye to detect. It consisted, perhaps, in an original want of power in the nerve to receive impressions. This is another proof of its connexion with hysteria and hypochondriasis, in which the nervous system is partly affected, as is often observable.

But though I have stated that nervous deaf-

* For a case of original deafness, with the appearances on dissection, vide Essay on the Deaf and Dumb.

ness in its first stage is generally curable, much will depend on the length of time during which the treatment is continued, as well as on the perseverance of the patient and the practitioner.

In some instances a cure has been accomplished in a very short period; in others, I have found it necessary to persevere for a considerable time; and recovery has at last crowned my efforts.

With respect to the application of topical remedies to the ear, gentle stimulants in the form of liniment (such as a portion of the essential oils mixed with the oil of almonds), may be beneficially introduced into it, where, being retained, they will serve as a substitute for the natural secretion, and at the same time increase the sensibility of the passage.

All the advertised nostrums* are prepara-

* " If we refer to the works of *Ætius*, written more than thirteen hundred years ago, we shall discover the existence of a large share of credulity with regard to physic. This author has collected a multitude of receipts, particularly those that had been celebrated or used as nostrums; many of which he mentions with no other view than to expose their folly, and to inform us at what an extravagant price they were purchased. We accordingly learn from him, that the collyrium of *Danaus* was sold at Constantinople for 120 numismata, and

tions of this kind; and, so far as they supply the secretion, and gently stimulate the passage, they may, in some cases, be useful: but the notion that they will remove an organic affection of the part, the various species of which I have described, is absurd, and only shews the ignorance of those who expect relief from such inadequate means.

the cholical antidote of Nicostratus for two talents: in short, we shall find an unbounded credulity with respect to the powers of inert medicines, from the elixir and alkahest of Paracelsus and Van Helmont, to the tar-water of Bishop Berkeley, the metallic tractors of Perkins, the animal magnetism of Miss Prescott, and, may I not add, with equal justice, to the nitro-muriatic acid bath of Dr. Scott?"—PARIS.

CHAPTER V.

THE DEAF AND DUMB.

THE miserable condition of the Deaf and Dumb cannot fail to affect every feeling mind even slightly acquainted with the numbers of their fellow-creatures thus doomed to pass through life deprived of the blessings of hearing and speech. But when we learn that, by proper attention and examination at an early period of infancy, a large portion of these individuals might have enjoyed the use of their faculties, our regret is increased to think that such means have not been tried. The evil seems chiefly to have arisen from supposing that all dumb children are totally deaf; an assumption utterly without foundation, and one which has been repeatedly disproved in my own practice. Cases of malformation of the ear are very rare; and, generally speaking, deafness in infants (for it is in infancy that a cure should be attempted), is caused by an obstruction of the Eustachian tube, or by some other defective condition of the function of hearing. Were all children sus-

pected of deafness to be submitted to an early inspection by competent persons, instead of being allowed to remain deaf until nine or ten years old (whereby the disease is confirmed), and then admitted into asylums, and treated as incurably deaf, the result would be very different, and many be rendered useful members of society, who, under the present system, are objects of commiseration as long as they live.

These remarks are made, not from ill-will towards any men or body of men; but merely from a desire that the subject may meet with that candid examination and strict scrutiny which its importance deserves. So long ago as January 11th, 1817, I submitted a plan to the Committee and Governors of the London Deaf and Dumb Asylum, in the Kent Road,* which was, that an aurist by profession should be appointed to inspect all infants previous to their admission into that Asylum; and that, where no structural derangement was discovered, a plan of treatment should be immediately commenced, having for its object the restoration of the faculty of hearing, which being obtained, speech would naturally follow.

* Vide the letter in my Essay on the Deaf and Dumb.

I cannot avoid warning parents to deliberate seriously on the step they are about to take when they resolve on consigning their helpless offspring to asylums for the deaf and dumb: for though temporary deafness in infancy may ensue from several causes, viz. fevers, various infantile diseases, obstruction of the Eustachian tube, &c.; yet the cure of the disease arising from either of these causes will generally, with proper attention, restore the function of hearing. Great care, therefore, should be taken that the habits the child has acquired while thus temporarily deaf be not perpetuated by the neglect of those who have the care of it. On the contrary, every means should be employed to rouse and bring into action its latent energies; and some gentle excitement of the organ will generally be advantageous.

It is remarkable how very common has been the error of considering a child once deaf always deaf, and consequently of abandoning all attempts at relief. No pains seem to have been taken to ascertain the real state of the organ itself; and thus, the ear being neglected, dumbness ensues to deafness,—the miserable sufferer is looked upon as one condemned, and is shut out from the sympathies of his fellow-creatures,

and doomed to perpetual silence and hopeless despair. It is painful to think how many of these unfortunates have been sacrificed to indolence and prejudice, in whom judicious timely aid might have developed those faculties with which nature originally endowed them, but of which (being temporarily suspended by disease) they have, through neglect, been deprived; and thus the divine gift of speech has been for ever denied them.

The Rev. W. Fletcher, in an able and eloquent pamphlet* on the Deaf and Dumb, has the following striking and just remarks on what used to be the condition and treatment of children born in this forlorn state.

“ They were, for the most part, left to themselves; their very relatives deeming their birth a family disgrace, and their existence a burden grievous to be borne. Indeed, in some countries, so great was the prejudice against, and so deplorably mistaken the opinions concerning them,

* Observations on the present Condition and Modes of Treatment of the Deaf and Dumb, as illustrative of the Importance and Efficiency of a new and simple plan devised for their Cure and Instruction. By the Rev. W. Fletcher, F.R.A.S. of St. John's College, Cambridge. London, Renshaw, 1836.

that they were either treated as mere idiots, or, if incapable of hearing and speaking at three years of age, cruelly destroyed as monsters. All attempts at relief being considered as vain and nugatory, their minds were left barren and uncultivated; their privileges were unheeded, and their claims denied; and if suffered to remain amongst their fellow-creatures, they were so far exiled from all rational society, as to degenerate, in the end, to a condition but little superior to the brute."

Nor are these cases of rare occurrence. The number of persons born deaf and dumb far exceeds what is generally supposed; for it appears, from a circular issued by the Institut Royal de Surds-muets de Paris, that in France, with a population of 23,000,000, there are 20,189 deaf and dumb, *i. e.* one in every 1585; in Russia, one in 1584; in America, one in 1556; for all Europe the proportion is as high as one in 1537.

Cases of malformation of the organ of hearing are, however, comparatively infrequent; and I am happy to find that in this opinion, the result of long experience, I am supported by the distinguished M. Itard, who, in a memoir to the Minister of the Interior, on the cure of

the deaf and dumb, states that structural defect is extremely rare, and that not above *one-fifth* of the deaf and dumb that have been examined by him have been in a state of total deprivation of hearing. It is also well known, that some of the children in the asylums can hear a little with one ear; and is it unreasonable to suppose, that by proper treatment that little might be much improved?

There are several respects in which the treatment hitherto pursued towards the deaf and dumb has been objectionable. In the first place, previous to entering upon any system of treatment, the child ought to be minutely examined, and the state of the ear be accurately ascertained; otherwise, a mere temporary affection, which might have been easily removed if taken in time, may settle down into permanent deafness, and dumbness will then be the natural concomitant. The custom of secluding such children, and preventing them from associating with those that are healthy, cannot be too much reprobated; for one of the most powerful means of developing the functions of hearing and speech (supposing, of course, that there is no structural defect,) is withheld, when the child is shut up with those who are as helpless as

himself; and it soon sinks into an almost hopeless state.

When parents find that children in early infancy are dull of hearing, and do not readily acquire their speech, but appear to them to be deaf and dumb,—if they have not an opportunity of consulting a medical man, I would recommend the ears to be well syringed with warm soap and water; and the external part, together with the sides of the ears, to be rubbed night and morning with a coarse linen cloth. Sir Everard Home used to advise, in cases where children were dull of hearing, an ointment made of equal parts of hog's-lard and soft-soap to be rubbed, not only all over the ears, but on each side of the head in the vicinity of the organ. Though I do not expect much benefit from this application, yet the friction is likely to be of service, and deserves a trial.

With regard to the medical treatment of the deaf and dumb, it must, of course, be suited to the peculiar disease of the organ under which the patient suffers. For instance, if a child becomes deaf in consequence of scarlatina maligna, or measles, or indeed any infantile disease, and has a puriform discharge from the ear, our efforts must be directed to curing the disease without

loss of time, otherwise the bones may become carious, and the hearing be utterly lost.

But, even allowing that the system pursued at the deaf and dumb asylums were the very best that could be devised (which I deny), still are they totally inadequate to afford relief to their numerous applicants; it being a well-attested fact, that three, four, five, and in some instances even seven, children in one family are so afflicted. According to a Report of the London Deaf and Dumb Asylum, it appears that a list of sixty-four candidates was presented to the governors, out of which they were under the painful necessity of electing only twenty-one, though all seemed to have powerful, if not equal, claims on their notice. By the same Report it will be seen, that in seventeen families, containing one hundred and thirty-six children, there are no fewer than seventy-eight deaf and dumb.

Of the good effects of the course of treatment pursued at the Royal Dispensary, I can speak experimentally, and rejoice to say that I have not a few witnesses who, in their own persons, can testify to the benefits conferred on them by that institution. Several cases of infant deaf and dumb have come under my care,

as Surgeon to the Dispensary ; and by adopting the means described in this Treatise under the various diseases,* I have the happiness to know that these poor children have obtained their hearing and speech. I may particularly mention, as having occurred lately, the cases of two brothers born deaf and dumb, and sent in that state from Brighton by Sir Henry Wheatley, by command of his Majesty. They have been some time under my care, and now begin both to hear and speak ; and I have little doubt of eventually enabling them to fill such situations in life as may fall to their lot.

* See also the cases and treatment in my second edition of the Deaf and Dumb.

CHAPTER VI.

ACOUSTICS.

SOUND was considered by the ancient philosophers to be a separate existence, something which would still have a being, even if no animal lived which was capable of hearing. It was thought to be wafted through the air to the ear, which it was supposed to act upon in a manner similar to that in which the nostrils are acted upon, when, through them, we are conscious of the sensation of smelling. Sound was one of the Platonic species, fitted for exciting the intellectual species, which is the direct object of the soul's contemplation.

But even at this early period, when Science may be said to have hardly put off her swaddling clothes, there were some philosophers, and especially the renowned founder of the Stoics, who maintained that sound (*i. e.* the cause of sound) is merely the particular motion of gross matter extended to the ear, and there producing that agitation of the organ which causes the sensation denominated hearing.

It was the opinion of Zeno, as we learn from Diogenes Laërtius, that it is the intervention of the air between the sounding body and the ear, which produces hearing. The air, agitated in a spherical form, moves off in undulations, and falls on the organ of hearing ; just as water in a vessel undulates in circles when a stone or other ponderous substance is cast into it. Among the ancients, some adhered to the Platonic notions on this subject, while many espoused those of Zeno ; but, in the generality of instances, this was done without giving themselves any further trouble to obtain a distinct idea of the explanation, or to institute experiments for their own satisfaction.

From the days of antiquity, the science of acoustics received but small accessions till about the beginning of the last century ; when, among the other phenomena of nature, it began to stimulate philosophers to an attentive examination of its properties, &c. The invention of the air-pump presented the first opportunity of deciding, by experiment, whether elastic undulations of air were really the causes of sound ; a point which was thereby satisfactorily established ; so that it is now a universally received doctrine of general physics, that air is the vehicle of sound.

The celebrated Galileo, the father of mathematical philosophy, was the first who, in modern times, discovered the nature of that connexion which exists between the lengths of musical chords and the notes produced by them. The fact had long before been mentioned by Pythagoras, whose knowledge of it was either the result of his own observation, or, as is not improbable, he had heard of it during his travels in the East: at all events, he constituted it the foundation of the refined and beautiful science of Music.

Galileo proved, that the real connexion existed between the tones and the vibrations of these chords; and that their various degrees of acuteness were regulated by the different frequency of their vibrations. But the plain and familiar manner in which he demonstrated this connexion did not satisfy the curious and subtle mathematicians of those days; in consequence of which, the mechanical theory of musical chords was prosecuted to a high degree of refined nicety. During this investigation, it was found that the chord vibrated exactly like a pendulum moving in a cycloid, and thus the air contiguous to it was agitated in the same manner: so that it would seem there is a par-

ticular kind of agitation, which the air is capable of receiving and retaining ; a curious and interesting fact.

Sir Isaac Newton, considering this question as worthy of his attention, directed his mind to its investigation, and endeavoured to ascertain, with mathematical exactness, the mechanism of this particular class ; and in the second book of his *Principles of Natural Philosophy*, the undulations of elastic fluids form the subject of the forty-seventh and following propositions : these are considered as containing the fundamental doctrines of the propagation of sound. A variety of experiments shew that such undulations really exist in the atmosphere, and are accompanied by various phenomena of sound, which exactly agree with all the mechanical circumstances of these undulations.

Meanwhile, anatomists and physiologists were sedulously engaged in examining the structure of the organ of hearing in man. Believers in the accuracy of the doctrine which assumes that aerial undulations are the cause of sound, their researches were chiefly directed towards discovering those circumstances in the formation of the ear, by which it is rendered susceptible of agitation from this cause. The

result was, that they perceived many things in its structure similar to a drum, on which instrument the aerial undulation from without must make very forcible impulses, that sonorous undulations may be produced on the air contained in it. They therefore considered these as the immediate objects of sensation, that is to say, the direct cause of sound.

Some anatomists, however, saw that this did not satisfactorily account for the phenomena; for when a drum has been agitated, it is capable of nothing more—it has produced a noise. But a still further process takes place in the ear: behind the membrane forming the head of this drum there is a curious mechanism that transmits the agitations of the membrane (which alone is acted on by the undulating air) to another chamber of very singular construction, where the auditory nerve is greatly expanded. I need not, however, say more on this topic here, as I have entered at large into the economy and structure of the ear in the physiology of that organ.

But the opinions deduced from the later investigations on the subject may be briefly mentioned, especially respecting what has improperly, I think, been called the *drum* of the

ear. Scientific men seem now to be agreed that this organ does not act as a drum, but in some other manner: for if it acts merely as a drum by producing a noise, we must be furnished with another ear by which it may be heard, and this ear must of itself be another such drum, which must have another, and so on *in infinitum*. Those, therefore, who were of opinion that the ear does not act as a drum, minutely examined its structure; the result of which examination was, that they perceived a wonderful unfolding of its auditory nerve, which is curiously distributed through every part of this cavity, lining its sides, being hung across like a curtain, and sending off fibres in all directions, in such abundance as to leave scarcely a point of it uncovered.

I shall here take the opportunity to introduce some remarks on the functions of the various structures of the ear by Sir Charles Bell, in his *Supplementary Dissertations* appended to the second volume of Paley's *Natural Theology*, illustrated by Lord Brougham and himself, which has just been published. At the same time I may say, that although his reasoning on the "uses of the parts of hearing" will be found very interesting not only to the pro-

fessional, but also to the general reader, yet there is nothing absolutely new in it. And, indeed, how could it be expected that there should, when the subject has been so often discussed, and the means for arriving at certain conclusions are unattainable?

“ We had occasion,” he says, “ to observe, that when a person is deaf from disorder of the tympanum, and when he substitutes the ear-trumpet, he may hear ; for the ear-trumpet, by its expanded mouth, collects the undulations of sound and concentrates them ; but there is this imperfection, that the ear wants its power of adjustment ; and the person is, accordingly, often timid in the use of his instrument with those who are not accustomed to speak to him, the sound of some voices being painfully harsh. Further, we may not hear a sound when called upon to listen to it, and yet when the particular sound is described, we do hear it. Now it remains to be determined whether this be a power of adjustment in the ear, or owing to the effect of association in the mind.

“ It is supposed by some that there are two tracts by which sound is communicated to the labyrinth ; that it passes both through the chain of bones and through the air in the tympanum.

With regard to the last mode, I can conceive no cavity less suited to convey sounds. Instead of having a definite form like the tube of the ear, by which the vibrations might be received and directed inwards, the tympanum opens into the cells of the temporal bone, and presents the most irregular surface possible, and such as would inevitably break and destroy any regular sound. The extension of cavity of the tympanum is calculated to increase the elasticity of the air in the tympanum, but most certainly not to collect or to strengthen the sound.

“ With regard to the labyrinth, comparative anatomy lends us considerable assistance. Were vibrations of sound being communicated to the brain the cause of hearing, the brain itself would be the organ, and no special nerve necessary. The brain in some animals, being placed in a cavity, and surrounded with fluid, is subjected necessarily to vibration. But we perceive that, in addition, an appropriate nerve and distinct organ are bestowed. There is here, in the cuttle-fish, very little apparatus in this organ; and it proves that the essential part of the ear is the nerve susceptible of sound, and not the exterior apparatus. Some sixty years ago, learned men in Italy wished to ascertain whether

the lobster had the organ of hearing or not. The celebrated Professor Scarpa, then a young man, undertook to decide that matter; not by looking for the exterior organ, but by examining the brain and the nerves which go out from it. Finding that there was a nerve which stood in the relation of an acoustic nerve, he traced it onward, and found it terminating in a little sac containing fluid, and open to the influence of the atmosphere by a small membrane which crossed the mouth of it. This was the just and philosophical mode of proceeding. There being, in fact, nothing in the brain itself, with respect to its exposure to tremours or motion, different from the auditory nerve, if that nerve had had merely to convey a vibration to the brain, it would have been superfluous, as the brain itself would have vibrated. Hence we perceive, that an endowment of a nerve which shall be susceptible of the sense of sound is necessary, and, consequently, it is the primary and essential part of the organisation. How the motions of sound shall reach it, is another question.

“ With respect to the semicircular canals, I am at a loss to understand what is meant by some authors saying that their use is not known. These canals consist of an elastic membrane full

of fluid, with a nerve suspended upon the septum of one extremity : are they not then admirably suited to receive the impulses which are conveyed through the bones of the head ? That they are so, is clear from their being found in the heads of fishes, where there is no access of vibration to the nerve except through the bone. But we are affected by the same when our head is on the pillow, and we are awakened by people moving in the house : the alarm is through the solid bones of the head. And when the Indian puts his ear to the ground to hear a distant tread, he is substituting the communication through the solids and the bones of the head for the atmospheric impulses."

In my work on the Physiology and Pathology of the Eye the reader will also find the curious experiments and observations of Lord Brougham on the inflection, reflection, and colours of light.

I shall now mention some inventions for the accommodation of those labouring under either malformation of the ear, or confirmed disease ; the most important and novel of which is my Acoustic Chair. This chair is intended for the benefit and use of the in-

curable deaf. A somewhat similar chair was constructed in 1706 by M. Duguet, who likewise invented some acoustic tubes. But one of the great advantages possessed by my chair over his consists in this, that the person sitting in it hears at the opposite side from that at which he is addressed ; thus avoiding the unpleasant and injurious practice of the speaker coming so close as to render his breath offensive and, at the same time, detrimental to the organ of hearing, by causing a relaxation of the membrane of the tympanum. This is an effect commonly produced by the use of short flexible tubes,* no less than by hearing-trumpets, which latter are as often, perhaps, employed for *speaking* through, as for the purpose for which they were designed ; and it is a certain fact, that many persons, after having used a trumpet for half an

* Instances are on record in which very baneful and injurious effects have resulted from the practice of speaking *into* the ear, more especially where the breath of the person is tainted. One case I may mention, which is related by Lord Herbert. Cardinal Wolsey, he tells us, towards the latter part of his life, was in the habit of whispering into the ear of his sovereign, Henry VIII. ; and the serious indisposition of the king has been many times attributed to this cause, and certainly not without reason.

hour, are quite deaf, from the action of the breath impelled against the membrana tympani.

My Acoustic Chair is so constructed, that, by means of additional tubes, &c., the person seated in it may hear distinctly, while sitting perfectly at ease, whatever transpires in any apartment from which the pipes are carried to the chair; being an improved application of the principles of the speaking pipes now in general use. This invention is further valuable, and superior to all other similar contrivances, as it requires no trouble or skill in the use of it; and is so perfectly simple in its application, that a child may employ it with as much facility, and as effectually, as an adult. It is, moreover, a very comfortable and elegant piece of furniture.

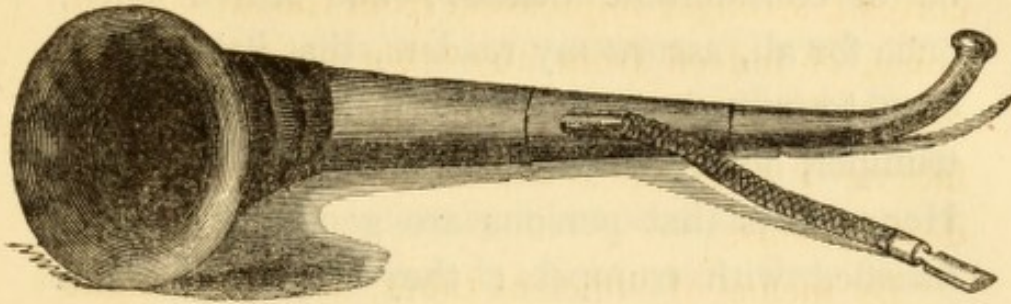
This chair is of the size of a large library one, and has a high back, to which are affixed two barrels for sound, so constructed as not to appear unsightly, and at the extremity of each barrel is a perforated plate, which collects sound into a paraboloid vase from any part of the room. The instrument thus contrived gathers sound, and impresses it more sensibly by giving to it a small quantity of air. The convex end of the vase serves to reflect the voice, and renders it more distinct. Further, the air enclosed

in the tube being also excited by the voice, communicates its action to the ear, which thus receives a stronger impression from the articulated voice, or indeed from any other sound. What first induced me to invent this chair was the fatigue I sometimes experienced in talking to deaf persons.

By means of sufficient tubes, this chair might be made to convey intelligence from St. James's to the Houses of Lords and Commons, and even from London to the King at Windsor. Marvellous as this may seem, the idea is not a novelty; it is but another confirmation of the saying of Solomon, that there is nothing new under the sun. M. Itard, in his excellent work on the ear, tells us that Aristotle (who was physician to Alexander the Great) invented a trumpet for his master, which was capable of conveying orders to his generals at the distance of 100 stadia, equal to rather more than twelve miles. And I may remark, bearing in mind, too, that both Alcmeon and Hippocrates are said to have invented ear-trumpets, that the ancients do not seem to have been so ignorant of acoustics as some in our day have represented them.

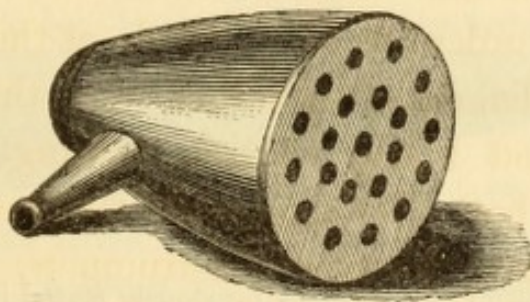
Another invention of mine is a trumpet with

two apertures, one to be inserted into the meatus, and the other into the mouth ; by which a



twofold advantage is gained, the deaf person receiving sounds at the same time both by the external auditory passage and by the Eustachian tubes. The idea was first suggested to me by my friend Sir Edward Stracey, Bart., to whom I am under many obligations.*

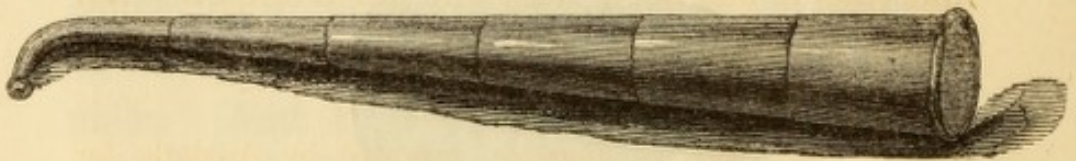
A curious little tin trumpet, which can be held in the hand without being observed, was invented by Don Consul Jovis at Cadiz. One



* This trumpet, as well as my various other instruments, may be had of Messrs. J. and S. Maw, 11 Aldersgate Street, Surgeons' Instrument-makers to the Royal Dispensary for Diseases of the Ear.

of these was given me by a Spanish gentleman whom I relieved. In some cases it is found to be of considerable benefit; but still I must, once for all, assure my readers, that it is useless ever to expect to hear so well with a short trumpet, however excellent, as with a long one. Hence it is that persons are generally so little satisfied with trumpets: they expect one not longer than the meatus to enable them to hear as well as if it were two feet in length. The thing is impossible; and it cannot be too plainly stated, that the longer the trumpet, the greater will be its power—it is with it just as with the lever in mechanics. The trumpet I use for examining deaf and dumb patients is about eight feet long.

Some years ago I invented a telescope hearing-trumpet, forming a parabolic conoid.* It



* In addition to the facts previously stated in other parts of this treatise, relating to the knowledge possessed by the ancients in the science of acoustics, there is contained, in a MS. found some time since in the Vatican, entitled "*Secreta Aristotelis ad Alexandrum Magnum*," an account of a circular

is of a very convenient construction, and shuts up into a small case for the pocket.

When at Amsterdam, a few years since, I was struck with the appearance of some very ingenious small acoustic tubes, about three quarters of an inch long, which, on being inserted into the meatus, increased the collection of sound : but except in slight cases, they could, for the reasons just given, be of little service.

I was also shewn, when in Paris, a short while ago, a very curious instrument, which would enable a person, sitting in the farthest part of a theatre, both to hear and see the performers distinctly at the same time. It might probably be convenient, if only occasionally employed ; but its frequent use would certainly prove highly injurious to the ear and eye.

One invention is often the parent of another, and thus it has been with the ear-trumpet. As, by its constant use, and sometimes from other

trumpet, *five cubits in diameter*, invented by Aristotle for Alexander the Great ; and, as I have mentioned in a preceding page, capable of conveying sound twelve miles. The power of this trumpet must therefore have been greatly superior to that invented by Sir John Moreland, which only conveyed sound, on the open sea, to the extent of about two miles, even when the wind was favourable.

causes, the membrane of the tympanum is often compressed, I was induced to try what I could do to relieve it; and accordingly procured a large caoutchouc bottle, to which I had fitted an ivory top capable of entirely covering the external ear, and which thus acting as an air-pump, I have found very effectual in drawing out the membrane of the tympanum, and thereby improving, and in some cases even restoring, the hearing: in *tinnitus aurium* I have also employed it with great success. It is very simple in its application, produces no pain, and in careful hands cannot do any injury.

Another invention is the French artificial ears, which, by fitting closely to the ear, increase the collection of sound, and resemble the natural ear in appearance.

In some cases the ears made of shells are serviceable; in others the German silver ears answer best: the latter are, however, objected to by many on account of their weight, and from being more conspicuous than the French ears: they also require to be fixed by a spring, which goes over the head. A Plate of these artificial ears may be seen in a former edition of this Treatise.

In addition to other inventions, I have lately

constructed some small ear-caps, with and without tubes, which, by being placed over the ear, collect sound from different parts of the room ; and for deaf persons while eating, reading, or otherwise engaged, they are found very serviceable and agreeable. At the same time I may remark, that my original telescope ear-trumpet, from its portability, convenience, and cheapness, is now generally preferred to all others.*

A few remarks on the choice, use, and abuse of ear-trumpets, shall conclude this chapter.

1. Of their choice. It is impossible to lay down rules applicable generally for the choice of ear-trumpets—what will suit one person exactly is utterly useless to another ; and therefore I would here advise, as I have before done with regard to spectacles, that those who require a trumpet should try several : still, there are cases of structural defect in which no trumpet

* A model of my Acoustic Chair, my improved Hearing Trumpets, Artificial Ears, &c., a metal cast of the Internal Ear, and large bronze casts of its small Bones ; together with an Artificial Eye composed of ivory and glass, my convex wire-gauze Eye-preservers, Spectacles for Strabismus, and Periscopic Glasses for the Short-sighted, may be seen at the National Gallery of Practical Science in Adelaide Street. The latter may be obtained of Messrs. G. and C. Dixey, Opticians to his Majesty, 3 New Bond Street.

can be of any use. To those who wish to hear well, and who disregard the appearance of the trumpet (which, by the by, seems to be the *crux surdorum*), I would recommend the tin trumpet with two apertures, or the telescope trumpet. The cheapest, and even the most unsightly, trumpets are often the best; and a common tin* one, of the value of half-a-crown, collects more sound, and renders the hearing more acute, than the German silver ears, which cannot be obtained, if properly made, under £25: they may, it is true, be worn under a cap or wig without being seen.

2. Of their use. Those who are obliged to have recourse to a trumpet, should begin with one of a moderate degree of power, and use it as sparingly as possible, never employing it when they can do without it; for the less a trumpet is used, *i. e.* the more rest that is given to the ear at a time, the better and longer will it answer the purpose.

3. Of their abuse. Ear-trumpets are intended for those who would otherwise be unable to hear at all; yet we often see persons using

* As pebble is the best material for spectacles, so, in my opinion, is tin the best for ear-trumpets.

them, who, if they were to exert themselves a little, would be able to hear without them. This may be considered as an abuse of them; and such persons should recollect, that trumpets act on the ear as glasses do on the eye. Many have injured their hearing by improper trumpets; and, in like manner, many have hurt their sight by unsuitable glasses. In fact, no person should use an ear-trumpet or spectacles that can do without them.

CONCLUSION.

I HAVE thus, in the preceding pages, treated of the various diseases of the Ear, and laid down the general principles of cure best adapted to each. But it is to be observed, with regret, that few attempts have yet been made by anatomists to trace the morbid changes or affections to which this organ is liable. On this subject we are almost destitute of information, while the diseased appearances of the other members of the body have been examined with great minuteness and attention; and the symptoms accompanying them, having been accurately ascertained, are recorded with precision and care.

And here it must be confessed that the difficulties which obstruct our inquiries are great; indeed, some of them appear, at first sight, to be almost insurmountable. Nature, as we have seen, has placed the chief and most important part of the ear beyond the reach of

our examination in the living subject; and its diseases being rarely mortal, the ears are seldom dissected in endeavouring to ascertain the causes of death.

The few, therefore, who have applied themselves to the elucidation of the morbid structure of the ear, have been obliged to dissect such ears as by chance came in their way, without knowing any thing of the previous history of the person to whom they belonged, or the symptoms of his particular case.

Thus, even though dissection may shew the various morbid changes of structure, such assistance is still very imperfect, since these changes are not accompanied with a knowledge of the symptoms which distinguished them during the life of the patient.

Besides the above difficulty, there is another obstacle to appropriate treatment, which is peculiar to this class of diseases; namely, that a clear and distinct account of the feelings can scarcely be expected from a deaf person, and is seldom obtained.

Individuals afflicted with deafness are frequently fonder of relating to the surgeon their own opinions and prejudices, than of giving a plain straightforward history of their case; and

if, as not unfrequently happens, the friends of a patient should join with him in his preconceived notions of his malady, the medical man, it will readily be perceived, has an arduous duty to perform. This, it appears to me, is one reason why practitioners often relinquish a case in despair of effecting any good, arising, on the one hand, from the whims and obstinacy of the patient, and, on the other, from the interference and suggestions of relatives and friends.

The approach of deafness is often slow and imperceptible, as well as unattended with pain, or other strong sensation, to mark its commencement. Yet there are cases in which the signs of it are too obvious to be overlooked; and where these are neglected, the consequences are not unfrequently serious.

In incipient deafness, generally, few strong impressions are for a time made on the mind of the patient, to warn him of his approaching infirmity; and he loses the faculty of the organ so imperceptibly, that his friends often notice it before he does himself.

It is from these various obstacles to the researches and inquiries of surgeons and anatomists, that the subject of the ear has been so much neglected. But I am inclined to think,

that the constant dissection of diseased ears, accompanied by due zeal and attentive examination, will lead to much useful information; and that by comparing the symptoms observable during the patient's life, as often as it can be done, with the appearances of the ear on dissection, we shall be enabled to trace cause and effect; and thus adequate means of relief will often be discovered.

But though our knowledge of the history and appearances of diseases of the ear will hereby be enlarged, we shall still, perhaps, be frequently disappointed of success in attempting a cure. This can hardly be wondered at, when we reflect that one-third of them are confined to the labyrinth, or internal ear; and as this part is totally inaccessible, no manual assistance can be rendered.

The aid of surgery being thus precluded, secondary means must be resorted to. Internal remedies are capable of producing changes of a salutary nature in a great number of local complaints, particularly in those organic affections whose nature is known and discriminated.

Deafness is often attendant on a cold, or on an inflammatory state of habit: in this case,

purging, or aperient remedies,* properly administered, will be successful.

Various other instances might be adduced, all tending to shew that there are different morbid changes of this organ, as of all others, which are curable by a general treatment acting upon the constitution, and thus indirectly affecting the part.

Nay, even the most difficult of all this class of diseases, namely, that termed *nervous deafness*, may, in its first stage, be arrested in its progress, and thus rendered curable, if the proper analogy between it and other nervous diseases, depending on constitutional habit, be kept in view. And when we recollect that the brain, besides being the organ of perception, is also the source of nervous power, and that all the vital parts of the body are affected by, and are capable of affecting it, we can be at no loss to perceive how prolonged pain, of any description, may induce disease.

But let us also remember, that while, on the one hand, many and great difficulties present themselves in the prosecution of our design,

* Celsus frequently prescribed strong purgatives in these affections.

there are, on the other hand, some advantages to counterbalance these, and to prompt us not to relax in our exertions.

In concluding the present work, therefore, I must again be allowed to urge, that though much may now be done to give relief in diseases of the ear, much still remains to be effected in this branch of practice.

As a leading step to this, and that theory and practice may be combined, I have succeeded, with the assistance and patronage of some of the first persons in rank, science, and professional celebrity, in instituting a Public Dispensary, *exclusively* for the treatment of Diseases of the Ear: it has now stood the test of twenty years' active operation; and of the good done by it, some idea may be formed from the fact, that nearly ten thousand patients have been cured or relieved during that period.

One of the great advantages of this Dispensary is, that its benevolent views are not confined to the inhabitants of the metropolis, but extend to all poor persons afflicted with diseases of the ear, including soldiers, sailors, domestic servants, distressed foreigners, &c., as well as to the deaf and dumb, who are gratuitously furnished with advice, medicines, acoustic

instruments, &c.: thus, while conferring on them the benefit of appropriate treatment, preserving them also from the rapacity and ignorance of pretenders.

This Institution is also of the highest importance, when considered in a scientific point of view; for here pupils have the fullest opportunities of examining the different diseases of the ear, of marking the success of the various modes of treatment adopted, and of judging of the value of new plans proposed, either by myself, or at the suggestion of any of the eminent professional characters who have kindly lent their assistance at the Dispensary.

From the success which has attended my exertions in this neglected branch of practice, I am happy to add, that others have been induced to direct their attention to it; and it is to be hoped that an extended investigation of the subject will, in a few years, place it in the same improved state as the other branches of medicine and surgery.

C A S E S.

CASE I.

MRS. W. applied to me, labouring under a violent inflammation of both ears, attended with much pain and fever.

After taking a few ounces of blood from the vicinity of the parts, and directing warm fomentations, the symptoms gradually subsided. It may be remarked, that her hearing was not much affected, although it was indistinct. By the use of laxative medicines, and at the same time adopting an antiphlogistic plan, she is now perfectly recovered.

CASE II.

Samuel Mortimer, aged 24 years, was admitted a patient at the Royal Dispensary for Diseases of the Ear. He complained of otitis,

or ear-ache, which was so extremely violent, that during the preceding night he had been totally insensible. On examination, I found the bottom of the right meatus inflamed, but the left without any appearance of inflammation, which was the more singular as he complained only of the left ear.

The pain being still very excruciating, I ordered him some drops composed of tinct. opii, with ol. amygdal. in the proportion of about fifteen drops of the former to a dram of the latter, which, on being inserted into the passage, procured him instant ease; but as I considered this only a temporary remedy, I had recourse to the same mode of treatment as in the former case, which was followed by the same happy result.

CASE III.

Miss G. sent for me late one evening, in consequence of a violent attack of otitis, which had continued without intermission during the preceding day and night; and as her medical attendant had administered a variety of remedies without their affording her any relief, I was desirous of clearly ascertaining the cause

of the disease. On inquiry, I found that she had caught cold at a critical period : she now laboured under strong inflammatory symptoms, having a furred tongue, violent head-ache, throbbing of the temples, with heat and constriction of the skin, and much disturbance of the respiratory and sanguiferous functions.

She complained of coldness of the extremities, and great chilliness ; I therefore ordered her a warm bath ; and afterwards, as her bowels had been well evacuated before I saw her, small doses of antimonials were prescribed, with the view of promoting a general diaphoresis : strong fomentations were also applied to the ears. On calling next day, I found her considerably relieved ; and as the pain had not entirely subsided, I ordered three leeches behind each ear, there appearing a fulness of the vessels of the part. By these means the complaint was shortly removed, and the re-establishment of her health effected by tonic medicines.

CASE IV.

Mr. O. N. complained of otitis, to which he was very subject on the least exposure to cold ;

and as it came on by paroxysms, I considered it a chronic case, and connected with some affection of the brain. Viewing it in this light, I accordingly regulated my treatment as in cerebral affections, both by venesection and blistering, to such extent as the violence of the symptoms required. By these means, and by attending to the proper state of his stomach and bowels, he is now perfectly recovered.

CASE V.

George Robinson, a man of colour, was admitted at the Royal Dispensary on the 10th of May. He complained of otitis. When he first applied, his head was of a most enormous size ; and from his grotesque appearance he almost frightened the rest of the patients in the waiting-room. It seemed that he had been drinking a few nights before, and having fallen asleep in the open air, had caught cold : the inflammation had extended considerably ; but by active treatment he recovered in the course of a fortnight.

CASE VI.

Miss L. complained of an ulcer which covered the whole of her left ear. It was not attended with a puriform discharge from the tympanum; but the external part merely was diseased. The ulcer having been of long standing, I was fearful that she would lose her ear, as she appeared of a scrofulous habit. After continuing the use of an alterative medicine for nearly a month, and applying the ointment of zinc to the parts affected night and morning, they began to put on a better appearance. In order to hasten the cure, I found it necessary to substitute the nitrated mercurial ointment, mixed with hog's-lard; which, in the course of a month from her first application, completely restored her to health. The ulcer, however, left a slight scar, which was not very observable.

CASE VII.

Mr. C. applied to me with a puriform discharge from the tympanum, which had continued for some time. As it was in its first stage, it yielded to a single astringent injection of the sulphate of zinc.

CASE VIII.

Colonel W. applied to me, in consequence of a puriform discharge from the tympanum. On inspecting this organ, I found it injured ; as air could be blown out of the meatus. By observing a strict antiphlogistic regimen, using an injection of the sulphate of zinc, and taking an alterative for six weeks, the discharge was suppressed, and hearing restored.

CASE IX.

Lord —— applied to me for advice respecting a discharge from the left ear, which was very fetid and troublesome. His lordship first observed it after the healing of an abscess behind the ear ; and being in Paris, he consulted an eminent practitioner of that city, who recommended an issue in the arm and other troublesome applications, to which being unwilling to submit, he returned to England, and placed himself under my care. The discharge, I soon found, did not proceed from the membrane of the tympanum, but merely from the meatus ; a circumstance of great importance to the right

treatment of the complaint, but which sometimes can only be known by examining the ear through an auriscope or magnifying-glass ; for unless this be ascertained, there is danger of improper remedies being employed : since, although strong injections are serviceable in discharges from the meatus, they are highly improper in those arising only from the tympanum. To a want of proper attention to this circumstance may be attributed the difficulty sometimes experienced by practitioners in suppressing these discharges. His lordship's complaint soon yielded to an astringent injection, and a healthy secretion took place.

CASE X.

Mrs. N. applied to me, in consequence of a large polypus which came out at the meatus. It appeared after a puriform discharge from the tympanum. For some time, air had passed out of the meatus, on blowing the nose : this symptom had ceased about the period when the excrescence was first observed. I succeeded in extracting the polypus entire. After dressing, for a short time, with the red nitrated

mercurial ointment, the parts to which the polypus adhered healed. I conceived it necessary to adopt the alterative and purgative plan, which was carried on for about a month ; at the expiration of which time she was quite well.

CASE XI.

Miss W. was sent to me with a polypus in her left ear, attended with a puriform discharge from the tympanum, which had impeded her hearing so much, that her friends took her from school.

On inquiry, I learned that she had had the discharge for some time. I extracted the polypus with a pair of small forceps ; but was not able to bring it away entire. I afterwards pinched the roots, and applied the *argentum nitratum*, as recommended by Mr. Saunders.

I found it necessary to order an astringent injection, which, after being used for a little while, suppressed the discharge. As she was a girl of a delicate constitution, I administered the bark, joined with a chalybeate. Her hearing is not only restored, but her general health also considerably improved.

CASE XII.

Mr. M'B. had, from his infancy, been troubled with a puriform discharge from both ears. When he first applied to me, it was very considerable, extremely offensive, and occasionally mixed with blood: such was its acrimony, that the ears and neck were excoriated by it.

Following my usual plan, of not stopping the discharge hastily by the use of astringent injections, for fear of producing an inflammation of the brain,—a caution, as I have frequently observed, necessary to be attended to in the treatment of diseases of this nature,—I prescribed small doses of the submuriate of mercury, and twice a-week some brisk purgative medicine, while blisters were applied behind the ears, and kept constantly open. After pursuing this course for some time, I ordered him an injection of the nitrated silver, which he used night and morning for a month; at the expiration of which time the discharge was suppressed, and hearing restored.

I am inclined to think that had the discharge been hastily suppressed, or the disease improperly treated, this case would have proved fatal, as the patient laboured at times under a cerebral affection.

CASE XIII.

Mr. D., aged thirty-two, had been deaf of the left ear from his childhood. On inspection, I found it perfectly sound. The cause was evidently a deficiency of the natural secretion: by restoring this, by means of proper applications, and by observing for some little time a strict antiphlogistic regimen, so perfectly has his hearing been restored, that he can hear the tick of a watch at the distance of four yards; which before he could not do unless held in direct contact with the ear.

CASE XIV.

Captain —, a native of Bombay, applied to me for relief. He had been deaf nearly six years when I first saw him. Finding that it was a nervous affection, I applied blisters behind both ears, put him on an antiphlogistic plan, gave him small doses of submuriate of mercury, and occasionally a brisk dose of the vitriolated magnesia. In the space of six weeks he was perfectly well, and returned to his native country.

CASE XV.

David Voir, a lad nine years of age, was admitted a patient of the Royal Dispensary on the 21st of March. He was a very delicate boy, and laboured under great difficulty of hearing. I treated this case in a similar manner to the former. The blisters behind his ears were kept open for a fortnight, and it was ten days before he found any considerable relief. He continued the use of the alterative and cathartic medicines for some time; which, although they relieved his hearing, reduced him more than I wished. I put him on a strengthening diet, and administered the bark in small doses. He has now perfectly recovered his strength, together with his hearing, and is altogether much better in health than formerly.

CASE XVI.

George Dawson, aged twenty-two years, was admitted a patient, for an obstinate nervous deafness, at the Royal Dispensary on the 28th of March. On inquiry, I learned that he had been deaf several years; and upon inspection,

I found his ears quite dry, wanting the natural secretion. He complained of the noises in his head, frequently attending nervous deafness, which at times prevented him from following his employment. As he was a robust man, of a plethoric habit, and was very desirous of obtaining his hearing, I took twelve ounces of blood from the arm, put a seton in the nape of his neck, and applied a blister behind each ear, which were kept open for a fortnight: he took five grains of the submuriate of mercury every night, and an ounce and a half of the sulphate of magnesia twice a-week; at the same time adopting a strict antiphlogistic regimen. He persevered in the use of his medicines for a short time. As he was reduced, I ordered him the bark. He was discharged on the 6th of May. I have seen him since the seton has healed, which it had not when he was discharged. He continues quite well, having his perfect hearing, and is not troubled with any noise whatever in his head.

CASE XVII.

Mr. T. applied to me: his case was similar to the preceding one. I pursued the same plan,

only in a milder degree. The blisters were applied; and not having the desired effect, I had recourse to the seton, which was kept open a month. The parts are now healed, and his hearing is perfectly restored.

CASE XVIII.

Mr. N., a gentleman resident in Ireland, wrote to me respecting his case, which, from what I could learn, appeared to be a nervous affection; for, besides being very deaf, his head was much affected with strange noises, which at times made him melancholy.

I prescribed nearly the same mode of treatment as in the two preceding cases, at the same time ordering him to lose six ounces of blood from the nape of the neck, in case the medicine and antiphlogistic plan did not relieve him. I heard from him a short time since, to the purport that his hearing is much improved, and the noise in his head considerably abated.

His brother has since called on me to inform me that he is now quite well.

CASE XIX.

Lady —, aged thirty-four, had been deaf from her childhood, and had had a great deal of advice, though, it must be confessed, she had not followed it. Fancying that she might be made worse (her mother and sister being both very deaf) was the reason why she had delayed having any thing done. When she applied to me, she had been for some months getting worse, so much so that she was completely shut out from conversation. Her ears were quite dry; but I restored the secretion by means of stimulants. As she objected to blisters in the first instance, I had recourse to a strong liniment, which not answering the desired purpose, I succeeded, with the assistance of her physician, in prevailing on her to consent to blisters being applied. After keeping them open a few weeks, and attending also to the state of her bowels and digestive functions, her ladyship, to the joy of her husband and friends, perfectly recovered her hearing.

I may here remark, that when blisters are judiciously employed, they are beneficial; but when used without proper discrimination, they are injurious. The nature of the disease, its

duration, the habit of the patient, his avocations, &c., must all be considered. Perhaps it may be observed, that in scrofulous patients, blisters have generally a bad tendency.

CASE XX.

Mrs. C., aged 24, on being brought to bed with her first child, determined on suckling the infant herself, being a woman of a healthy constitution. This she continued for some time, without feeling any inconvenience; but in a few months her strength began to fail, her sight was greatly impaired, a sense of extreme languor oppressed her, and consumption was apprehended. When I first saw this lady she was nearly blind, and unable to discern even the furniture in a room. Considering her case to be one of debility, caused by suckling, I ordered a wet-nurse to be procured for the child, and began my treatment by administering the bark conjoined with quinine and valerian, and promoting the evacuation of the bowels, which were habitually costive, by means of gentle aperients; in addition to which I recommended quietude, country air, and gentle exercise. By

attending to these directions, in a little while she recovered her sight, and with it good general health. On her return to town she informed me, for the first time, that she had also been at times very deaf; and that it was a source of great satisfaction to herself and her husband, that the remedies I had employed had likewise been the means of perfectly restoring her hearing.

CASE XXI.

Jane ——, a black servant, aged 17, native of Antigua, was sent to the Dispensary in December last. The poor girl, who was of an interesting appearance, was very deaf, and subject, at the same time, to noises in her head and ears. As she was a great favourite with her mistress, to whom she was exceedingly attached, and with whom she is about to return to Antigua, I felt very desirous of restoring her hearing; and by adopting the usual mode employed at the Dispensary, I was fortunate enough to succeed, for which she is very grateful.

CASE XXII.

Capt. D. applied to me with a considerable polypus of the left ear, which had troubled him for several years : it was attended with a profuse discharge. As he had a great dislike to any operation, I had recourse to the ligature, as recommended in a former part of this work ; and by passing the ligature with a probe to the bottom of the fungus, I succeeded in tying it, thereby stopping the circulation of the vessels. In a short time the polypus came entirely away ; but as there was still a discharge, I had recourse to an injection of the sulphate of copper, which suppressed the discharge, and his hearing is most completely restored.

CASE XXIII.

Miss —— was afflicted with a polypus in the left ear, attended with a profuse discharge. On inspection, it appeared that the ossicula auditûs were diseased ; in fact, part of the os temporis had become carious. She suffered great pain, especially at night. Small doses of opium, and occasionally belladonna, were admi-

nistered, to allay her intense agony. After removing the polypus, fomentations and poultices were applied to the part affected, and the carious portion of the bone sloughed off. As, after the parts were healed, she was much reduced, and suffering from debility, I prescribed small doses of quinine. Some discharge still continuing from the ear, and many remedies having been tried without success, I ventured on a weak injection of the pyroligneous acid, which completely suppressed the discharge. Her health appeared to be very precarious; I therefore ordered her to the sea-side for a few weeks. She has since returned, perfectly recovered; although it must be observed, that she does not hear quite so well with the left ear as with the right.

CASE XXIV.

When I first saw Lord D., he had been some time under the care of his medical attendant, who appeared to have treated the case judiciously, though unsuccessfully. His lordship complained of great dimness of sight, accompanied with vertigo, dilatation of the pupils, and sluggishness of the motions of the iris; consti-

pation and flatulence were also present: but perhaps the most distressing symptom was a continual violent head-ache. I began my treatment by ordering six ounces of blood to be taken from the nape of the neck; the bowels to be evacuated by means of aperients; and blisters to be applied behind the ears, to be kept open for about ten days. By these means the alarming symptoms subsided, his lordship's sight was restored, and a good state of general health ensued. I ought to add, that Lord D. was also partially deaf when he applied to me; but his hearing was recovered simultaneously with his sight.

CASE XXV.

Amelia Stubbs, aged 18 years, had been troubled with an obstinate nervous deafness for twelve years, without having obtained any relief. She applied at the Royal Dispensary on the 22d of September, and in about six weeks was discharged perfectly cured, by the method I have so repeatedly laid down, and so successfully adopted.

CASE XXVI.

William Hill was admitted a patient at the Royal Dispensary on the 12th of June. His case is rather singular, having been born in the open air, as his mother was passing a common on her way from an entertainment. He informed me he had been deaf from his birth. By employing my usual means, he has perfectly obtained his hearing.

CASE XXVII.

Sarah Green, five years of age, was brought by her mother to the Royal Dispensary on the 3d of May. The child seemed very deaf, and of a listless aspect; and by her mother's account, she passed restless nights, gnashing her teeth during sleep: appetite various, at one time indifferent, at another voracious. The child's appearance was sickly, the eye languid and heavy, countenance pale, and the upper lip somewhat tumefied: the bowels were irregular, and the stools dark and offensive.

Suspecting, from the deranged state of the digestive functions, that the deafness might be

sympathetic of indigestion, I felt inclined to try the effect of gentle emetics, repeated twice a-week, with small doses of calomel intervening. I shortly had the satisfaction to find that the stools became less fetid, the appetite more natural, and the general health and appearance of the child improved. As these salutary and flattering changes in the constitution took place, a corresponding alteration in the local affection accompanied them. In short, with a restoration to good health, there was also a complete recovery of the sense of hearing. No worms were observed to pass by stool, and the child remains perfectly well.

CASE XXVIII.

In about a week after the last case was dismissed, cured, Master Macnamara, a fine boy, about nine years of age, was brought to my house, labouring under similar symptoms. From the efficacy of emetics in the case of Sarah Green, I had recourse to them in this; and, without detailing the symptoms at length, and the progressive and simultaneous disappearance of the disorder of the system and the sympathetic affection of the ear, suffice it to say, that

their use appeared equally appropriate, and their effect was equally beneficial.

CASE XXIX.

Master —, the son of a worthy Baronet, was exceedingly deaf when brought to me. He, too, was of a pale complexion and languid appearance, ground his teeth during sleep, and often when awake picked his nose ; his bowels and appetite were irregular, stools fetid and dark-coloured, belly hard and tumid, with frequent complaining of griping pains about the umbilicus.

As the symptoms of worms were unequivocal, he was put on a course of the fol. spigelia and other strong anthelmintics, when vermes of the lumbrici kind were passed in abundance. The general health shortly after this improved daily ; and what shews that the hearing was affected sympathetically, was the restoration of this sense on the other complaints being got rid of.

No topical means were had recourse to in these cases ; but the cure was wholly effected by having detected and remedied the remote, yet indubitable source of the deafness.

CASE XXX.

Mr. L., aged 24, clerk to a solicitor in the country, complained of great depression of spirits, dyspepsia, distension of the abdomen, stiffness of the eyeballs, dazzling and mistiness before the eyes, accompanied with extreme dullness of hearing. At first I was at a loss to account for these symptoms, except by considering the case as one of nervous debility; the only cause the patient assigned being his sedentary employment and want of exercise. My attempts at relief were unsuccessful; and on questioning him more closely, he confessed that he had been intemperate and imprudent. As he was extremely debilitated, I resolved on giving a trial to the decoction of bark, joining with it quinine, valerian, and the tinct. ferri muriat. twice a-day. Under this treatment he rapidly improved; his sight and hearing were soon completely restored; and he is now in a state of robust health, and free from all the distressing symptoms under which he was suffering when he applied to me.

CASE XXXI.

Susan Vaughan was admitted a patient of the Royal Dispensary on the 6th of September. She complained of a violent pain in her left ear, which annoyed her exceedingly: the meatus auditorius appeared considerably enlarged. By continuing the use of a stimulating liniment by means of a bougie, she was surprised one morning to find a worm, nearly two inches long, come from her ear; and by persevering in the use of the application, in the course of a week a second was ejected, leaving a discharge, which yielded in a little time to an astringent injection. Her hearing is now perfectly recovered.

CASE XXXII.

Miss ——, aged nineteen, had suffered much from deafness, accompanied with violent headache; she was subject also to variable appetite, fetid breath, pains in the stomach, acid eructations, paleness of the countenance, irregular pulse, and occasional hysterics. She had consulted the most eminent of the profession, without obtaining any relief. Suspecting, from her

symptoms and countenance, that she was troubled with worms, I was induced to try an ounce and a half of the *oleum terebinthinæ*, which dose being repeated, had the effect of expelling a worm of the *tænia* kind, thirty feet long; since which, her health has been re-established, and her hearing completely restored.

Worms appear to be most frequent in those who are dyspeptic, or of a relaxed habit, their bowels containing a preternatural quantity of mucus. Hence the disease is most common in children; though sometimes met with in adults to a very high degree, particularly in persons who live chiefly on a vegetable diet. The tape-worm is rare in infancy or childhood; instances of it, however, now and then occur. Some physicians are of opinion that intestinal worms do not arise from a weak or impaired digestion, and a consequent collection in the bowels of matter capable of converting itself into such worms; but that they are introduced into the human body with the food or drink, and find in the intestines an appropriate place of existence.

CASE XXXIII.

Miss ——, aged six years, accidentally fell out of the nurse's arms when two years old, and had apparently struck against the banisters, as part of the auricle was lacerated. She was completely deaf on the right side when I saw her. There was a discharge from the meatus, but not from the tympanum; which, being at times extremely unpleasant, led me to suspect that the os temporis was carious. On examination with the probe, my conjectures were confirmed, I being able distinctly to feel a loose portion. As this child had endured extreme agony, I was unwilling to add to her sufferings by hastily removing it; but applied linseed poultices with a small portion of oil to the parts. I had soon the satisfaction to find a small piece of bone come away without pain, and the ulcer speedily healed. Her hearing shortly afterwards returned, and she is now quite well. As this child was of very wealthy parents, the only argument advanced for the neglect was, that it was thought she would outgrow the disease. If this case had been left much longer, it would have been beyond the reach of art.

CASE XXXIV.

Robert Cartwright had been deaf nine years when admitted a patient at the Royal Dispensary : his deafness at the same time was attended with a puriform discharge from the tympanum. By adopting the plan already recommended, he is now quite well.

CASE XXXV.

Mr. K., a merchant of some celebrity, consulted me for tinnitus aurium, attended with indigestion and great irregularity of the bowels. He was a man who applied himself very closely to business, and took little or no exercise : when he first came to me he was very thin, and extremely irritable and nervous. He did not complain of any diminution of hearing, but, to use his own words, his only wish was, to get rid of the eternal noise in his head and ears. He had taken the opinion of some medical friends, who advised bloodletting and aperients, which seemed to aggravate the malady. After having the ears well syringed, I put him on a course of the pil. galban. comp., joined with pil. ex aloe cum myrrhâ ; and the inf. gentian. comp. with

potassæ subcarbonas, joined with tinct. calumbæ. By persevering in the use of these remedies for a few weeks, and taking his meals regularly, I have the satisfaction to state that the noise in his head and ears has entirely left him, and that his health is perfectly restored.

Indigestion chiefly arises in persons between forty and fifty years of age, and is principally met with in those who devote much time to study, or who lead either a sedentary or irregular life. A great singularity attendant on it is, that it may, and often does, continue for a considerable time, without any remission of the symptoms. Mr. K. observed to me, that when his digestion was most impaired, the noise in his head was most troublesome. This disease is frequently caused by chronic weakness, excesses, immoderate repletion and over-distension of the stomach, a deficiency in the secretion of the bile and pancreatic or gastric juices, diseases of the liver and spleen, exposure to moist and cold air without exercise, &c. Many, perhaps most, of the diseases of the digestive organs, brought on by various circumstances, consist in weakness or atony of the parts, accompanied by a deficiency or depravity of the fluids secreted by them, and upon the healthy quality of which a right per-

formance of the functions depends. The state of the tongue is in general a pretty good criterion of a disordered state of the stomach.

CASE XXXVI.

Mr. Y. applied to me with, as he expressed himself, a most obstinate case of nervous deafness, for the relief of which he had tried a variety of means; and being a medical man, he had consulted most of his professional acquaintance. As I considered it a good case for the new mode of practice mentioned in a former part of this work, I began by excluding the external air from the meatus, which was continued for some days. At the expiration of a month he lost the violent noise in his head, which had so much distressed him; and in a fortnight after this, by continuing the plan, his hearing returned.

The number of cases of incipient nervous deafness, which I have successfully treated, only convinces me that, if early attended to, they are more easy of cure than is generally imagined.

CASE XXXVII.

Mr. Y., a young man twenty-seven years of age, applied to me with an obstruction of the Eustachian tube, which, from what he informed me, seemed to proceed from a syphilitic cause. After using a stimulating gargle for some time, without effect, I was induced to perform the operation of puncturing the tympanum, which succeeded in instantly restoring his hearing; but I had some difficulty in preventing the aperture from again uniting. The edges of the wound became fistulous, and in a few weeks the membrane recovered its usual tension: his hearing is now restored.

It may be proper to remark here, that in slight cases of obstruction of the Eustachian tube I have found a gently stimulating gargle of the greatest service, and in my opinion it deserves a trial in cases that are supposed to proceed from this cause: as the remedy is simple, its application cannot be attended with any unpleasant effect. It may, indeed, make the throat a little sore; but that soon goes off. An obstruction may arise from various causes, as before stated; but the most frequent is a cold, when the orifice of the tube becomes

swollen; in that case, a gargle is of great service.

CASE XXXVIII.

Lady ——, aged 24, applied to me with extreme deafness, attended by great fulness of the throat and elongation of the uvula. She could not hear a watch tick, when placed in the mouth or put close to the ear, which clearly proved that she laboured under obstruction of the Eustachian tubes. As she had had a good deal of advice without benefit, I removed a part of the uvula, and commenced by giving emetics; and, always bearing in mind the possibility of doing injury by the exhibition of too powerful a remedy, the doses were gentle, composed of ipecacuanha and tartar emetic: they were repeated every five minutes until free vomiting was produced. By these means, her ladyship's hearing was completely restored.

No remedy is so suitable for removing these obstructions as emetics. Of the truth of this, every well-informed practitioner must be convinced, when he considers the nature of their action. The operation of emetics is not, as is imagined by the vulgar, confined to evacuating

the contents of the stomach: they produce a great increase of the secretions of the mouth and throat, as well as of the juices of the stomach. By their action the biliary and pancreatic ducts are emulged, the secretions of the liver and pancreas augmented, no less than those of the glands in the vicinity of the mouth and throat; stagnant fluids are put in motion, morbid congestions and accumulations in various parts of the system removed, the excretion of mucus from the lungs promoted, the general absorption of the system increased, the circulation rendered freer, the blood diffused more equally over the system, topical determinations in many instances lessened or removed, and the cuticular and pulmonary exhalations very sensibly promoted; besides which, a commotion is excited in the nervous system, which is often highly salutary in nervous disorders, by rousing the sensibility of every part.

CASE XXXIX.

Mr. W. came to me with an unusual sensation of both ears, under which he had laboured for a long period. On inspection, I perceived

there was a collection of cerumen, in a very hard state, at the bottom of the meatus. By continuing to syringe the ears, the whole was removed. On the first application of the syringe, which brought away a considerable quantity, he was able to hear the church-clock strike, which he had not done for several years before. What makes this case rather singular is, that this gentleman thought he laboured under a violent nervous affection, and came to me for the purpose of obtaining a trumpet; which not answering his expectations, I prevailed on him to let me examine the state of his ears. I need not mention that he was much pleased at being relieved by such simple means.

CASE XL.

Miss B. applied to me with an herpetic eruption of both ears, to which she had been subject, at different times, for the last five years. By taking the compound calomel pill regularly every night, for about a month, and anointing the external part of the ear with an ointment made of equal parts of the nitrated mercurial ointment and hog's-lard, she is now perfectly

well. It was necessary, however, to order her an astringent injection, which was continued for the space of ten days.

CASE XLI.

Lady Y. applied to me with a swelling of the glands of the neck, caused by using a strong astringent injection, which a friend had recommended her to try for a discharge from the ears, and which nearly proved fatal. Several instances have lately been recorded in the different medical journals, in which suddenly stopping these discharges has been attended with most injurious consequences. By reproducing the discharge, and exhibiting neutral laxatives, her ladyship is now quite well, and the discharge ceased without any inconvenience.

CASE XLII.

Mary Robson was admitted at the Royal Dispensary, with a polypus in the right ear, of a large size, which completely deprived her of hearing on that side. On removing it by ligature, a cure was effected.

CASE XLIII.

Annette Brun, a poor Frenchwoman, was sent to the Dispensary. On admission, she was exceedingly deaf. As she had enlarged tonsils, I removed a part of them with a pair of forceps constructed by me for that purpose, and she is now quite well.

CASE XLIV.

Master Lewis was brought to me by the master of one of the schools in the neighbourhood of the metropolis, having unfortunately got a piece of slate-pencil in his ear. A boy, or some unskilful person, had been trying to extract it; but in endeavouring to remove it, had pushed it farther into the passage. When it had been in some days, it produced great inflammation, pain, and fever. With the assistance of my auriscope, I discovered it, and after loosening it, I succeeded in removing it with the French forceps. On examining the part, I found that a small abscess had formed at the bottom of the meatus: this was dispersed by poultices of bread and milk, after gently eva-

cuating the bowels, and taking a little febrifuge medicine. He is now perfectly restored to health and spirits.

CASE XLV.

Lord ———, on returning one evening from the theatre, was overset, in consequence of his lordship's carriage coming in contact with another vehicle, and in the fall he received a concussion of the brain. Being placed under the care of two eminent practitioners, he in a great degree recovered from the accident; but upon any extraordinary mental or bodily exertion he experienced extreme dulness of hearing, and acute, darting pains in the head and ears, which made him giddy and insensible. Under these circumstances, he consulted me. On inspecting the meatus, after freeing it from a small portion of coagulated blood, I observed that the membrane of the tympanum was forced inwards. The removal of the coagulum by syringing the ear gave him great relief; but still there was an unpleasant tightness and fulness of the membrana tympani, which was completely taken away by dry cupping the ear, and he was then able to inflate the membrane, which he

could not do before. What tended to relieve the pains in the head, as well as to remove the pressure from the tympanum, was the application of a few leeches behind the ear. By these simple means his lordship was relieved from the distressing pains, and his hearing effectually restored.

CASE XLVI.

Mr. S. applied to me one very warm day, saying he had something in his left ear which annoyed him exceedingly, depriving him of rest, and producing great irritation of the nervous system, with much pain and swelling of that side of the head. A medical friend who accompanied him had examined his ear, but could not observe any thing. After I had applied the auriscope, and also minutely examined the meatus, I likewise could not see any cause likely to produce such unpleasant symptoms; however, I lubricated the parts with some ol. amygdalæ, and afterwards made use of my medical pump, charged with rose-water and eau de Cologne. When a few ounces of the fluid had been injected, I perceived a small insect come away with it. He experienced instant

relief, and was much pleased at having been right in his conjectures. The insect must have penetrated the internal membrane of the meatus.

CASE XLVII.

Major M'K., aged 64, had been much in the West Indies, where he had been a free liver, and accustomed to an indolent life. He was seized with dimness of sight, pains in the head, attended with giddiness, constant acid eructations, a sensation of pressure on the scorbiculus cordis, heartburn, distension of the abdomen, thirst, nausea, &c.; the tongue being considerably furred. As derangement of the digestive functions was evidently the primary source of all these evils, I ordered him two brisk purgatives of hydrarg. submuriat. with pulv. jalapii comp., which completely evacuated his bowels, and gave him much relief: his sight, however, remaining still very imperfect, and the sense of pain in the head not being removed, twelve ounces of blood were taken from between the shoulders, and a blister applied behind each ear, to be kept open for sixteen days. At the expiration of this time, all the before-mentioned

distressing symptoms had left him ; his sight returned, and with it also his hearing, of which he had been occasionally deprived for twenty years.

CASE XLVIII.

Thomas Smith, a private in the first regiment of horse-guards, was admitted at the Royal Dispensary on the 3d of May. Independently of being very deaf, he had been affected, for three months preceding his deafness, with considerable derangement of the digestive functions ; his appetite was bad, and acid eructations accompanied digestion ; he was liable also to severe nervous head-aches, and complained of a sense of weight and uneasiness in the region of the liver, and on the top of the right shoulder. Judging from these symptoms that his deafness might proceed from the torpid and diseased action of so important a viscus as the liver, I put him under a gentle mercurial course ; and in the space of six weeks had the pleasure to see my views of his case verified, by the restoration both of his health and hearing.

CASE XLIX.

Mrs. A. applied to me with a violent noise in her head, and consequent obtuseness of hearing. Her spirits were greatly depressed, her bowels costive, and she complained much of the globus hystericus. These symptoms are not at all uncommon in females after a certain period of life.

By attending to her general health, and strengthening the tone of the whole nervous system, the noise in her head ceased, and she shortly afterwards perfectly recovered her hearing.

CASE L.

Louisa Green, a married woman, and mother of thirteen children, was admitted a patient at the Royal Dispensary on the 10th of August. She was of a delicate and feeble constitution, spare habit, and extremely nervous. About seventeen weeks previous, she had caught cold in her head, accompanied with deafness ; which last had progressively increased. By tonic remedies, and stimulating applications to the ear, she got quite well in five weeks.

CASE LI.

Mr. V., a native of Switzerland, complained of a dulness of hearing, with great noise and pain in his head, which at times was so violent as almost to distract him. His whole appearance indicated a melancholic temperament; and having reason to suspect a deranged action in the liver, I ordered him an alterative course for three weeks, and afterwards sent him for a fortnight to the Leamington Spa, whence he returned perfectly recovered.

CASE LII.

Mr. M., a principal clerk in a public office, from want of sufficient exercise, and having too much intellectual exertion, was subject to constipation, which had impaired his health, and brought on deafness, with a perpetual noise in his head, which he compared to the singing of a tea-kettle. By the administration of bark, bitters, aloetics, and by gently stimulating the ear, he was cured.

CASE LIII.

Mrs. G., a widow lady, was troubled with a violent noise in her head, attended with total deafness, from great nervous irritability and domestic circumstances. When I was called in she was completely insane. With the concurrence of her physician, I bled her profusely, gave her brisk purgatives, and applied a blister to the head, as well as a seton to the nape of the neck. The noises she complained of in her head, which, according to her account, were extraordinary, have entirely left her; and she has regained her faculties and hearing, so as to enjoy common conversation.

CASE LIV.

Colonel — applied to me under very distressing symptoms, viz. extreme deafness, headache, constipation of the bowels, violent noises in the head and ears, with an apparent tendency to insanity. As there was a strong sensation of weight on the head, accompanied with giddiness, I ordered it to be shaved, and a blister applied, which was kept open for some weeks,

and considerably relieved him: he had also leeches behind the ears, and his feet put into warm water in which a little mustard had been mixed. But in order to complete the cure, I found it necessary to give him some brisk aperients (pulv. scammon. cum extract. colocynth. comp.), which effectually removed the deafness and noise in the head.

Tinnitus aurium, I have observed in a former part of this work, is frequently a forerunner of insanity, and is derived from the same source as madness; namely, anxiety, grief, the love of an absent object, the pain of jealousy, sudden frights, violent fits of anger, disappointed ambition, the haughtiness of pride, prosperity humbled by misfortune, religious terror or enthusiasm, the frequent and uncurbed indulgence of any passion, or from violent emotion, and intense study. In short, it may be produced by any thing which affects the mind so forcibly as to take off its attention from all other affairs.

CASE LV.

Miss K., a young lady from Ireland, of superior accomplishments, was subject to con-

siderable hysterical affections, attended with their usual symptoms, such as dejection of spirits, anxiety of mind, effusion of tears, difficulty of breathing, sickness at the stomach, palpitations of the heart, &c. As she had been very deaf for some years, and had consulted many of the most eminent practitioners in town and elsewhere, I did not give her much hope of cure; but as the relative who accompanied her was very desirous that I should attempt something by way of relief, I began by gently evacuating the bowels, and applying strong stimulants behind the ears, joined with the use of tonic medicines and generous diet; and I have the pleasure to state that the young lady has now perfectly recovered her health and hearing.

CASE LVI.

Mrs. D., a married lady, consulted me: her case was similar to the preceding, except that she complained of violent noises in the head and ears. What made this case the more distressing was, that, although possessed of all the luxuries of life, her spirits were so depressed that she was rarely free from shedding tears, even

at church, the theatre, or elsewhere. She had two fine children, an indulgent husband, and, as she often expressed herself, was perfectly happy. I must remark here, that her deafness was not considerable; and through the means usually employed by me in this species of nervous deafness, I succeeded in restoring her hearing, and getting rid of the noise in her head and ears. She in some measure recovered her spirits; and as I thought change of air would be of service to her, I recommended her to go to Cheltenham. I have heard from her since, informing me she is now quite well.

CASE LVII.

Miss M., wishing to have a good view of the late eclipse of the sun, very imprudently made use of a small magnifying-glass for that purpose; and notwithstanding the pain it occasioned in her eye, she continued to look through the glass as long as the eclipse lasted. In a few hours after, she was seized with violent pains in the head, and was nearly deprived of sight in the eye with which she had observed the eclipse. In this state she went into the country for some

days, and nothing was done for her until her return, when I saw her, with her father, for the first time. She complained of great pain in the back part of the head, and wore a shade over the affected eye, with which she could scarcely see at all. I immediately directed leeches to be applied over the eyebrow of the injured eye, and a blister behind the ear on the same side: the blister was kept open a week. I also gave her some aperient medicine; joining to it a small portion of the antimonium tartarizatum, to promote a gentle diaphoresis, there being much fever present. The young lady is now quite recovered. She has also since informed me that she had been deaf for some time previously, but that she now hears as well as ever she did in her life.

CASE LVIII.

Miss G., a native of Pennsylvania, applied to me with an obstinate nervous deafness, which had baffled many of the American practitioners. Besides being extremely deaf, she was likewise subject to hysterics.

It appears that women of a delicate habit, and whose nervous system is extremely sensible,

are those who are most subject to hysteric affections; and the habit which predisposes to these attacks is acquired by inactivity and a sedentary life, grief, anxiety of mind, late hours, dissipation, a suppression of the customary evacuations, &c.

Conceiving this case to proceed chiefly from a deranged state of the nervous system, I treated it similarly to the two preceding ones, and with the happiest effect, as the lady has now returned to her own country perfectly recovered.

CASE LIX.

Mr. Q. had consulted most of the profession in London and Edinburgh before he applied to me. He complained of great pain in his head, especially at night, which disturbed his rest. He had been a long while in the West Indies, and had formerly lived a very free life. He had now no appetite, and his bowels were at one time costive, at another lax. By attending to the regulation of the constitutional symptoms, and thus giving tone to the nervous system; putting a seton into the nape of the neck; and throwing warm injections into the ear, he became perfectly well.

CASE LX.

Mrs. A., a case similar to the preceding, had been electrified regularly every day for nearly six months, without effect, and had likewise been galvanised: indeed, I never knew either of these remedies of any permanent use, although I and my pupils have given them a full trial at the Dispensary. The electrical machine I employed was one of extensive powers, having been constructed for the late Mr. Royston. In this case the same constitutional and local treatment was equally successful as in those just detailed.

CASE LXI.

Master G., a fine youth, became quite deaf on one side, from the blow of a ruler, inflicted by one of the ushers of the school. The deafness was preceded by violent hemicrania, but the internal ear had not suppurated. By blistering, alterative medicines, and stimulating injections, the boy eventually recovered his hearing.*

* I have inserted the above case as a warning to those who have the care of children, never to strike them upon the head, as the most serious consequences may ensue; and,

CASE LXII.

Lieut. R., an officer in the royal artillery, became deaf in consequence of a violent explo-

further to enforce the warning, I shall add two cases from Mr. M'Kenzie.

The first is that of a young gentleman, who, at twelve years of age, was wounded at school on the right side of his head, by a blow from the edge of a flat ruler: the wound did not heal for six years. Soon after its healing, his sight began to fail, and continued so till he became quite blind; he also now began to suffer from frequent epileptic fits.

The part wounded was trephined, as this was thought most likely to be of service. There was no particular appearance of the cicatrice, nor was the bone found to be diseased, or even discoloured. Upon removing the piece of bone, some blood and serous fluid escaped from between the skull and dura mater, which had not lost its healthy colour. By the next day the pupils had recovered their natural sensibility; but the blindness remained as before the operation. The patient's strength hourly declined; a degree of low fever supervened; and on the third day after the operation he had an unusually severe fit, and expired soon afterwards.

On opening the head, the cranium and dura mater were apparently every where healthy. Below the part exposed by the trephine, the pia mater had evidently suffered from chronic inflammation, but this appearance was circumscribed. The brain was found considerably indurated to the whole of the middle lobe of the cerebrum, from the surface of the hemisphere down to the basis of the cranium.

The other is that of a young lady, who, when about fifteen

sion of a large barrel of gunpowder, and the deafness had affected him for some years; but by a continued course of alteratives, and re-

years of age, received at play a slight tap on the right side of her head, which gave her, at the moment, rather severe pain; but she disregarded it, and nothing more followed than a common head-ache always attacking the part which had been struck. These attacks lasted for thirty years, when, though naturally lively, she began to grow heavy, and sometimes stupid and sleepy, without any known additional cause. This disposition gradually increased, till a perpetual comatose state took place, and she died convulsed. Her vision had gradually become very much impaired.

On dissection, the part of the parietal bone upon which the blow had been received, appeared to be of a dark colour; but upon removing it, it was transparent, and almost wholly absorbed. The portion of the right hemisphere of the brain directly underneath was found to be quite black, and thus gave the bone that appearance, the dura mater at this part being altogether removed by absorption. Had she lived much longer, the bone would probably have been quite absorbed, and the brain itself protruded. The portion of brain under the seat of injury was indurated and scirrhus, and this change had taken place through the whole of the middle lobe of the cerebrum. The colour was dark livid. Every other part of the brain was quite sound, nor was the thorax or abdomen diseased. The disease had so pressed upon the optic nerves at their origin, as to make them as flat as a piece of tape, thereby occasioning the loss of sight, which, for some time before death, had amounted to almost total darkness.

peated blistering, his hearing became very much improved.

CASE LXIII.

Mr. F. became deaf from a severe cold, caught by being washed overboard on the passage between Dover and Calais, from which accident he narrowly escaped with his life. By appropriate means, as indicated by the case, and varied according to the progress of the cure, his hearing was restored.

CASE LXIV.

Mr. B. had had the tympanum perforated by an unskilful practitioner, for a slight defect of hearing; the effect of which was, to make him completely deaf. I could cite several other instances of equally unhappy results. By mild astringent and stimulating injections, my patient was much relieved.

CASE LXV.

Thomas Nevenson, a carpenter, was admitted a patient at the Royal Dispensary on the 3d of February. He had some time before fallen from a scaffold, and remained insensible for several days. Blood had flowed freely from the ear; and on his senses returning, he found himself deaf. Leeches were applied to the external ear and neighbourhood, and afterwards a perpetual blister kept open behind the ear. He took full doses of the neutral salts thrice a-week, and in the course of a month was quite well.

CASE LXVI.

Mr. F. received a severe blow on the right side of the head, when attached to the army in Lisbon, in the year 1811. He applied to many medical men of eminence, but without receiving any relief. During the campaigns from 1811 to 1814, the constant exposure to cold, damps, and night air, completely confirmed his deafness, which continued obstinate in the right ear.

About two years ago, when in America, he began to be affected with deafness in his left

ear, which daily increased, and was attended with violent head-aches, dyspepsia, constipation, &c. On his return from America, he went to Scotland for his health, and remained there nine months; at the end of which time he found his deafness in the left ear so great, attended with a copious discharge, that he could only hear, and that very indifferently, when one person was speaking with a loud voice. He is now perfectly cured on that side, and considerably relieved on the other.

To adopting local remedies, combined with a constitutional treatment, I attribute the successful issue of the case.

CASE LXVII.

Mr. C. was very frequently troubled with epileptic fits, which, he observed to me, were always preceded by dimness of sight, noise in the ears, and complete loss of hearing. After the paroxysms had subsided, the dimness of sight left him, but the noise in the head and deafness continued, attended with great debility, although not to such an extent as he experienced before the coming on of the fit.

Upon inquiry, I found that he had been subject to worms; and as I have known them to produce epilepsy and deafness in other cases, I determined to employ strong anthelmintics, combined with the other remedies for his deafness. The vermifuge medicines had the desired effect; for he voided a worm of the tape kind nearly twenty inches long. His hearing by degrees returned; the noise in his head left him; and he has not had a recurrence of a fit for the last nine months; whereas he used to have them frequently before, at least once in about three weeks.

However, I do not wish to be understood as affirming that epilepsy always proceeds from this cause; on the contrary, it often arises from blows, tumours, polypi, violent affections of the nervous system, fits of passion, sudden frights, strong emotions of the mind, frequent intoxications, &c.; I merely wish to observe, that, before prescribing for any disease, it is essentially necessary to endeavour to find out the cause of it.

CASE LXVIII.

Mr. M., a schoolmaster, aged forty-seven, applied to me. He complained of extreme deafness; so much so, that he was unable to follow his avocation. He had been deaf, at times, for seven years: the reason he assigned for not having had recourse to advice, was, that he was fearful of being made worse; and had he been able to have attended to his profession, I am inclined to think he never would have applied. As he complained also of a noise in the head and ears, I ordered the cerumen to be dissolved, and the ears to be well cleansed. Blisters were applied behind the ears, and a slight degree of inflammation kept up in the meatus by means of some acoustic drops. I likewise gave him brisk aperient medicines. In the course of a few weeks he was completely cured. He attributed his deafness to sitting in a current of air in the school-room in warm weather, the windows being open.

CASE LXIX.

Miss P., aged five years, was left, during the absence of her mother, to the care of a

servant of a thoughtless disposition, and, in consequence of her fretting, was put into the cellar, by way of frightening her. This had instantly such an effect upon her, that she became entirely deaf and dumb, in which state she was brought to me. After an inquiry into the cause of these defects, I considered it as a case of nervous deafness, and treated it as such. She has considerably recovered her hearing and speech, although the influence of the fright has not left her; but I trust, from the present advantages gained, that in the end the cure will be complete.

CASE LXX.

Miss A., ten years of age, was brought to my house by her mother very early one morning, quite deaf, and nearly insensible. When I had recovered her a little, I found she had been much frightened during the preceding night by her elder sister, who, it appeared, slept with her. I pursued the same plan as in the former case, and with the same success.

I insert this case with a view of deterring any one from alarming children: it is an evil, the effects of which remain a long while, some-

times till death ; not unfrequently producing epilepsy, and a long train of diseases.

CASE LXXI.

Dr. B., a physician of some eminence, consulted me for an odd noise in his head, which he could not account for, attended with deafness and great depression of spirits.

The case appeared to be hypochondriacal, as it was attended with inactivity, a want of resolution to set about any thing, great despondency, apprehension of evil upon the slightest grounds, and a dread of danger from any unusual feeling, even of a trifling kind ; together with flatulency of the stomach and bowels, acid eructations, costiveness, spasmodic pains in the head and other parts of the body, giddiness, and palpitations : in fact, to detail his symptoms would outstretch my limits. Suffice it to say, that, attending to the digestive functions, as he was much troubled with dyspepsia, and administering strong nervous medicines, different from what he had before taken, I have the satisfaction to add, that he is now quite well, and able to attend to his professional duties ;

at the same time having his perfect hearing. One thing which I recommended to him, and which, I am persuaded, tended much to the recovery of his health, was taking constant exercise on horseback, instead of riding in a carriage.

Hypochondriasis frequently attends nervous deafness ; and by removing the latter, you cure the former. The disease seems to depend on a loss of energy in the brain, or a torpid state of the nervous system, induced by various remote causes, such as close and intense study, long and serious attention to abstruse subjects, the constant remembrance of some material loss or disappointment which has occurred, great anxiety of mind ; leading an inactive, indolent, or sedentary life ; immoderate indulgences, or the use of crude, flatulent, or unwholesome food ; being guilty of great irregularity and intemperance ; and from a variety of other causes. As to its prognostic, the disease, if recent, is rather to be regarded as troublesome than dangerous ; but if long continued, it is apt to produce scirrhus of the viscera, cachexy, dropsy, incurable melancholy, or madness.

CASE LXXII.

John Jacobs, in consequence of fever, had a discharge from both his ears at the age of four years, which, on ceasing, left him completely deaf. He lost his speech gradually, and at the time he was brought to me by his guardian, could not hear or articulate a word. He was a native of Amsterdam ; and as he had been under the care of a physician at the Hague, who had applied blisters behind the ears, and administered a variety of remedies, without success, I was desirous of perforating the membrane of the tympanum, which operation I performed on the 2d of February. I succeeded in restoring his hearing instantly, which continued until the 7th inst., when the orifice made in the membrane partly closed, and by degrees he returned to his former state of deafness. I repeated the operation on the 20th, after immersing the instrument in a weak solution of the acidum nitrosum. After the operation he did not hear so well as when it was before performed ; but I had the satisfaction to find that the orifice kept open, and the hearing continued to improve. Yet I do not attribute the cure so much to the operation as to the

after-treatment. The submaxillary glands being much affected when he first came to England, they recovered by the use of small doses of hydrargyrum cum creta : his speech is now returned, and his hearing continues perfect.

CASE LXXIII.

Mrs. E., aged 35, the widow of an officer in the navy, had been deaf in her left ear from childhood ; and, in consequence of catching cold a short time ago, became deaf on her right side also. Before coming to me, she had consulted a practitioner, who recommended a preparation of veratria, which, instead of relieving her, made her much worse. When I first saw this lady, she complained of a dull heavy pain in the head, attended with giddiness and shooting pains in the ears, the external parts of which, as well as one side of her face, were much swollen. The swelling I reduced by means of fomentations and poultices ; and in a great measure relieved the pains in her head by gentle aperients and saline effervescent draughts ; but could not succeed in removing her deafness.

In connexion with this case, I may remark,

that I consider veratria to be a very dangerous and uncertain remedy ; besides which, I never knew any good result from its application in cases of deafness : and when we remember how *very small* a portion of it, either injected into any part of the body, or taken into the stomach, speedily produces tetanic convulsions, it is obvious that extreme caution ought to be used in prescribing it. Where a stimulant is required in deafness, the antimonium tartarizatum is much preferable. I have the same objection to iodine, which I have repeatedly tried at the Dispensary ; though, I must say, not with such success as the tartar emetic. It is, moreover, a dangerous remedy, unless great care be taken in its application : if too strong, it might produce paralysis of the muscles of the parts ; if too weak, it would not act at all. In those cases where it has been supposed to do good, I am of opinion that more of the benefit resulting is to be attributed to the friction necessarily employed in applying it, than to the iodine itself. In fact, I have throughout the whole course of my practice, public and private, laid it down as an invariable rule, always to prescribe the mildest remedies that promised to be effectual ; and never, except in the most extreme cases, to

employ violent ones. And it is no small satisfaction to my own mind to reflect, that, out of the thousands who have been relieved at the Dispensary, I have never heard of one instance in which any injury has been done by the mode of treatment pursued there. It would be well if all other public charities, as well as private practitioners, could say the same.

From a perusal of the Cases, in the different species of deafness, just laid before the reader, and the favourable issue of them, it cannot be too strongly impressed on practitioners, that in all diseases of the ear, arising from whatever cause, perseverance is an essential point, and one on which I consider the successful termination of most of the foregoing cases chiefly depended.

Although no visible alteration should take place for several weeks, still the patient is not to be abandoned; but some further changes must be made, so as to modify the treatment to the apparent circumstances. From no remedy have I found greater effect in obstinate cases than from blisters applied behind the ears, and kept

gently open in the form of an issue. The period of continuing this issue must be regulated by the appearance and progress of the amendment.

Although, in very young children, a want of hearing is frequently indicated by backwardness of speech, yet it seldom arises from any organic or permanent defect; for if the ears are *completely syringed*, and the other means employed which I have before stated, a marked change will often be observed to take place, and the children very soon acquire their speech. This is a sufficient inducement for early attention; and if regularly paid, I flatter myself there would not be so many suffering from this malady.

If the prejudice so long entertained in this country, that diseases of the ear are incurable, could be removed, and would persons labouring under this defect apply for relief at an early period of the complaint, with the same alacrity as for other disorders, there cannot be a doubt that the greater number of cases, by yielding to proper treatment, would be cured: but one great source of error is, that patients are not sufficiently aware of the danger often connected with deafness.

Every accumulation of blood in the head at

a certain period of life is marked by a slight attack of deafness; and if this symptom be long neglected, and proper remedies are not employed, we frequently find that apoplexy ensues, or some other affection of the brain. The means, therefore, which remove the deafness, by diminishing cerebral congestion, reducing the action of the heart and arteries, and emptying the *primæ viæ*, will likewise be successful in warding off the alarming mischief.

Indeed, when we consider the near connexion of the ear and the brain, and the intercourse of the nerves and blood-vessels which takes place in all the organs of sense with the brain, there can be no doubt, that in all affections of this primary organ the adjacent parts become more or less implicated, and take on the cerebral disease; so that the cure of deafness cannot be complete without ascertaining its original source.

In the same manner, deafness occurs as a symptom in nervous and irritable constitutions, particularly in females of a delicate chlorotic habit, and is often combined with hysteria, dyspepsia, and affections of the stomach. In this condition the general diseased state of the nervous system is communicated, through the

brain, to the portio mollis of the auditory nerve ; and the treatment here must be directed to the system at large, and not limited to endeavouring merely to remove the imperfection of the ear.

As it is an admitted fact, that the stomach is the grand centre, with which every organ sympathises,* so every derangement of this organ necessarily extends its influence to distant parts, particularly those of acute sensibility ; hence the deafness, and often dimness of sight, which accompanies a morbid state of the system. How vain, therefore, would be the attempt to remove these partial symptoms of imperfect hearing, without attention to the general derangement of the constitution, and without restoring the stomach and bowels to their natural and active condition, and giving full play to the circulating and secreting powers of the system !

That an impression made on the stomach by a medical agent should be the means of exciting the distant parts of the machine, will not appear extraordinary, when we consider how universal

* Vide (p. 132, &c.) the Plate of the great sympathetic nerve, shewing its various ganglia and ramifications, extending from the stomach to the ear, eye, &c.

a sympathy and control this central organ exercises over every function of the body. Imbued with exquisite and diversified sensibilities, subjected to the first and coarsest impressions of our various ingesta, stretched occasionally to an enormous extent by the unrestrained indulgence of appetite, disturbed by the passions, exhausted by inanition, or debilitated by strong diluents; in short, assailed by numerous foes from without, and harassed by various revolutions from within, can we be surprised that the aberrations of this viscus are the source of the greater number of maladies with which mankind are afflicted, or that those medicinal means are effective which are directed for their cure through the medium of its sympathies?

These facts are sufficient to shew that deafness is not that simple and uncomplicated malady generally supposed; on the contrary, it is often to be looked upon as the forerunner of serious and fatal consequences, and should, with all persons somewhat advanced in life, be regarded with attention, and its cause particularly inquired into.

Though it is admitted that the maladies of the ear are not numerous, yet, compared with other classes of disease, the misery they entail,

by excluding the sufferers from the intercourse of society, renders them objects of high consideration.

In consequence of the establishment of the Royal Dispensary, I have had daily opportunities of treating diseases of this organ to a much greater extent than others ; and, accordingly, I have seen the necessity of occasionally varying and amplifying all the fixed modes of practice. This leads me to speak with confidence on what can be done in acoustic surgery, as the result of my observation and experience.

In proof of the advantages of the treatment recommended in this work, I have the pleasing satisfaction to know that my principles of cure have been adopted by the most eminent of the profession, not only in this country, but also in France, Italy, Germany, and America.

THE END.

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THE ROYAL

DISPENSARY

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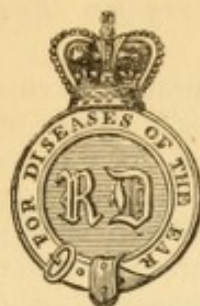
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Royal Dispensary for Diseases of the Ear.

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In consequence of the great success which has crowned the exertions of the Royal Dispensary, it was resolved, at a late meeting of the Governors, still further to extend its sphere of usefulness, by enlarging the present building, in order to receive within its walls not only deaf and dumb patients, but also persons from the country afflicted with deafness or other diseases of the ear, who are destitute of a habitation.

Such patients as require acoustic instruments are supplied with them gratuitously.

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Accidents, and also cases of deaf and dumb, are admitted without letters of recommendation.

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* * By the last Report of this Institution it appears, that since its establishment in 1816, upwards of 9520 patients have been cured or relieved, including several cases of deafness and dumbness.

†† The benevolent views of this Charity are not confined to the inhabitants of the metropolis, but extend to every individual.

PLAN OF LECTURES
ON
The Anatomy, Physiology, and Pathology
OF
THE EAR,

BY JOHN HARRISON CURTIS, Esq.

*To commence on Friday, October 1, 1836, at Seven o'Clock
in the Evening,*

AT THE
ROYAL DISPENSARY
For Diseases of the Ear and the Deaf and Dumb,
DEAN STREET, SOHO SQUARE.

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IN the introductory part will be considered the importance of the sense of hearing as the medium of social intercourse; the various degrees of this sense in the several tribes of animals; with the different construction of the organ for that purpose.

The anatomy of the human Ear will be described, as divided into external, intermediate, and internal parts; and the description will be illustrated by anatomical preparations.

The physiology, or uses of the different parts of the Ear, will next be examined.

PLAN OF LECTURES.

On finishing the structure and uses of the Ear, the various diseases occasioning deafness will then be considered, treating them in the same order in which the structure has been described.

This order will comprehend, first, the affections of the meatus auditorius, or external Ear; secondly, those of the tympanum, viz. its puriform discharge, and the obstruction of the Eustachian tube, with the operations; thirdly, the diseases of the labyrinth, whether constitutional, as nervous, scrofulous, syphilitic, &c.; or local, as paralysis of the auditory nerve, defective organisation, &c.

The subject will conclude with general remarks, applicable to this class of diseases; pointing out, *inter alia*, the intimate connexion existing between the organs of hearing and sight; to which will be added, considerations on the best means of treating the deaf and dumb.

A CLINICAL LECTURE will be given occasionally on the most important cases that occur at the Royal Dispensary.

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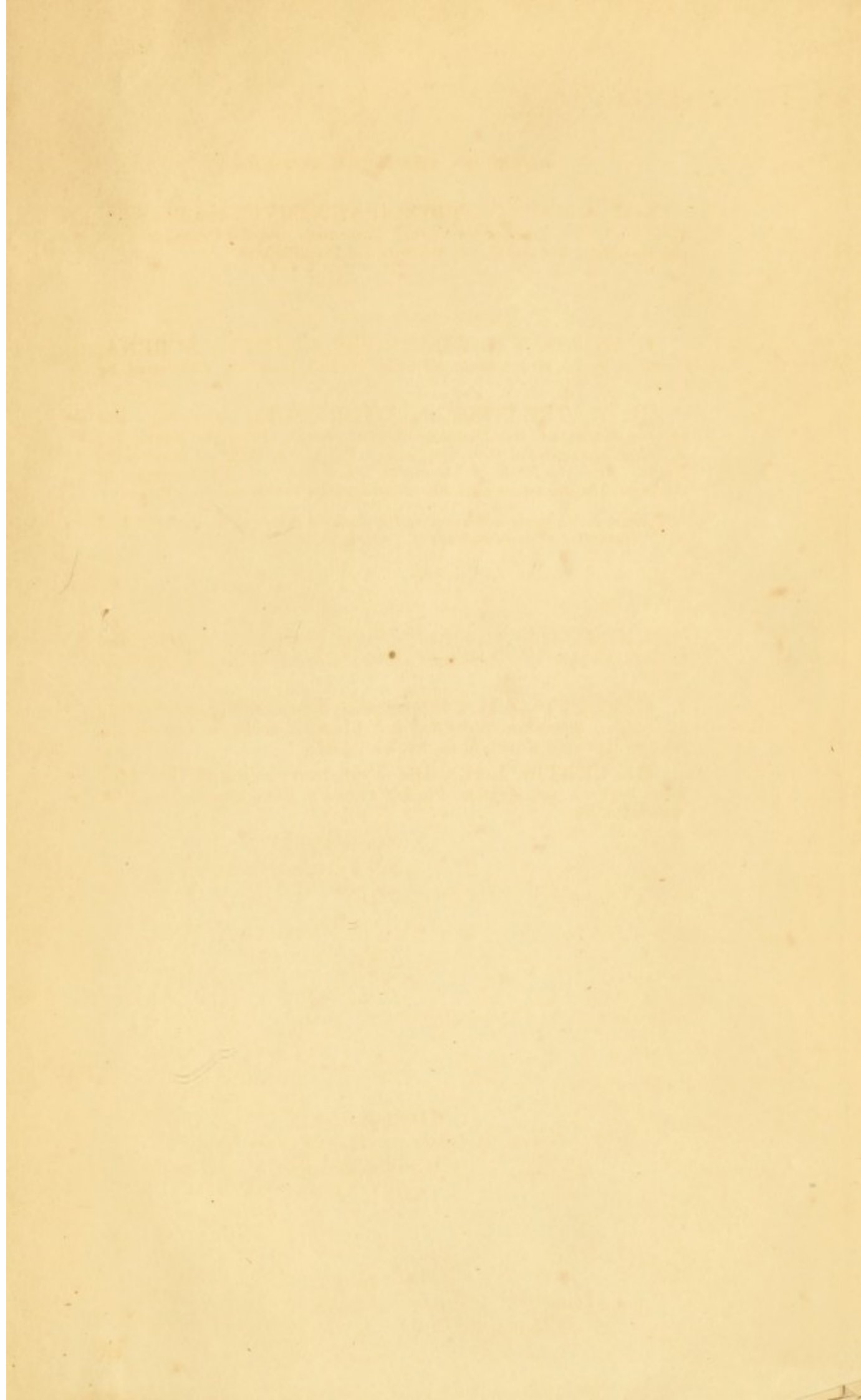
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