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A HISTORY
OF
LARYNGOLOGY
AND
RHINOLOGY

BY
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AND HOSPITAL

SECOND EDITION, REVISED AND ENLARGED



LEA & FEBIGER
PHILADELPHIA AND NEW YORK
1914

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THIS BOOK IS
DEDICATED TO THE MEMORY OF
MY FATHER.

PREFACE TO SECOND EDITION.

A FEW words may not be amiss in the way of preface to this history of the development of our knowledge of the nose and throat.

An attempt has been made to link together the story of the records of the nose and throat in medicine with the general drift of medical history, with the salient features in the early history of the civilization of mankind and with the general literature which has a bearing upon the central subject of the work; for, as Huxley has said: "Science and literature are not two things, but two sides of one thing." This has been done in constant fear of rendering the story too verbose and pedantic, but with the earnest hope of riveting the attention of the reader in a way which can not be attained in the routine preparation of an encyclopedia or a dictionary. The author has also ventured to hope that the information thus laboriously offered will not, on account of its form, prove less accurate or extended because an attempt has been made to make it more attractive. If he has failed in realizing these ideals—and who ever fully succeeds?—he may comfort himself with the reflection that the labor expended in an attempt to attain them has been fully repaid by his pleasure in the work itself.

In the preparation of this work the author has taken his notes chiefly from the original sources. In addition he has made use of many historical works both of medicine and of general literature. Among the former those of Sprengel (the French edition of his history), Baas (in English translation), Whittington, and especially Gordon Holmes' "History of the Progress of Laryngology,"¹ and Heyman's "Geschichte der Laryngologie und Rhinologie" in his "Handbuch;" among the latter those of Buckle, Guizot, Freeman, Draper, Lecky, Gibbon, Grote, Ranke, Prescott, Renan, and many others have been systematically read during the course of the work.

¹ Med. Press and Circular, London, 1885, xci (n. s. XL), p. 49, seq.

In revising his book for a second edition the author cannot fail to acknowledge his indebtedness to *The Laryngoscope* and to its editor, Dr. Max A. Goldstein, for publishing the text of the first edition in their columns. Through an oversight this was not explicitly stated when it was first published in book form. As it was not a part of the author's ambition in preparing the first draft of the work that it should eventually appear in permanent form, and inasmuch as the text was furnished from the columns of that journal without emendation, naturally that care was not given to various matters in its preparation which is essential to its existence as a book.

There is in press at this time a valuable and exhaustive history of laryngology in Germany. Its author, Dr. Karl Kassel, of Posen, has with the greatest courtesy furnished advance proof-sheets, which show that it enters more into detail than this work, but differs somewhat from it as to references to contemporaneous events in the general history of civilization.

The author desires to acknowledge his indebtedness to Semon's *Centralblatt für Laryngologie und Rhinologie*. Without it the task of collecting such data as have been added would have been too great. He desires also to acknowledge a personal debt of long standing to Sir Felix Semon, who urged him years ago to undertake the present task and whose appreciative words in regard to the first edition are still gratefully remembered.

The author desires to express his appreciation of the work of Mr. Frank Place, of the library staff of the New York Academy of Medicine, who has undertaken to confirm and revise the references.

J. W.

NEW YORK CITY, 1914.

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INTRODUCTION.

IN every age there have been attempts to draw from the appearance of the countenance, especially from the shape and size of the nose, prognostications as to the mental and physical attributes of men; but although many are the rules laid down for the guidance of observers, they are of little value; for while doubtless the features tell their story to us occasionally, if we are close observers, in spite even of the modern and scientific treatises of Bell and of Darwin, the expressions are too fugacious and elusive to allow us to gather from them any reliable data as to the characteristics of the individual. The extensive disquisitions on character drawn from the aspect of the features are largely flights of a foolish and puerile fancy.

Physiognomy of the Nose.—No longer ago than 1820 we find it stated in a scientific work¹ that “a long and pointed nose passes for a sign of sagacity. A short and blunt nose marks a simplicity of mind, easy to deceive and with very little foresight. A little nose, thin and movable, denotes a natural mocker. Large noses are an indication of heaviness, for they bespeak the lymphatic nature of the complexion. Twisted noses, they say, are a sign of an obliquity of mind; but an aquiline nose, large and muscular, announces force and courage; a flattened nose an inclination to luxury; in fact, it is thought there is a correspondence between the sexual organs and that part of the countenance.”

“Noscitur ex labiis quantum sit virginis antrum
Noscitur ex naso quanta sit hasta viri.”

This is a quotation drawn from a literature stimulated by the recent excursions of Lavater into the realms of uncontrolled and uncritical observation.

On the testimony of Plutarch we learn that the Persians most admired the hawk-nosed type of man as resembling Cyrus, their best beloved king. This saying we find echoed in the sixteenth century by Riolan² and Laurentius,³ the latter declaring, with how

¹ Dict. des Sciences Médicales, Paris, 1820, Vol. XXXXII, p. 220.

² Opera Omnia, Paris, 1610, Anatome, Cap., LIII, De Naso.

³ L'Histoire Anatomique traduit par Size, Paris, 1610, p. 1374.

much truth I do not know, that the Egyptians in their hieroglyphs use the figure of a nose to designate a man. We may plainly see the type of Cyrus in Bellini's portrait of the Sultan Mohammed.¹ We learn from the Old Testament (Levit. XXI, 18) that there was a prejudice among the Patriarchs against flat-nosed people.

But in spite of these predilections of the Caucasian race we find among the native negroes and the Chinese different ideals as to the beauty of the nose. "The ancient Huns during the age of Attila were accustomed to flatten the noses of their infants with bandages for the sake of exaggerating a natural conformation. With the Tahitians to be called long-nosed is an insult and they compress the noses and foreheads of their children for the sake of beauty. So it is with the Malays of Sumatra, the Hottentots, certain negroes, and the natives of Brazil."²

In attempting to present an outline of the growth of our knowledge of the nose and throat and of their diseases, it must be remembered that a complete and intelligent review of the subject cannot be obtained by beginning our study with the discovery or rather with the introduction of the use of the laryngoscope. That would be a consideration of the history of laryngoscopy and its sequelæ in the history of the diseases of the upper air tract, and of the growth and development of technical skill. However great may have been the revolution wrought by Türk and Czermak in this field, the history of rhinology and laryngology begins not with the invention of the speculum and the laryngeal mirror, but with the earliest records of the civilization of man. In fact, it is reasonable to conjecture that it is only the lack of records which prevents us from tracing knowledge of the diseases of the nose and throat still farther back into prehistoric times. It must necessarily be that any disease of the respiratory system causing obstructive dyspnoea, or any affections causing deformity and discharge from the nose, would have attracted the attention of the medicine men of our primeval ancestors. Injuries to the head must, as frequently then as now, have involved the nasal organ. Indeed, we shall find in the very earliest Hindu and Greek records evidences of the care and attention devoted to the study of this branch of the medical art. We shall also find that to some extent the nose and nasal disease in the earliest times possessed proportionately a larger interest for medical men than it did in more recent and more enlightened times, until the beginning of the growth of what we are pleased to call Modern Rhinology. Exposed to accidental and intentional injury in the sports and wars of the ancients, mutilated by the deliberate acts of a cruel justice before the days of jails, or in the fierce outbursts of passion and revenge, traumatic

¹ This may be conveniently referred to in Mrs. Oliphant's *Makers of Venice*.

² Darwin's *Descent of Man*, Part III, Chap. XIX.

conditions of the nose have occupied necessarily not only a very large place in the medical literature, but in the secular writings of former civilizations:

“Atque hic Priamiden laniatum corpore toto
Deiphobum vidit, lacerum crudeliter ora,
Ora manusque ambas, populataque tempora raptis
Auribus et truncas inhonesto volnere naris.”
—VIRGIL, *Aeneis* VI, 494.

Innumerable colloquial phrases in all known tongues still testify to its importance as a symbolical figure of speech.

Etymology of Nose.—It would seem that the remarkable coincidence, pointed out by Hvorka,¹ that the word “nose” has the same stem in all known European languages, might be explained, as he suggests, on phonetic principles, and it is very likely that the nasal resonance of the “n” followed by a vowel has had an influence in preserving the stem from radical changes; but it is difficult to see why, on this ground, the sibilant “s” should enter almost universally into the word. The following is the list of languages quoted by Hvorka in a little different sequence, with the accompanying word for nose:

Sanskrit	Nās	Danish	Noesen
Old Indian	Nāsā	Netherland	Neeus
Old Persian	Nāna	Modern German	Nase
Zendic	Nāonha	Old Slavonic	Nosz
Hebraic	Nohar	Old Bulgaric	Nosû
Greek	{ ῥῖς ῥῖνος	Old Prussian	Nozy
Latin	Nasus	Lithuanian	Nosis
Italian	Naso	Lettic	Nasis
Spanish	Nariz	Bohemian	Nos
French	Nez	Polish	Nos
Gothic	Nasa	Polabian	Nūs
Old Norse	Nös	Upper and Lower Sorbian	Nos
Old German	Nasa	Russian	Nos
Middle German	Nase	Servian	Nos
Anglo-Saxon	Nose	Croatian	Nos
English	Nose	Slovenic	Nos
		Swedish	Näsan

It thus seems evident that there has been a direct transmission from the ancient Sanskrit of the word nose to the modern languages of Europe, one of the innumerable etymological evidences of the origin of our branch of the human race. If we look at a photograph of a miscellaneous group of natives of Calcutta or Bombay, and then glance out of the window at the pedestrians along Broadway or the Strand, we will note that not only the word has been transmitted, but the characteristics of the feature for which it stands.

It may not be without interest in this connection to supplement

¹ Hvorka: *Die Aeussere Nase*, 1893.

Hvorka's investigations by examining other languages having no known affiliation with the so-called Aryan stock:

Chinese	Pe
Japanese	Hana
Congolese (Africa)	Djolo
Mexican (Nahaute)	Yacatl

SOUTH AMERICAN INDIANS.

Aymara	Nasa
Moxas	Nusiri
Incas (Quichua)	Seneca

NORTH AMERICAN INDIANS.

Cree	Miskiwan
Lenape (Delaware)	Wikiwan
Onondaga	Onionchia
Chinook	Bekats
Clallam (Washington Territory)	Nuk'su

A number of vocabularies of other North American languages show no such conformity as the European languages. There is, however, as will be seen, a suggestion of a common derivation of the word even as between the tongues of the three continents (Europe, Asia, America), but it would lead us too far astray to pursue the question further. It will be noted that the persistence of the nasal "n" and the sibilant "s" is not so marked in the languages of the non-Aryan races of the world.

THE NOSE AND THROAT IN MEDICAL HISTORY.

EGYPTIAN MEDICINE.



IN a volume published from the unfinished manuscript of A. Mariette Bey, entitled "*Les Mastabas de l'Ancienne Empire*,"¹ among many others is a fac-simile of a drawing on a slab found in the tombs of one of the old Egyptian kings. The grave in which the slab was found is said to date back to the fifth dynasty, a matter of 3500 years before the birth of Christ. On the slab is the delineation of a physician and his wife with her hand resting affectionately on his shoulder. He was the medical attendant of King Sahura and his name was Sekhet'enanch, but what the name of his wife was does not appear. It is said to have been everywhere erased from the tablets. What subsequent domestic infelicity this may hint at does not appear. Edward Meyer, in his "*Geschichte des Alten Aegyptens*" (II, p. 95), translates some of the inscription relating to the physician in such a manner that it appears the king had ordered it to be engraved as a testimony of gratitude to his doctor because he had "made his nostrils well." He wishes him, therefore, long life and happiness. This tablet had formerly been set up in the king's palace in an ante-room where all might see and read. We see hereby not only the antiquity of medicine, but also the antiquity of certain propensities which have not yet disappeared, so the uncharitable say, from the activities of its devotees; for we read further in Meyer's text that this method of recompense was suggested to the king by Sekhet'enanch himself. Truly "*Vita brevis, ars longa*." However, it does not appear that this early practitioner of medicine and violator of medical ethics was necessarily a rhinologist, for the word "nose" in this place, according to the translator, seems to have signified "breath of life." This, of course, makes the meaning of the passage very indefinite. It is an indication, however, that five thousand years ago they recognized the nose as belonging to the respiratory system, a fact to which it has frequently been necessary to draw attention in later, and we are fain to believe, more enlightened times. Voltolini² has

¹ On Plate D 12.

² *Die Krankheiten der Nase*, Breslau, 1888, p. 16.

quoted Moses for authority (Genesis II, 7), that the nose was recognized as an organ of the respiratory apparatus when the "Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life." According to Kautzsch this utterance was recorded only about 400 years before Christ or about the end of the life of Hippocrates as it is usually reckoned (Kassel).

This reference and several others in the Sacred Writings point directly to the nostrils as emblematical of life and of the soul. It is not at all improbable that this figure of speech had its origin in Egypt where the nostrils were the route by which the contents of the cerebral cavity were extracted in the more expensive methods of the universal practice of embalming the dead. The exodus of the people of Israel from Egypt is said to have taken place at a date subsequent to that ascribed to the compilation of the "Papyros Ebers" (1550 B.C.).

Specialists in Egypt.—As to the possibility of Sekhet'enanch having really been a rhinologist, we are supported only by a single historical reference. Herodotus (II, 84) makes a very positive statement as to specialization in Egyptian medicine, but makes no reference to rhinology, unless we suppose reference to the head to include affections of the nose and throat. The passage reads in Rawlinson's translation (vol. ii, p. 136) thus: "Medicine is practised among them on a plan of separation; each physician treats a single disease and no more; thus the country swarms with medical practitioners, some undertaking to cure diseases of the eye, others of the head, others again of the teeth, others of the intestines, and some those which are not local." *"ἡ δὲ ἰητρικὴ κατὰ τὰς σφί δέδασται μῆτ' νοῦσον ἕκαστος ἰητρός ἐστι καὶ οὐ πλεόντων. πάντα δ' ἰητρῶν ἐστι πλέα· οἱ μὲν γὰρ οφθαλμῶν ἰητροὶ κατεστᾶσι, οἱ δὲ κεφαλῆς, οἱ δὲ ὀδόντων, οἱ δὲ τῶν κατὰ νηδύν, οἱ δὲ τῶν ἀφανέων νοῦσων."*

Maspero¹ and Erman² are both inclined to believe that Herodotus somewhat exaggerated the extent to which the specialization of medicine was carried in ancient Egypt, but Montaigne, that garrulous and delightful old French classic, not only credited the statement of Herodotus but approved of it, for he says:³ "The Egyptians were right in neglecting the general calling of physician and of dividing the profession; for each illness, for each part of the body, there was an attendant, and therefore each part was more skilfully and less blindly treated, because they studied each one specially."

It has been conjectured that this specialization of medicine in Egypt, when at the height of her civilization, was due to the same causes which have produced it today. The teeming population

¹ Maspero: Dawn of Civilization.

² Erman: Life in Ancient Egypt.

³ Montaigne: Essais, Livre II, Cap. XXXVII.

in the fertile, irrigated valley of the Nile dwelt largely in cities¹ and these enormous aggregations of population, which is the striking phenomenon of modern civilization, furnish the only conditions under which such subdivisions of the arts and sciences are possible. The whole matter, however, resting as it does upon this passage in Herodotus, is involved in much doubt and uncertainty.²

The "Papyros Ebers."—Whether these old Egyptians had specialists or not, it is evident from the "Papyros Ebers" that they had physicians who observed and knew how to treat diseases of the nose and throat after a fashion. This "Papyros" is the earliest of all books on medicine and is said to have been compiled about 1550 years before Christ,³ but even the date of its compilation is somewhat conjectural, while that of its origin is wholly so. It is supposed by some to be merely a book on pharmacology, but as its learned translator⁴ has stated, it is more than that, for near the end it deals with anatomy, physiology, pathology, and surgery. In spite of the practice of embalming, anatomy was evidently largely a matter of fancy with these early doctors, and gave no promise of the great development which the Greeks under the Ptolemies, in the future city of Alexandria, a thousand years later, were to bring about in it. We read, page 181, "There are four vessels in both nostrils of which two carry blood and two carry mucus." In physiology they were scarcely less at sea, for when the air once entered the nose they lost track of it. "It goes to the heart and the rectum," says the author of the "Papyros," a few lines farther on. It is evident that tumors of the neck, both tubercular glands and goitre, were well known and as little understood. It must be remembered, however, that the translation is often uncertain and that it is impossible for us to comprehend exactly what they meant even when the equivalents of their hieroglyphics are selected in the modern languages. "If thou findest in his throat a fatty tumor (?) and it appears like an abscess of the flesh, which can be reached by the fingers, thou must say thereto, 'he has a fatty tumor in his throat; I will treat the disease with a

¹ Egypt in the time of Herodotus contained from eighteen to twenty thousand cities. Under the successors of Alexander it is said to have contained thirty thousand towns. (Baas.) There were so many physicians in Egypt that Homer declared, perhaps as an early instance of poetic license, they were all physicians.

² Cyrus sent for an eye doctor out of Egypt (Herod. III, 1) and Darius (Ibid. III, 129) made use of one of his captives, the Greek physician Democedes, to cure him of a sprain, but there is no mention of a nose doctor which I can find. Democedes, by the way, was the first physician of whose life and adventures we have a trustworthy record, and his romantic and interesting story is graphically told by the Father of History. He lived 490-430 years before Christ, and was paid fabulous prices for his services not only by the Persian King but by his countrymen.

³ Moses brought Israel out of Egypt 1300 years before Christ, and hence, according to these computations, 250 years after the compilation of the Papyros Ebers.

⁴ Papyros Ebers, übersetzt von Dr. Med. H. Joachim, Berlin, 1890.

knife, taking care of the (blood) vessels.' " They were apparently very chary of surgical procedures, and even in this place it is uncertain from the translation whether the author does not really give preference to ointments and cataplasms, for which he gives a number of scarcely recognizable prescriptions.

We will find in the "Zend Avesta" that the surgeon must first thrice essay his skill upon a slave or a lower caste man before operating on their betters. Let us think of our hospitals and dispensaries and refrain from unkind criticism. If they neglected to do this they operated at the peril of their lives on the high caste man. Such a penalty was calculated to encourage conservatism if it obtained in old Egypt as well as in Chaldea.

CHALDEAN MEDICINE.

Closely allied with Egyptian civilization was that of the Chaldeans and the Assyrians, but scarcely any notice has come down to us of their medical attainments beyond the records of magic,¹ the incantations and the invocations of good and evil spirits, which would indicate that our art among them was about on a level with that of the American Indians. In the satires of Juvenal we find Chaldean magic much cultivated by the decadent social world of Rome against which he aimed his shafts.

"Chaldeis sed major erit fiducia; quicquid
Dixerat astrologus, credent a fonte relatum
Hammonis." (VI. 552.)

In the popularity of theosophy and the mind cure and the faith cure we have in our day a parallel to the condition at Rome so far as the mystic influences of the Far East are concerned.

It is impossible for us to stretch our credulity to the point of believing Herodotus when he asserts that the Babylonians had no physicians, but depended on the wisdom of the market-place, where the patients were exposed for the benefit of the comments of passersby. Familiarity with human nature compels us to believe that even if they possessed no medical knowledge they must have possessed men who pretended to it, and others who believed in their assertions, for as Celsus remarked, "*Medicina nusquam non est.*"

According to Sayce² dog's flesh and the ordure of animals were among Chaldean medicaments, and such things we find in abundance in the "Papyros Ebers." These disgusting drugs we will

¹ Some one paraphrasing Pliny has said: "Magic was the offspring of medicine, and after having fortified itself with the shield of Astrology it borrowed all its splendor and authority from religion." See Pliny: *Hist. Nat. Lib.*, XXX, Cap. 1-2.

² Hibbert Lectures, 1887, p. 84.

again find recommended in the works of Galen, Ætius and Oribasius, among those prescribed internally and even for internal local applications in throat disease. We can perhaps therefore understand Juvenal's objections to the Chaldeans, and we may see from his mention how these articles crept into the later medical writings of the Roman Empire and subsequently appeared among the drugs of the Middle Ages, thus transferred from the plains of Mesopotamia to the banks of the Rhine and the Thames. The belief in the efficacy of precious stones as medicaments is first found in the accounts of Babylonian medicine and existed far into the Renaissance as costly articles of the Pharmacopœia.

Witch Medicine.—Mysterious invocations, gruesome and disgusting prescriptions occupy a prominent place in all records of primitive medicine, but apparently these with the cabalistic use of figures and signs have long lingered in the records of medicine and in literature as the heirlooms of Chaldean sorcery. The Faust legend¹ is full of them. The Walpurgisnacht in Goethe's "Faust" has a distinctly Chaldean flavor, not pleasant but weird. We recall the dark cave in "Macbeth," where the witches' prescription is compounded:

"Fillet of a fenny snake
In the cauldron boil and bake;
Eye of newt and toe of frog,
Wool of bat and tongue of dog,
Adder's fork and blind worm's sting,
Lizard's leg and owlet's wing."

The same Chaldean prescription is found in Horace, where the foul witch Canidea orders:

"Et uncta turpis ova ranæ sanguine
Plumamque nocturnæ strigis,
Herbasque quas Iolcos atque Hiberia
Mittit venenorum ferax.
Et ossa ab ore rapta jejunæ canis
Flammis aduri Colchicis."

—HORATII FLACCI EPODON, Liber 5, V, 19 Seq.

These are merely Babylonian or Egyptian prescriptions in meter.

The Therapy of the Magi.—Pliny,² who believed that he would be able to include all the wisdom of the world in his histories, has left behind him some curious information as to therapeutics derived from Chaldean or Oriental sources. He may be held up as a terrible example to the gentlemen who still believe that even now the whole field of medical science does not offer too wide a scope for their mental powers. "I find," says he, "that a cold is checked if any one will kiss the nostrils of a mule." "Inflammation of the fauces and the pain will be cured by the dung of kids before they have tasted grass, if it is dried in the shade." "Gargling with the

¹ Faust in der Geschichte und Tradition, Kiesewetter, Leipsic, 1893.

² Hist. Nat., Lib. XXX.

milk of a sheep helps the tonsils and fauces." "Anginas are helped by a goose's gall mixed with elaterium and honey—by the brain of an owl, by the ashes of a swallow soaked in hot water. Ovid is the author of this medicament." These suggestions are taken at random and do not exhaust the supply of therapeutical measures for nose and throat diseases, which were derived from the Magi by Pliny, to whom I would respectfully refer those curious in regard to or desirous of profiting by such garnered wisdom. Such things still are to be found in the folk-medicine of rural communities to a surprising extent. These relics of this peculiar phase of medical history are still with us, but we have but little direct knowledge of Chaldean medicine, although Sayce has lately partly deciphered "An Ancient Babylonian Work of Medicine."¹

For some mysterious reason Egyptian civilization, and with it Egyptian medicine, was at a standstill for many centuries before the downfall of the Oriental dynasties. At a later period we see the same phenomenon among the Hindus. Although the Greeks apparently derived at least the foundation of their learning from these sources, they were far in advance of them when the generals of Alexander (330 B.C.) established his empire over Asia. Even in the time of Xenophon (401 B.C.), two generations earlier, the Persian monarchs were surrounded by Greek physicians whom they brought to their courts, usually by profuse pecuniary inducements, but not infrequently by force and by kidnapping. It was Ctesias, a Greek physician and historian, who treated the wound, and is said to have saved the life of Artaxerxes when he was left for dead by many of his native followers on the battlefield of Cunaxa, where he so nearly lost his crown to his brother, Cyrus the Younger, who was subsequently himself killed in this battle.² Now, more than a hundred years before this, we have seen that Cyrus the Great (559–529 B.C.) sent to Egypt for a physician for the eyes, while Darius (521–486 B.C.), one of his immediate successors, made use of Democedes, the Greek, in preference to native and Egyptian court physicians.

I do not know whether this sequence of historical events in medicine has any great value, but, in connection with other facts, it is perhaps significant of the shifting of medical knowledge.

THE MEDICINE OF THE PARSEES.

If we have not already had sufficient glimpses of Chaldean and Assyrian medicine we have only to glance through the "Zend-Avesta,"³ the sacred book of the Parsees, to understand the reluctance of their monarchs to avail themselves of home talent. The

¹ Zeitschrift für Keilschriftforschung, II, 1–3.

² Xenophon: *Anabasis* I, VIII, 27. Plutarch: *Life of Artaxerxes*.

³ Darmstetter: *Sacred Books of the East*, Vol. IV, Part I.

remedies of the ancient Parsees consisted chiefly of charms and spells. They divided medical practitioners into three groups: Those who healed with the knife, those who used herbs, and those who practised spells and incantations, and the "Zend-Avesta" recommends the latter class, not an anomalous proceeding in ecclesiastical advice of later time as well, but it gives, perhaps, a very good reason, viz.: They were apparently the least to be feared. We learn that one of their evil deities created 99,999 diseases with which to plague mankind. Out of this large number we find no mention of those of the upper air passages, nor of any other differentiation that is intelligible to us.

THE MEDICINE OF THE "TALMUD."

There are a number of modern treatises upon the medical knowledge of the "Talmud," but a perusal of them, while it reveals a perhaps interesting state of early Hebrew sanitary science, does not give us much insight into their knowledge of diseases of the nose and throat. There are several references¹ to acute inflammations of the throat which seem to bespeak the existence among the Babylonian Jews of diphtheria, or of that disease described later by Aretaeus as Syriac ulcer, from which "they died the most terrible death of all" the 903 deaths possible. This passage reminds one of the mention of the number of diseases in the "Zend-Avesta." We are still further reminded of Chaldean medicine by the incantations spoken of as therapeutic measures, of demons as etiological factors in fatal throat inflammations, and of the dung of a white dog mixed with myrrh as a local throat application in cases of coryza. Cynanche and "tumor of the palate" (apparently quinsy) are also mentioned.

In the *Mischna*² (Fol. 42) we learn that transverse division of the trachea is fatal, but (Holin, Fol. 45) that longitudinal section is not, if there remains an unsevered portion at the top and bottom. In the "*Ghemara*" (Holin, Fol. 57) it is stated that a hole in the trachea may be stopped by an artificial contrivance. It appears that they learned these facts from their sacrificial practice on animals. In the "*Kethubot*" treatise occurs this passage: "Samuel says that the polyp shows itself by a bad smell of the nose. A '*beraitha*' says the odor comes from the mouth." Evidently Samuel and the "*beraitha*" meant *ozæna*, although in a footnote the translator seems to think otherwise.³

¹ Bergel: *Die Medizin der Talmudisten*, Leipzig, 1885, pp. 33, 37, 42, 51.

² *La Medizin du Talmud*. Rabbino-witz.

³ Being entirely ignorant of Hebrew and Sanskrit, I have had to rely on the authority of translations which have been sharply criticised, but I have taken some pains to verify the above extracts from the Talmud. The Jews are said, I know not on what authority, to have been ignorant of medicine until their introduction into Egypt.

HINDU MEDICINE.

When we begin to search the writings of the ancient Hindus we enter a mysterious realm full of surprises, finding therein many medical facts which seem to belong to a later period of the evolution of the art. Finding these at a date many centuries before the beginning of the records of the Greeks, vouches by itself for the remoteness of the beginning of Hindu civilization. That their writings are, some of them, of immense antiquity seems evident, and that they are the origin of much which is to be found in the later scientific literature of the Greeks, seems very probable, for it is unreasonable to suppose that Greek civilization was as indigenous as they claimed both for it and for their race. Whatever was the origin of the Hellenic tribes, it is becoming yearly more evident with the advance in archæological knowledge that their learning was transplanted at a comparatively high state of development from the land of the lotus flower, and in all probability from that mysterious table-land of Central Asia, the roof of the world, through the people which dwelt along the Ganges and the Euphrates to the shores of the Aegean; but while at its source scientific knowledge seems to have stood still in historical times, it has blossomed in other soil to the fruition we now enjoy. It may be conjectured that the reason for this non-progressive character of the knowledge of the Oriental lies in racial characteristics, and yet it is difficult from our ignorance of their history to understand why this halt in the evolution of their knowledge should have occurred after it had grown to the proportions we recognize in the *Susruta*.¹ The contention of Haas,² a German critic, that the writings of the Hindus show that they have never been a progressive race, but that they had borrowed their knowledge from the Greeks without developing it, is plausible when we consider how eagerly the Persian monarchs sought medical aid from that source rather than from the East. The Hindus, however, were further removed from the Persian monarchs than were the Greek cities of Asia Minor, which indeed formed a part of their empire. Perhaps the strongest argument against this assumption is the fact that the same non-progressiveness is seen in Egyptian civilization, and yet the "Papyros Ebers" and other evidences prove that a comparatively high state of medical knowledge existed in Egypt at a period even anterior to the date assigned by the Greeks to the Trojan war, and at least many hundred years before the birth of Hippocrates.

¹ Guizot and Freeman both ascribe the stationary condition of Eastern civilization to the unison of the temporal and spiritual powers, but this scarcely satisfies us, and while admitting the strong probability of the efficiency of this factor, we instinctively look for other causes concomitant and anterior to it.

² Haas: *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, Vol. XXX, p. 617; Vol. XXXI, p. 647.

"Herodotus' Histories" are sufficient evidence on this score. Nevertheless Haas attempts to show that the medical writings of the Hindus are of recent origin: in fact, that they were composed at a period subsequent to that in which the various Hippocratic treatises were given to the world.

Susruta and Hippocrates.—Haas goes still further and asserts that in all probability the Susruta is really a derivative of the Hippocratic system, and even that the name "Susruta" is a Hindu corruption of Hippocrates. It is supposed by him that the Hippocratic writings were rapidly disseminated through Asia and India by the Greek physicians, who were in such demand at the courts of the Eastern kings, but in the accounts of Alexander's campaigns will be found notices of Oriental physicians who possessed such knowledge of various parts of physic as were unknown to the army doctors, especially in regard to the cures for the bites of venomous serpents, which is perhaps not very conclusive evidence of a more extensive knowledge. Nevertheless in reading the Susruta and the Charaka one will be much impressed by some striking analogies to passages in some of the Hippocratic books which seem not to have been transmitted through generations, but to have been directly transferred from one treatise with very little modification to the other. Which was the original in nowise appears. It is scarcely necessary to say that Haas' arguments have not been generally accepted as convincing.

At any rate, since the dawn of history, western medical knowledge blown on the wings of the wind from European lands has scarcely produced a ripple on the stagnant pool of Hindu medicine, and today the two systems in India are practised side by side.

In the Talmud we have seen a reference to wounds of the cartilages of the larynx and we again meet it in the Rig Veda and the Susruta.

India is referred to in the Rig Veda as the Bountiful One who without a ligature can cause the wind-pipe to reunite when the "cervical cartilages" are cut across, provided they are not entirely severed.¹ Thus early do we find a statement which refers to a point discussed for more than 1500 years after the beginning of the Christian era in the history of tracheotomy.

The Hindu "Ayurvedas," just as the medical knowledge of all ancient peoples, were supposed to be of divine origin. Even in modern times the Christian Scientists and their ilk remind us of this tendency. The "Ayurveda of Susruta" was revealed by D'hanvantare, the physician of the gods, out of compassion for the suffering of mortal men. These medical vedas or axioms were

¹ Hörnle: *Studies in Ancient Indian Medicine*. The Journal of the Royal Asiatic Society of Great Britain and Ireland, London, 1906-09, Vol. II, p. 922. See also Julius Jolly: *Zur Quellenkunde der Indischen Medizin*, Zeitschrift der deutschen Morgenländischen Gesellschaft, Leipzig, 1900, Vol. LIV-LV.

collected and transcribed by his disciple Susruta. The "Ayurveda of Susruta" is said by the wise men of the East to be at least of a date 1000 years B.C., and it contains scraps of medical lore which bear every evidence of being still more ancient. Time being of little value to the dreamy Hindu, his chronology is a source of inexhaustible irritation to the uneasy Western savage. Although we of another civilization have good reason for tracing our philological, our scientific and philosophical, even our ethnical origin, back to this cradle of antiquity, we have traveled a long distance since then on all these highways, and not only is the language obscure, but the ideas are many of them unintelligible to us in their old books. Therefore, although the "Susruta" is admirably arranged in captions much in accord with modern medical ideas, the Latin translation of Hessler (1844) is in many places confusing, and it is perfectly evident that the translator is often himself groping in the dark.

There are to be found in the "Susruta," and easily referred to in Hessler's rendering, many references to the diseases of the nose and throat, some of them recognizable by our barbaric Western intellect, but many of them to us quite vague.

Charaka Samhita.—The Charaka Samhita is being translated from Sanskrit into English by Avinash Chandra Kaviratna, a learned pundit of Calcutta. This work is said by the Hindus to be a revelation of Indra, the god of the middle air, through Charaka the sage, and is said to be of much more ancient origin than the compilation of "Susruta." At least it is more unintelligible to the modern student of medical history. To the student of philology it is said by Wise and Müller, and Eastern scholars generally, to be of greater value than the "Susruta," and the learned and enthusiastic translator, a patriotic Hindu, indulges in the fond hope that by the diffusion of the wisdom of Charaka a profound impression may be made upon the practice of the medical art as pursued by the energetic sons of the West, the physicians of Europe and America. I am afraid our Hindu confrère does not realize the obduracy of the seed of Japhet.

Both in the "Susruta" and in the "Charaka" the declaration is made, and this is found very little modified in the medical works of the Greeks, that "Wind, bile, phlegm have been said to be the cause of all bodily disease." What follows, however, I have not noted among the writings of the Greeks. It is a little too mystic for them, apparently. "The qualities of passion and darkness have again been indicated to be the causes of mental diseases."—("Charaka.")

In "Susruta" we learn¹ that there are sixty-four diseases of the mouth in seven situations. The seats of morbid action are the

¹ Susrutas: Ex Sanskrita in Latinum: F. Hessler. Erlangæ, 1844-55, Tom. I, p. 202.

lips (8 diseases), roots of the teeth (15), the teeth (8), the palate (9), the fauces (17) and all of them together (3).¹

As one of the diseases of the palate we recognize quinsy in Hessler's Latin: "Tumor rigidus, in palati regione a sanguine ortus existit. Cognoscendus est hic morbus angina, febre dives." There are various passages translated by Hessler which Morell Mackenzie supposes to refer to diphtheria, but I doubt if we can differentiate the different forms of acute throat inflammation, accounts of which are found here, as elsewhere, in all extensive treatises of the ancients on disease, it matters not to what age or people they belong.

One cannot but be struck by the early tendency of the medical man to lay great stress and emphasis on a name. We have seen how the physician of Egypt was to announce the presence of a "fatty tumor in the neck," and here in the "Susruta" the rendering is: "Qui tumor in linguæ dorso magnus est, is intumescencia vocatur." We may readily imagine that these venerable doctors of the hoary past made use of some recondite word of a language still older than their own, if any such there were, to express in suitably dignified terms for the edification of the laity a diagnosis which was really only a definition, "Un specieux babil, qui vous donne des mots pour des raisons," as Molière² puts it 2500 years later.

Uvulotomy and Tonsillotomy.—Here and there we can recognize familiar surgical operations. "By means of forceps between thumb and finger, drawing the uvula forward, the physician may cut it with a sickle-shaped knife above the top of the tongue." "Gilagum (quinsy?), so-called, may be cured by the knife." Firm, hard, and filling the fauces, extraordinarily swollen with sprouting flesh, giving rise to much pain, caused by the evil inflammation of the humors, killing almost a hundred men, it is recognized that (this?) swelling of the tonsils is incurable; but a tumor seen in the

¹ The statement is made by Galen—"Galen in Hippocratis Librum de Alimento Commentarius," III, XXVI (Opera omnia [Kühn] Lipsiæ, 1821-33; XV, p. 363)—that the school of Cnidos, the rival of that of Cos, divided diseases into a great number of different kinds: "Seven diseases of the bile, twelve diseases of the bladder, four diseases of the kidneys," etc.

If we consult the ideas and the philosophy of Pythagoras (500 B.C.), which had a profound effect upon Greek civilization and had a great influence at the school of Cnidos, we will find in them traces of much which he derived, evidently from his long travels and his diligent studies pursued among the Oriental nations with which Greek tradition credits him. Now this reverence for numbers we find in the Charaka and Susruta, and we have already noted it in the Zend-Avesta and in the Talmud in connection with diseases. It is by many little hints such as this that we are able to trace the connection of Greek medicine with that of the Orientals, and we may also note how the latter have purified and exalted it, not only by their initiative, but by the dropping of the superstitions with which it was overgrown. There is very little of spells and incantations, and reverence for numbers and malignant demons, to be found in the Hippocratic writings.

² Malade Imaginaire.

throat about the size of the seed of the *Phyllanthus Emblica*, stationary, a little painful, made up of phlegm and blood, adherent like the fruit of the *Terminalia Alata*, this, curable by the knife, is called *Gilagu*." Are we here to recognize a differentiation of malignant and benign swelling of the tonsils and the prevalence of the practice of tonsillotomy?

Wise,¹ in his "Hindu System of Medicine," describes a method of abscission of the tonsils which aimed at removing a third part only with the knife. "If all is cut the patient will die of hemorrhage." As he does not give his reference I am uncertain if this is contained in the more ancient books or not. Many more recent writers have insisted that a partial excision only is ever indicated, and is sufficient. We may be sure from these passages that they knew what secondary tonsillar hemorrhage meant as well as some of the rest of us.

Rhinoplasty.—It is especially in the Hindu writings that we find such complete and minute accounts of the various plastic operations about the nose. This was due, doubtless, to the practice of the wrathful Oriental potentates who amputated the nose out of revenge or in the exercise of judicial penalties. This art was almost entirely forgotten by the Greeks, because they shrank in horror from the mutilation of the human form, and had little opportunity to practise plastic operations for its correction. In a more savage age and country, many centuries later, it was revived by Tagliacozzi, but we shall easily trace it back to its Oriental source.

Vaporization and fumigation through a tube were frequently employed in the diseases of the nose and throat. Stimulating and acrid vapors seem to have been recommended in what we may conjecture was *ozæna*.² It was also prescribed for coughs, asthma, hoarseness, mucous discharges and enlargement of the tonsils, but as it was also advised for "morbid baldness and a reddish yellowness of the hair,"³ one is left in some doubt as to its *modus operandi*. These diseases were all due, according to the sage, to the same cause. Local applications of ointments were made to the nostrils and various sternutatories were used for cleansing the nasal chambers, after which, apparently in *coryza*, the following directions were explicit, and could be only slightly improved by the modern rhinologist: The patient was to lie on his back, raise the tip of his nose with his index finger and allow his physician to drop in his nostrils warm oleaginous liquids. While this was being done he was not to become angry, nor speak, nor laugh, nor swallow the oil dripping from his nose, but spit it out. The use of sternutatories or snuffs was also recommended for sleeplessness and clearing the

¹ Wise, T. A.: *Commentary on the Hindu System of Medicine*. Calcutta, 1845.

² *Susruta* (Hessler), *Therapia*, Cap. XXII-XL.

³ *Charaka*. (Trans. by Kaviratna.) Calcutta.

head in the morning—apparently prescribed for conditions in which we order douches and sprays. Gargles were also a part of their therapeutical resources. They very often used oil as a menstruum, and apparently had a more thorough way of using the gargle than we usually insist upon.¹ It is evident that these old Hindus recognized the dependence of laryngeal or nasal diseases, as is apparent in this sentence in Hessler's translation: "*Nasale remedium morbos hominum supra claviculam ortos refrenat et organa sensuum pura atque os suaveolens efficere potest.*"

In the light of recent sanitary doctrines and regulations the following quotation from Charaka (p. 74) may be of interest: "One should not eject the mucus or phlegm of one's nose in a place that is crowded." This, however, may have been only a precept of social intercourse rather than having the additional sanitary weight it now possesses. At this place occurs rather frank advice as to the relations between man and wife. They are amusing, but perhaps a little out of place now in print when not attended by the strict scientific necessity for their publication. The one precept which may be quoted here is as applicable to laryngologists and rhinologists as it is to the rest of mankind. It is to the effect that a man should make a confidante of his wife, but he should not tell her all his secrets. These little scraps from the dim and misty past of a forgotten civilization make one realize the universal brotherhood of man. In fact, one cannot even glance through the works of Charaka, and especially of Susruta, without having one's mind impressed with the antiquity of human knowledge and wisdom, and it is a vast education for any man when he can be brought to realize, in this egotistical epoch, how little of it after all has had its origin in his day and generation.

We can only conjecture that the development of the arts and sciences of the ancient Oriental world must have occurred chiefly in some prehistoric cycle of human activity, when man's mind and body were as free along the Ganges as they were on the shore of the Ægean when the Hellenic tribes took up the torch, in the blazing light of which we still live. This is what liberty means, and we can now see along the Ganges and on the Ægean the results of the mental and political slavery not only of an Oriental, but of a once glorious Occidental race. Kassel² quotes from Susruta a passage, which apparently I have missed, in which, to judge from the description, there is very good evidence that syphilitic disease not only of the genitals but of the nose was well-known to the Hindus.

In Wise's work on "Hindu Medicine,"³ from which I now quote, there are many accounts of nose and throat diseases which I

¹ Susruta (Hessler): Tomus, III, p. 42.

² Die Nasenheilkunde des Altertums, p. 20.

³ Loc. cit.

cannot find or have inadvertently passed over in the translations of the "Charaka" and of the "Susruta" at my disposal. As he states that his work is taken exclusively from the ancient Hindu writings, although in the passages cited he does not indicate the sources from which he draws his information, it may be inferred that they are of equal antiquity with those I have drawn directly from the translations of Hessler and Kaviratna. Moreover, I recognize in Wise's book many passages identical with those in the "Charaka" and "Susruta."

Medicines administered by fumigation through the nostrils were used not only for local nasal diseases, but for some general affections, and particular directions are given for using them. Among the errhines or sternutatories to clear the head may be noted pepper, mustard, orris, ginger, asafœtida. One might think they would be efficient. One of the methods recommended for causing sneezing was to look at the sun so that its rays would fall on the mucous membrane of the nostrils. We recognize here an error in mistaking a reflex phenomenon of the retina for a direct action.

Among the gargles, besides the more agreeable ones of oil, vinegar, honey, and the juices of fruits, the urine of cows finds a place. Stimulating and irritating substances (pepper) were also prescribed as gargles. There is an instrument spoken of (p. 169) for "eradicating nasal polypi; a frequent and troublesome disease in many parts of Hindustan." It seems to have been some sort of a curette.

Foreign Bodies.—(p. 186.) If a foreign body is "in the throat, the extraneous matter may be discharged by thrusting down a hot iron to dissolve it, or soften it, and so remove it. In such case the hot iron is passed through a metallic tube. A probang for removing fish bones is usual; by drinking fluids and emetics it is also dislodged; this may also be done by beating the patient upon the back of the neck." Among the fifteen modes of removing extraneous substances, *Bidmapana* is "by blowing, as a substance introduced into the larynx, which produces great irritation and strong efforts at coughing," etc. *Pramarsa*: "If in the nostrils, errhines are to be used." It must be confessed that the art of removing foreign bodies from the upper air passages does not seem to have been very highly developed, and the above described use of the hot iron seems strange and hardly credible. Is it possible that we have here a confused Hindu rendering of the recommendation by Hippocrates for the use of the hot iron in the nose?¹

Fracture of the Nose.—We are reminded of Hippocrates in the passage (Wise, p. 192): "When the bones of the nose are depressed they are to be raised into their natural position by means of an

¹ Diseases II, where much else resembles the Susruta.

instrument called *Shalaka*: a hollow wooden tube is kept in the nostrils so as to retain the bones in their natural position."¹ We may note another passage, and this is especially dwelt on by Haas (*l. c.*) as indicative of the corrupt and degenerate derivation of Hindu medicine from the Greeks. There is probably no quotation from Hippocrates so well known as that in which he describes the facies of approaching death (*Prognostics* 2):² "A sharp nose, hollow eyes, collapsed temples; the ears cold, contracted, and their lobes turned out; the skin about the forehead being rough, distended and parched; the color of the whole face being green, black, livid, or lead-colored." Now compare this with Wise's translation from the "*Susruta*": "When it [the nose] becomes pale, dry, and shining, and is turned to one side; the nostrils extended, dry, and dirty, and the passage of the air produces a noise; or when the point of the nose retracts and is flattened with weakness and depression, the person will soon die." We note how distinctly inferior this is to the graphic description of the Greek sage. I doubt very much the conclusiveness or even the suggestiveness of the passage in the "*Susruta*" as an argument for the derivation of Hindu from Greek medicine. Similar phenomena were observed by men of dissimilar mental powers.

There are thirty-one diseases of the nose. Simple catarrh, acute and chronic, was called *Pinasa*. *Ozæna* is *Putinaska*. Nasal polypi were termed *Nâsârsah* and there were four kinds. Tumors of the nostrils are of five kinds and were called *Nasarbuda*, but it does not appear how they were distinguished from the nasal polypi (Wise, p. 289). Goitre, tumors of the neck, scrofulous swellings, hoarseness, asthma, cough are all described, but there is little in the passages which is either interesting or instructive. We may pass lightly over the Hindu conception of anatomy and physiology. As an indication of its limitations, Wise,³ among other examples of their ignorance, declares that the Hindus had but one name for throat, "*Khunt*," including in its signification not only the air-way but the gullet.

PRE-HIPPOCRATIC MEDICINE IN GREECE.

Whatever may have been the truth as to the derivation of Hindu medicine, we have little actual means of knowing whence the Greeks drew the germs of their medical knowledge. We may conjecture that it came with the Phœnician trading vessels from the shores of Asia, or the Hellenic tribes may have brought it from

¹ Vid. *Susruta* (Hessler), Tomus, II, p. 67.

² Genuine works (Adams), I, p. 195.

³ Review of the History of Medicine (among the Asiatics), London, 1867, I, p. 135.

the Asiatic table-lands with them, but more probably much the larger portion of it came directly from the valley of the Nile when in 670 B.C. the land of the lotus flower was thrown open to Greek commerce and Greek curiosity. Thales and Pythagoras are significant personages in the early history of Greek science. In the fragments of their philosophy as well as in the legends of their lives we find unmistakable evidences of their sojourn among the Orientals and of their absorption of Oriental civilization and philosophy. The same may be said of Solon.

Perhaps it may be of some value to note that therapeutics in Greek medicine include none of the disgusting substances and scarcely any of the charms and invocations which mark so strongly that division of medicine among the Egyptians, Chaldeans, Hindus, and Eastern races generally, and which we have seen later was introduced into the Greek medical writings of the Roman Empire and upon which I have already commented.

The period of four hundred or five hundred years which stretches from the supposed age of Homer to the birth of Hippocrates (460 B.C.) is one of which we know but little in the history of medicine. It is entirely devoid of medical works which have come down to us. In philosophy, Thales, Xenophanes, and Pythagoras greatly influenced the minds of men in weaning them from the superstitions recorded in the "Theogony" of Hesiod. They winnowed out from them idealistic portions which could be made to stand as symbolical of their own ideas of cosmogony.¹ Coming down to the time of Socrates, we find him recognizing things divine and things material, while Hippocrates, but little his junior, brings all phenomena under one head and calls them all divine, one not more than the other. (Airs, Places, and Waters.) Whatever may have been the channels by which were carried the seeds of knowledge, the marvelous growth which sprang up on the soil of Greece has not ceased and will never cease to excite the wondering admiration of mankind.

Civilization in Greece.—It is significant perhaps that the opening of Egypt to Greek commerce took place at about the time of the beginning of written records in Greece (660 B.C.),² and two hundred years after writing was first introduced and the epic ballads of the wandering bards and rhapsodists became perpetuated in written records we have the birth of the "Father of Medicine." It needs only a cursory perusal of the Hippocratic writings to realize how intense the mental activity of nascent Greek civilization must have been to have produced in the short period of two hundred years a condition which made possible the compilation of these masterpieces of medicine in whose inspiration we still live. After the excursions we have made into the more stagnant civilizations

¹ Grote: History of Greece, Vol. I, p. 368 f. f.

² Ibid., Vol. II, p. 149.

in the search for the origin of medical knowledge we feel that we are nearing home, or at least on more familiar ground, when we begin the study of Greek medical history. At the port of entry looms up, obscuring all others, the great name of Hippocrates. There was medical knowledge in Greece before the birth of Hippocrates, of course, but the records of it have perished and so have the works of those who followed him. It is only by scanning secular literature and by noting references in later medical writings that we are able to obtain some glimpses of the state of the knowledge of the anatomy and the functions, but scarcely of the diseases of the upper air passages. In the legends of the Hellenic races are to be found traces of familiarity with a medical art which existed long before the rise of the school which clustered around the altars of Aesculapius in the Isle of Cos.

Ancestry of Hippocrates.—Hippocrates¹ traced his lineage in the seventeenth generation through a medical ancestry to that demigod who according to Cicero (*De Natura Deorum*, III, 22) was the son of Apollo or of Hermes, or of Arsippus and Arsinoe. He was the first to discover the probe, according to Greek legends, the first to bandage a wound, the first to teach men to draw teeth and to purge their bowels. For these and other services he was deified, but because he raised the dead and attempted to exercise his power of making men immortal, he was struck into Tartarus by the forked thunderbolt of the jealous Olympian Zeus. His two sons, Podaleirus and Machaon, led the thirty Thessalian ships to the siege of Troy (*Iliad*, II, 731), where they exercised their father's art as well as that of Mars. Machaon was said² to be skilled in the arts of the surgeon, while Podaleirus had "skill over things invisible," and to the latter was given precedence, a custom still prevailing in medicine to-day. It is to Machaon, who knew how to draw out darts, to make incisions, and to treat wounds and ulcers, that the present generation of rhinologists owe homage rather than to Podaleirus, who diagnosed madness in the blazing eyes of Ajax.

We can do little more in this period of medical history than seek out the origin of the nomenclature of the parts of the human anatomy with which we are concerned. We have seen that the word nose is apparently contemporaneous in origin with that of the Aryan languages. While we have the authority of Daremberg³ for the statement that there are only five instances mentioned in Homer's *Iliad* of wounds of the throat, there are a large number of lines in which the nose is mentioned.

The Nose and Throat in "Homer."—We read (v. 291) how Athene directed the lance of Diomedes so that it pierced the nose of Pandarus

¹ Grote: *History of Greece*, Vol. I, p. 182.

² Arktinus: (770 B.C.) *Epicc. Graec. Fragm.*, II, p. 22.

³ *La Médecine dans Homère*.

near the eyes, crashed past the white teeth and, cutting the tongue, appeared under the chin, and how the mortally wounded chieftain pitched headlong from his chariot. There is a line in the *Iliad* which gives evidence that embalming was understood by Homer's Greeks (XIX, 39).

The goddess Thetis dropped nectar and ambrosia into the nostrils of the dead Patroclus to keep the skin hard and firm and thus preserve the body. This she does to allay the grief of her son Achilles at the death of his friend. As we know that embalming was foreign to later Greek customs, we may perceive here a familiarity at least with Egyptian practices, if not an influence of Egyptian ideas, and to some extent the prevalence of oriental customs.

Etymology of Greek Words for "Throat."—We have seen how indefinite was the Hindu word for throat. Although the Greeks, unlike the Hindus, had many words for this part of the anatomy, they used them at first very indefinitely and interchangeably. The word pharynx in early Greek literature was about as indefinite as our word throat. It occurs in Homer's *Odyssey* first. If you will turn to the graphic description of that horrible man-eating Cyclops, Polyphemus, in the ninth book, at line 373, you will find the word there used in describing how, after eating a brace of Greeks and swilling barrels of wine, the bloody, swinish giant fell over in drunken stupor on his back in the cave while wine and morsels of his cannibalistic feast regurgitated from his capacious pharynx (*Odyssey*, IX, 373).

φάρυγος δ' ἐξέσσυτο δινος φωμὸς τ' ἀνδρομέοι.

Whether this is the first written use of the word or not, it certainly occurs here in a most vividly striking passage of the greatest of poems by the first of poets. It will be seen that Homer has used the word here in accordance with its present significance, but in the *Odyssey* again (XIX, 480), Ulysses grasps with his right hand the φάρυγξ (throat) of Euryclea to prevent her crying out. Even in the works of Hippocrates a similar looseness of meaning is to be observed, as, for instance, in the Littré edition,¹ where the translator renders the word as larynx. Galen,² however, in his comments on Hippocrates, declared that by the term pharynx the latter understood that region which is situated in front of the gullet and wind-pipe and which may be inspected by depressing the tongue.

The word larynx is not found in Homer, but is first noted among the dramatic poets; but here again quite indefinitely arousing our suspicion that λάρυγξ may have been at first a corruption and

¹ Oeuvres complètes d'Hippocrate, Trad. par. E. Littré, Paris, 1839-61, VIII, p. 565.

² Opera Omnia (Kühn, XVIII, pars II, p. 264).

a tautological use of the word *φάρυξ*. This may be seen by a reference to the plays of Aristophanes (The Knights, I, 1363; The Frogs, I, 575). In the Cyclops of Euripides (I, 157) occurs the passage, *μῶν τοῦ λάρυγγα διεκάναξέ σου*, which the dictionary translates, "Has aught run gurgling through thy throat?"

Drink in the Larynx.—The thought arises from this quotation that the idea of the drink going into the larynx must have originally arisen from the resonance of the larynx and trachea transmitting the sound of the swallowed liquid from the œsophagus. This might have been still further strengthened by the sight of the movements of the larynx in the act of deglutition. Hippocrates, however, will be found to use the word more correctly when referring to results of the division of the wind-pipe (Des Chairs, 18),¹ and in the chapter (De la Nature des Os, 1)² where he describes how the larynx goes to the lungs and thence to the top of the bladder, but even as late as Galen the two terms were occasionally used interchangeably. Aristotle also uses the word in its present signification and only rarely speaks of the wind-pipe, *i. e.*, the trachea, as extending from the lungs to the mouth. Not until Galen, however, do we find the term definitely established by his anatomical descriptions.

Homer uses the word *Ἀσφάρωγος* once in the Iliad (XXII, 328), as a similar but more indefinite term. The god-like Achilles, with the terrible spear, smote Hector in the throat, above the clavicles, where the neck starts from the shoulder, in order that there might be quick loss of life. "There the point went through the tender neck," but the *Ἀσφάρωγος* was not cut, in order that the prostrate man might answer the victor's cruel taunts. It is clear, therefore, that Homer recognizes, by this term, the organ from which the voice issues. We may be allowed to conjecture, in the absence of any information to the contrary, that this term *Ἀσφάρωγος* arose from the contemplation of the wind-pipe as it sprouted from the root of the lungs of the slaughtered sacrificial animals, whose entrails were examined by the priests in their religious ceremonies for prophetic indications. It must have appeared to them not unlike a thick stalk of the vegetable for which the word, in one of its two forms, was identical, according to the dictionary. From this may have come *φάρυξ* and later *λάρυξ*. This, however, is entirely conjectural on my part.³

¹ (Littré) VIII, p. 607.

² Ibid., IX, p. 169.

³ While the root of the word pharynx is said to be the same as in *φερω*—Latin *fero*—we may imagine it is true, without any proof to the contrary, that the word *aspharagos* arose as here stated.—Vid. Cent. Dict. and Greek Lexicon. Luschka (Der Schlundkopf des Menschen, Tübingen, 1868) prefers a different derivation, but the etymology he refers to would presuppose an amount of anatomical knowledge in Homer or the primitive Greeks who composed his songs, which we may well hesitate to ascribe to them.

Daremberg is of the opinion that Homer, and, of course, by Homer we mean the men of his day, knew that food and drink passed down the gullet. He refers to the *Iliad* (XXIV, 641, 642), but I am not satisfied that *λαοχανίης*, the word employed, meant the œsophagus. It seems to have been applied almost as loosely as the other Greek words for throat (*vid.*, XXII, 325).

We will discuss later the interesting error of the ancients in regard to the destination of liquids when swallowed. It is well known, of course, that the word trachea arose from the subsequent use by Erasistratus of that Greek adjective, meaning "rough," in connection with the artery (*αρτηρία τραχεία*) to signify that it belonged to the same class of structures as we now know to carry blood and not air. The artery part of the name was dropped when this error passed away and the trachea remained. *Βράγχος* was a word also frequently applied to the whole wind-pipe, but later coming into use for the channels below the division of the trachea.

Finally, I quote from another brochure of Daremberg¹ the derivation of another term rhinologists use every day:

Euripides (Fragm. 1044) is, I believe, the first author where one meets with *Μυζτηρ*—the nostrils or the nose. It seems also that Sophocles (Fragm. 581), and especially Aristophanes (Fragm. 650), calls the nose or the nostrils by the name *Μύξα*, which is regularly applied to the mucus which escapes from them. (*The Knights*, 910; *The Wasps*, 1488.)

Scientific and philosophical records being so defective, and purely medical treatises being entirely lost, if any existed before the Hippocratic era in Greece, we cannot hope to glean much in regard to our subject from this period. Nevertheless some faint reflections may be found in the works of the later writers.

Early Greek Superstition.—Here is a fragment suggestive of the character of early Greek medicine, showing that it differed little from that of other rude and uncivilized races. The Dog and the Serpent were alike sacred to Æsculapius, and on the second one of the columns, seen by Pausanias at Epidaurus, this record has been found engraved among others of medical interest, testifying to the efficacy of the holy dogs kept at the shrines. A child of Aegina, "affected with a tumor of the neck, applied to the god. One of the sacred dogs licked the affected part and cured it."²

Philosophy has always at all epochs of Medicine dominated it. Pythagoras established four elements: Earth, Fire, Air, and Water

¹ *L'État de la Médecine entre Homère et Hippocrate*, Paris, 1869, p. 14.

² Reinach: *Révue Archéologique*, 1884, II, p. 129; 1885, I, p. 267. For a most interesting account of the Temple of Æsculapius at Epidaurus, see a paper by W. S. Coleman, M.D., F.R.C.P., *St. Thomas' Hospital Reports*, Vol. XXVII, 1898, p. 397.

For a very readable account of the cult at Epidaurus, see *The temples and Rituals of Asklepios*, by Richard Caton, M.D., etc., 1900.

—Empedocles admits these, but adds to them their qualities: the cold and hot, the wet and dry, which are found in medicine until the Renaissance.

In Plutarch's "Morals"¹ there are to be found some curious chapters on the senses, and he there quotes from many of the old Greek philosophers who lived before the time of Hippocrates and whose writings were apparently extant in the time of Plutarch (46 A.D.). The chapters on smell and taste are of interest to us here.

"Alcmaeon (520 B.C.) believes that the principal part of the soul, residing in the brain, draws to itself odors by respiration. Empedocles (490 B.C.), that scents insert themselves into the breathing of the lung; for when there is great difficulty in breathing, odors are not perceived by reason of the sharpness; and this we experience in those who have the defluxion of Rheum."

"Alcmaeon says that a moist warmth in the tongue, joined with the softness of it, gives difference of taste. Diogenes,² that by the softness and sponginess of the tongue, and because the veins of the body are joined in it, tastes are diffused by the tongue; for they are attracted from it to that sense and to the commanding part of the soul, as from a sponge."

The Eustachian Tube.—Alcmaeon is said to have been the first Greek anatomist and to have dissected the eyes and ears of animals, discovering the optic nerve and the Eustachian canal, thus antedating in the latter discovery Eustachius by many centuries. Aristotle (Hist. Animal I, IX, 1) comments on a mistake of Alcmaeon in supposing that goats breathed through their ears. It is singular that this error should crop out so late as the seventeenth century A.D., but Tulpus may be found³ asserting, in spite of Aristotle, that on account of this anatomical configuration, as described by Alcmaeon, it is possible in labored inspiration for air to find this auxiliary passage to the lungs. Kassel has drawn attention to a passage in a papyrus No. 1558 from the Egyptian Museum dating back 1400 years before Christ in which it is said, "There belong two vessels to his left ear through which the breath of life goes; there belong two vessels to his right ear through which the breath does." We may conjecture from this that the source of Alcmaeon's knowledge as that of most of the knowledge of his day was Egyptian. Whether any of this error may have arisen from observations of pathological perforations of the drum membrane is a permissible conjecture only.

¹ Translation. Ed. Goodwin, 1870, Vol. III, p. 170 (De Placitis Philos.).

² I presume Plutarch here refers to Diogenes of Apollonia, born in the fifth century B.C., who described the distribution of the bloodvessels, which is to be found in the fragment of his writings still preserved. Fragm. Philosoph. Graec. Mullach, Vol. I, p. 254.

³ Observat. Med. Amst., 1641, Lib. I, Cap. XXXV.

Alcmaeon explained hearing by the hollow bone behind the ear—"for all hollow things are sonorous." (Plutarch, l. c.)¹

Empedocles discovered the labyrinth of the ear and explained sound by the impress of air upon it as upon a drum. In one of the fragments preserved from the "*Carmina of Empedocles*,"² we read: "Thus they breathe out and in. Bloodless tubes extend through all the flesh throughout the whole body, and the end of these placed within the nostrils is perforated by large openings leading to the cavities (cerebral?) so that they may hold back the blood and open free passage for the air through the meatus." This perhaps would suffice to illustrate the confusion in regard to anatomy which existed among the best informed of those philosophers older than Hippocrates, but I may perhaps be allowed to add an embryological idea which Sprengel has found among the fragments of verses of Empedocles: "He attributed the formation of the abdominal cavity and that of the intestines to the sudden and rapid passage of water through the body at the moment of its formation, and the external openings of the nose to a current of air which was established from the interior to the exterior."

Diogenes of Apollonia (500-400 B.C.) explained the superior intelligence of men by supposing they breathed a purer air than the beasts which carry their noses near the ground. (Draper.)

The Atomic Theory.—Democritus is said to have been born at Abdera in the same year (460 B.C.) and to have been greatly admired by Hippocrates, who reproved the countrymen of Democritus for having supposed him insane and for sending for him to cure him. He is said to have derived his atomic theory from Leucippus (500 B.C.). He is quoted by Plutarch (l. c.) in regard to the voice as saying that "the air is broken into bodies of similar configuration and these are rolled up and down with the fragments of the voice." This statement seems, of course, rather fantastical and we might suspect Plutarch had confused a more intelligible passage from Democritus did we not find in one of the fragments³ remaining to us from Democritus an analogous statement as to taste, the distinctions of which he attributed to the different shapes of his atoms. Plutarch continues: "The stoics say the air is not composed of small fragments, but is a continued body and nowhere admits a vacuum; and being struck with the breath, it is infinitely moved in waves and in right circles until it fills that air which invests it, as we see in a fish pool which we smite by a falling stone cast upon it; yet the air is moved spherically, the water orbicularly. Anaxagoras (500 B.C.) says a voice is then formed, when upon a solid

¹ See also Kuehn: *Opuscula Minora*, I, p. 69.

² *Fragm. Philosoph. Graec.*, Mullach, 1875, 2d Vol. I, 343 ff.

³ *Ibid.*, Vol. II, p. 362.

air the breath is incident, which being reperfused is carried to the ears; after the same manner the echo is produced." Out of much which is to us mere jargon, but which to them was perhaps full of meaning, it may be seen that we may occasionally extract passages which need little altering to conform with modern doctrine.¹

THE HIPPOCRATIC TREATISES.

So completely have the records of Greek medicine before the time of Hippocrates perished, that he seems himself to have created it. It seems to have sprung from him and his associates, like Athene from the head of Zeus, or like the sudden growth of the infant Apollo after tasting of the ambrosial cup from the hand of Themis, to have started at once into the full life of a vigorous and fruitful manhood. We may be sure, however, from the cold analysis of historical experience and of philosophical logic that there must have been a long previous condition of growth and development, which cannot be traced in the scanty remnants of history left us.

Hippocrates as a Specialist.—On the authority of Celsus² we must accept Hippocrates as really the first medical specialist in our civilization, for he was the first to separate medicine from other sciences and devote himself exclusively to that branch of knowledge, for which, no doubt, as we may judge from reading Plato, he was regarded by other philosophers as lamentably narrow and one-sided. Reasoning from experiences of later ages, we may imagine that after a little time some philosophers, who thirsted after the reputation of progressiveness, acknowledged that this specialization might possibly be excusable, provided the heretic had first spent all the productive years of his youth in the pursuit of inquiry into the nature of the gods and the occult properties of the four cardinal elements, fire, earth, air, and water. I cannot forbear giving here Celsus' explanation of how it happened that philosophers took up the study of medicine at all, since it is somewhat amusing. He intimates that the old philosophers spent so much of their time in sedentary contemplation and nocturnal vigils that they fell

¹ It is absolutely necessary for any one desiring an intelligent knowledge of the medical theories in the writings of Hippocrates and of all subsequent medical writers, that he should acquaint himself thoroughly with the material and psychic philosophy of the ancients. A very good résumé of the subject so far as it applies to medical doctrines may be found in the Preliminary Discourses attached to Adams' Sydenham edition of *The Genuine Works of Hippocrates*, while Draper in his *Intellectual Development of Europe* gives a somewhat biased review of Greek philosophy in its broader ramifications. In the *Proemium* of Celsus, however, will be found the most succinct and the clearest account of Medical Schools among the ancients.

² *De Medicina*, Lib. I, Praefatio.

sick, and were forced to resort to the study of medicine to cure themselves.¹

The civilization of the Chaldean and the Parsee, of the Egyptian, and even of the Hindu is strange and incomprehensible to us, but we instinctively feel that the Isles of Greece, that Cos, over opposite Abdera is a familiar land, and that there we will find a mental activity into which we are able to enter. When we read in Xenophon's *Anabasis* (III, 119) that the soldiers cried out when their comrade sneezed, "*Ζεῦ σῶσον*," "God save you," immediately comes to our mind the Frenchman's ejaculation "*Dieu vous benisse*," and the Germans' hail, "*Gesundheit*."² Turn to Hippocrates' account of the case "in Thasus, the wife of Dealces who was lodged on the plain"³ and read there his account of a death from fever with cerebral symptoms. No such vivid impression is left on the mind by any other portrayal of the fatal march of a mortal disorder until we find Shakespeare describing in Dame Quickly's patois the death of Falstaff, who was "so shak'd of a burning quotidian tertian that it is most lamentable to behold," and how "at the turning o' the tide" she saw him "fumble with the sheets and play with flowers and smile on his fingers end," and noted that "his nose was sharp as a pen," how "a' babbled of green fields," and cried out, "God, God, God, three or four times," and "his feet were as cold as any stone." The wife of Dealces fumbled with the bed clothes and picked at the hairs on them and laughed and there was much talk and again she was silent. Adams (l. c. p. 196) supposed Shakespeare to have derived his description second hand from the celebrated passage in Hippocrates⁴ as to the facies of death, but it seems to me that it bears a much closer resemblance to the description I have alluded to. I do not believe Shakespeare ever had any knowledge of either of these passages in the Hippocratic writings, either first hand or second hand. We are struck by the resemblance of the impressions made on our

¹ Therefore, after those of whom I have spoken, no distinguished men practised medicine until, by the more diligent study of letters, education began to be pursued which, although indeed necessary of all things for the mind, is inimical to the body. Some have it that the science of medicine first began because the cure of diseases and the contemplation of nature were pursued by the same authors. This, moreover, was especially necessary to those who injured the strength of their bodies by sedentary thought and by late hours. Therefore, we believe that many of those who were expert in the knowledge of things suffered in this way. The most distinguished of these were Pythagoras, Empedocles, and Democritus. The latter as some believe had Hippocrates of Cos for a disciple, the first and indeed the one of all most worthy to be held in memory, for he separated this science from other pursuits, a man distinguished in art and in natural attainments.

² This ancient custom, however, is older than the Greek civilization.

³ *Epidemics* III, Sec. 17, case XV. (Adams) I, p. 349.

⁴ *Prognostics* 2 (Adams) I, p. 235. Hereafter, in the references to Hippocrates' works, English terms refer to Sydenham (Adams) edition, (N. Y.: Wm. Wood & Co., 1891, 2 vols. in one); French terms, the Littré edition; and Latin terms to the Kühn edition.

minds by the words of two masters in the description of similar objective phenomena. It is the stroke of the master artist, the touch of immortal genius which sprang as frequently from the soil of Greece in its Golden Age as it did from that of Britain at the zenith of her literary glory. Such objectivity is not to be found in the Orientals' dream of life. Do we find here an explanation, or part of an explanation, of why the civilization of the Orient, of the Ganges, and of the Nile has stood still for 3000 years and cannot now be aroused from the slumber of so many centuries? At least we can comprehend somewhat from this objectivity how the virile fructifying aggressive mind of the Ancient Greek furnished a soil for the quick luxuriant growth of seeds from a dying civilization, dying even then with its youth stretching back into the inscrutable past of prehistoric times.

The Era of Hippocrates.—It must be borne in mind that Hippocrates lived in that glorious time of Greek civilization and culture, the golden age of Pericles, that his life overlapped that of Phidias and Praxiteles, of Anaxagoras, Socrates and Democritus, of Æschylus, Euripides, Sophocles and Aristophanes, of Herodotus, Thucydides and Xenophon, of Plato, Aristotle, and Demosthenes. Never since, in the history of the world, have there existed in the span of one man's life so many men whose fame still shines in mortal records and whose words still influence the thoughts of men. Such a throng was not to be gathered from all the broad empire of Augustus, nor to be found in the brilliant court of the Grand Monarque, nor among those who flourished in the days of England's Virgin Queen. None can say that the great name of Hippocrates stands less illustrious on the rôle of medical science than does that of Socrates in philosophy, of Phidias in sculpture, of Demosthenes in oratory, of Thucydides in history, or of Aristotle in science.¹ It is the evidence of the knowledge of the upper air passages and their diseases possessed by this great primeval figure in medicine with which we are now concerned. Among the large number of writings ascribed to Hippocrates, there are only a few which have been acknowledged by all authorities to have been really written by him. Some have been proved, many have been surmised, to have been written by his predecessors and successors. It seems probable that some were written by others during his lifetime who had the benefit of his guidance and of his instruction. However this may be, it is not my aim to enter into a general discussion of such matters, but rather to bring into prominence those gleams of light thrown upon our subject which have come to us across twenty-five centuries. A reference to the editions of Adams and of Littré and to the works of Galen will enlighten the reader as to the books which are accredited to Hippocrates himself and

¹ Littré's Introduction to *Oeuvres Complètes d'Hippocrate*.

as to those which are supposed to have been written by others of his time or school. Some of the passages in the writings of these *Æsclepiadæ* seem ridiculous to us, but we should keep constantly in mind the charity which our successors in their histories will have to extend to the productions of our own times. Indeed, in looking over the various commentaries on Hippocrates from Galen's time to our own, it is curious and not a little amusing to observe how careful each critic is to point out the errors Hippocrates committed in not being in accord with the doctrines of the critic's own time, which are now as obsolete as those of Hippocrates. So little does Hippocrates have to say of the cure of diseases that *Asclepiades*, an early type of the genus charlatan, subsequently ridiculed his system by saying it was the contemplation of death. It is perfectly evident that he recognized the futility of drugs as curative agents, and all his works, especially those which are supposed to be genuine, testify to the persistence with which he studied the symptomatology rather than the pharmacology of disease.

Innumerable facts have been discovered since these early times, and the wonder chiefly is that they should have then been able to reason as acutely as they did from the little actual knowledge they had of normal anatomy or of pathological processes. We have seen from the few extracts I have been able to gather how primitive knowledge of the anatomy and physiology of the upper air passages was. In the Hippocratic treatises themselves we find it little more advanced.

In fact, until the writings of Galen, the knowledge of anatomy seems to have been almost nil from a modern standpoint.

The Destination of Fluids.—"Drink through the pharynx and œsophagus. Larynx to the lungs and trachea. From these to the top of the bladder." This is the literal translation of the Greek text as given in Kühn's edition, but Kühn himself translates it "*Potus per fauces et gulam, arteriæ summum, quod larynx dicitur, in pulmonem et arteriam ex quibus in summam vesicam.*" This latter passage occurs in the book on the Nature of the Bones (i), which is apparently a collection of notes. In the fragment of the book on "Anatomy" we find it stated that the bronchi terminate at the top of the lungs, being composed of curved rings. Then follows a description of the lungs and of other organs detailed in such a manner that no room is left for the supposition that the writer had any idea that fluids passed through the lungs to the bladder. Again, elsewhere,¹ we find, "If any one will give water tintured with a blue color or with vermilion to a thirsty beast to drink, preferably to a swine, for this beast is not fastidious but

¹ *De Corde Liber*. Magni Hippocratis Opera Omnia, edit. Kühn. Lipsiæ, 1825-27, I, p. 485.

dirty, and will then cut the beast's throat after the drinking, he will find it colored with the fluid." Nevertheless, he says the greater part of it goes to the stomach. At the end of the Fourth Book on Diseases the author distinctly combats the idea that drink passes through the larynx. It is evident, therefore, from these quotations that no one man, but several, wrote the so-called Hippocratic treatises. History tells of the great rewards offered by the Ptolemies for manuscripts of well-known authors for their great library, and nothing seems more certain than that enterprising, and of course highly-respectable "rare-book" dealers, found it more convenient to write than to find hitherto unknown treatises of Hippocrates. The author of the Fourth Book on Diseases says, referring to the epiglottis, that the presence of a process in the form of an ivy leaf prevents liquid from entering the larynx and keeps it in the pharynx. He declared that the sounds emitted on expiration were multiplied by the resonance of the head. The tongue articulates as the air is driven out striking against the palate and the teeth. "All of which shows that it is the air which makes the noise." In the book on the Flesh (19) it is recognized that severance of the larynx stops the voice, which is regained when it is reunited.

On the subject of the destination of liquids when swallowed, there is a very curious chapter among Plutarch's "Symposiacs" (Book VII). When a line from the poet Alcæus (611, 580 B.C.) was quoted, "Now drench they lungs with wine, the dog appears"¹ (Dog Star), Nicias of Nicopolis, a physician, is made to say that Plato should be reproved for the passage in the *Timæus*² where he adopts the same error. He enters into an argument in refutation of the idea that the drink passes into the lungs, and he instances the epiglottis as an apparatus for preventing it. In the discussion which followed Protogenes, the grammarian, claimed that Homer first spoke of the stomach as the receptacle of the food, and of the breath and windpipe as the instruments of the voice, but the discussion on this passage in Homer hinged upon the meaning of the word *φάρυγξ*, which we have seen had a very indefinite meaning. Florus quoted many poets, among them Euripides, who affirm with Plato that the drink passes into the lungs, and the conclusion of Plutarch's Symposium seemed to be that Plato was right. Florus asserts that not only Hippocrates, but his pupil, Dioxippus, (390 B.C.?) and Philistion, a very ancient physician of Locri, had

¹ Vid. Gaisford: Poet. Min. Graec., Vol. III, p. 321, XVIII.

² The passage referred to reads "the lung is a soft and bloodless organ, and, moreover, is full of pores internally, like a sponge, in order that receiving air and drink it may refresh the heart, quiet it and cool the heat which burns it. This is the reason why the channels of the trachea are directed toward the lung, and the lung is placed near the heart. A few lines farther on it is evident, however, that Plato recognized that some of the liquids at least go to the stomach, or rather "the region between the diaphragm and the navel."

no other thought. Dioxippus supposed that the epiglottis served to divide the food and drink into the coarser parts which passed into the stomach and the finer parts which passed into the lungs. Aristotle¹ did not share this error at all, but distinctly states that the larynx is only for the passage of the air and the voice. From a passage in this symposium Sprengel seems to draw the conclusion that Erasistratus taught that the drink does not pass into the lungs. Now, Plutarch's writings are of a date in the first century of the Christian era, 500 years after the time of Hippocrates and 400 years after the time of Erasistratus. One hundred years after Plutarch we find even Galen in a modified form entertaining this idea. He says, in reference to it: "If Plato supposed that we take all our drink into our lungs, it is proper to remark that he was ignorant of a very evident matter. If he supposed, however, some part of the drink passing through the trachea is carried to the lungs, he announces a thing possible and like other matters concerning which physicians and philosophers may disagree among themselves." He then proceeds to state that it is quite possible for a small amount of fluid to steal down the sides of the air tubes without producing irritation sufficient to cause a cough.

We may, since we have already digressed somewhat, add here another mention of Hippocrates by Plutarch.² He compliments him as a man of wonderful skill in physic and fit to be imitated by the greatest philosophers, especially as to his ingenuousness, for "he confessed publicly that he had mistaken the nature of the sutures of the skull,³ and has left an acknowledgment under his own hand; for he thought it very unworthy a man of his profession not to discover where he was in the wrong seeing that others might suffer and err by his authority." Plutarch's comment on this is quite as applicable today as in his own time. "And indeed it had been very unreasonable, if he whose business and concern it was to save others and set them right should not have had the courage to cure himself and to discover his own weakness and the imperfections in his own faculty." Quintilian echoes Plutarch's eulogium.⁴

The Origin of Catarrhs.—When we realize that the ancients, Hippocrates, Galen, and their followers, knew nothing of the muciparous glands, and of course nothing of the function of these microscopic structures, it is easy to understand the absolute mental necessity for them to find some explanation of the origin of the secretions which bathe not only the respiratory tract, but the

¹ On the Parts and Gait of Animals, III, 111, 4.

² Man's Progress in Virtue.

³ Vid. Hippocrates: Epid. V, § 27—cf. De Vuln. Cap. § 12.

⁴ Celsus, from whom probably Plutarch and Quintilian drew their information, remarks in regard to Hippocrates' superiority in this respect over lesser men. *Nam levia ingenia, quia nihil habent, nihil sibi detrahunt.* Lib. VIII, Cap. IV.

gastro-intestinal mucous membranes as well. As for the moisture of the lungs, it is natural that they should look for some explanation in the liquids swallowed. This lack of knowledge, as well as a mistaken anatomical observation, led them into another error which persisted still longer. The cribriform plate of the ethmoid bone (the sieve-like bone) at the top of the respiratory tract was usually seen only in the dried specimen by the ancients unfamiliar with dissection of the human body. The idea arose that the humors were distilled in the gland-like contents of the cerebral cavities and sifted through the cullender plate of the ethmoid to parts below. If we can find no trace of this idea in Hindu or Egyptian medicine, Herodotus¹ supplies us with indubitable evidence that it existed among the Libyans. He says: "The Libyans, when their children come to the age of four years, burn the veins at the top of their heads. Others burn the veins about the temples. This they do to prevent them from being plagued in their after lives by a flow of rheum from the head and such they declare is the reason they are so much more healthy than other men. In all this I only repeat what is said by the Libyans themselves." This burning, as we shall have occasion hereafter to note, was the sovereign Arabian cure for all diseases.

This idea of the cerebral origin of catarrhs once fixed in the conception of medical men was not detected as an error even by Galen himself, whose anatomical knowledge was so extensive.² They supposed that the airs and vapors, as they called them, were inspired through the cribriform plate by the brain acting like a live sponge, drawing up into itself not only the moisture but the air of the nasal cavities and then redistilling them. Hippocrates says olfaction takes places through the cribriform plate. The latter he describes as being made of cartilage, soft like a sponge, and is neither flesh nor bone.³ So entirely had this conception of the anatomy and physiology of the cribriform plate taken possession not only of the medical mind, but so completely had it passed into the popular mind, that it was supposed that the mental processes were sluggish in those in whom the faulty excretion led to a clogging of the brain with mucus. Hence, we find in Greek that not only Coryza stands for a cold in the head, but it was the name applied to a fool, a driveler. Still more was this evident in the Latin tongue. "*Emunctæ naris*" refers to the mental acuteness of the individual because he was supposed to keep his nostrils, the cloaca of the brain, well cleaned out. This is found chiefly in the satirists.

"Hinc omnis pendet Lucilius, hosce secutus
Mutatis tantum pedibus numerisque, facetus,
Emunctæ naris, durus componere versus."

Horatii Satira, IV, 6.

¹ Liber IV, Cap. 187.

² Vid. Galen: De Instrumento Odoratus. Cap. IV (Kühn), II, p. 867.

³ Des Chairs (Littre), VIII, p. 605.

"*Obesæ Naris*," fatty or obstructed nose, in distinction to "*emunctæ naris*," referred to mental dulness. Many similar passages may be found in Martial. Hippocrates believed that in order to smell well the nose must be dry, and probably this arose from the observation of obtunded olfaction during a cold. He supposed that the vaporous parts of the inspired air escaped through the sutures of the skull.

Hence we may understand why Hippocrates looked upon the brain, which he described as a gland, as the origin of all catarrhal troubles, naming seven, of the eyes,¹ of the nose, of the ears, of the stomach, of the throat and lungs, of the spinal cord, and of the hips. The acrid humors were distilled to these parts by various routes—to the respiratory and digestive tracts through the cribriform plate—but all starting from the brain.

Coryza.—In his book on "*Ancient Medicine*," where he protests against the entertainment of hypotheses as to etiology, Hippocrates describes the symptoms of a coryza. "This discharge is much more acrid than that which is usually found in and runs from the nostrils daily; and it occasions swellings of the nose and it inflames, being of a hot and extremely ardent nature, as you many know if you apply your hand to the place; and if the disease remains long, the part becomes ulcerated, although destitute of flesh, and hard, and the heat in the nose ceases, not when the defluxion takes place, and the inflammation is present, but when the running becomes thicker and less acrid and more mixed with the former secretion; then it is that the heat ceases." One of the Aphorisms (II, 40) reminds us that catarrhs and coryzas are not severe in old people. It is clear from a passage in the "*Airs, Waters, and Places*" that Hippocrates believed that not only do stomach catarrhs have their origin in the head, but that nasal catarrh produces gastric symptoms. "Their bellies are subject to frequent disorders, owing to the phlegm running down from the head." Another modern idea we are reminded of in the relation of a case² of habitual catarrh which was cured in three days by coitus.

Acute Throat Inflammations.—Cynanche, which English translators usually render as quinzy, is a term Hippocrates applied to nearly all the acute inflammations of the throat. Littré (V, p. 579) discusses the question as to whether Hippocrates was familiar with diphtheria. Croup, Littré calls it. It is doubtful whether the cases are sufficiently differentiated in the Hippocratic writings to make them intelligible to modern readers. Even in the time of Littré's edition (1846) they would seem more intelligible than in these bacteriological days. They were of a very severe type, apparently, whatever the nature of them. We may conjecture

¹ Des Glandes, VIII, p. 565.

² Des Epidémies: V, 72, and VII, 69; (Littré) V, p. 247, 433.

that the peculiar and striking features of Ludwig's Angina or erysipelatous pharyngitis and laryngitis arrested Hippocrates' attention and caused him to record the case¹ of "the woman affected with quinzy who lodged in the house of Ariston." Profound constitutional symptoms, severe external swellings, and evidently internal stenosis, causing dyspnea and the return of fluids by the nose, rapidly brought the case to a fatal termination. The etiology of cynanche was supposed by Hippocrates to be the coagulation of the blood in the vessels of the neck. One cannot imagine what sort of an angina could be the cause of opisthotonos² lasting forty days and getting well. One has only to refer to "Diseases II," 26, 27, 28, 29, 30, 31, 32,³ to perceive how severe was the type of throat inflammation with which the Hippocratic writers were familiar and yet how impossible it is from the description to more than guess at the class we would now put them in; as, for instance, No. 26 seems to have been diphtheria, while accounts of the others indicate, some of them a milder type of disease, and some ending fatally, but apparently not diphtheria. In the "Coan Prognostics" is a paragraph (II, 14)⁴ which deals entirely with the prognostics of acute throat inflammations, but it is of little modern interest. In the "Aphorisms" (IV, 34, 35)⁵ Hippocrates declares that "if a person laboring under a fever, without any swelling of the fauces, be seized with a sense of suffocation suddenly, it is a mortal symptom." Moreover, "if, in a person affected with a fever, the neck become suddenly distorted and he cannot swallow, except with great difficulty, although no swelling be present, it is a mortal symptom." Antitoxin, tracheotomy, and intubation have of late years somewhat impaired the force of this prognosis, but we still recognize the gravity of the condition.

Intubation.—Since the following passage contains an indication that the idea at least of intubation existed in Hippocratic times, and because also it is a striking bit of objective description, I will translate it as literally as possible from Kühn's text (Vol. II, p. 300):

"*Cynanche.*—From cynanche, so-called, a man chokes, and it seems to be especially in the pharynx, and he is unable to swallow his spittle or anything else, and his eyes are affected and start forth as in those strangling, and he stares with them straight ahead, and he is not able to turn them, and he hiccups and starts suddenly up, and the countenance and the pharynx are burning, and even the neck. To those looking on there seems nothing the matter. He sees and hears dully, and from the dyspnea he knows not what he says, nor hears, nor does, but lies there with open

¹ Des Epidémies, III, Case VII; (Littré) II, p. 328.

² Des Affections Internes, 53; (Littré) VII, p. 301.

³ Des Maladies, VII, p. 41-51.

⁴ Prénotions Coaques, V, p. 641.

⁵ (Adams) II, p. 224-225.

mouth drooling and acting thus. He dies on the fifth or the seventh or the ninth day.

"Paracynanche.—When some of these symptoms are absent, it appears the disease is not so severe and they call it paracynanche. It is necessary to bleed, especially from the vein beneath the nipple of the breast, for this naturally follows from the hot breath, *pneuma*,¹ of the lung, and it is necessary to purge by drugs or move the bowels by enemata, and to *pass tubes into the pharynx* along the jaws, so that the breath may be drawn into the lungs, and to make them as quickly as possible to spit and thin the lungs (clear them out?) and to fumigate with Cicilian hyssop, and with sulphur, and with bitumen, and to breathe these in through the tubes and through the nostrils so that the phlegm may be cleared out, and the pharynx and the tongue may be cleaned in those having phlegm, and the veins under the tongue should be cut; and blood should be drawn from the elbows if the strength is sufficient. Abstention from wine should be enjoined and thin barley water should be taken. After the disease has subsided and the appetite returns, purging with fresh elaterium should be employed so that he may not fall into another illness." The appearance of an external rash in all these cases of severe, possibly scarlatinal and diphtheritic pharyngitis and laryngitis, was thought by Hippocrates and Galen, and reasserted by Avicenna, to be a good sign.

In "Diseases II," 30 and 31,² he recommends hot fomentations for what is apparently peritonsillitis, and scarification of the tonsils, but this latter not with sufficient clearness to make us sure of the recommendation. He also speaks of treating external fistulæ, resulting from this affection, with the cautery. Evidently we have here a confusion of diseases according to modern classification.

Uvulotomy and Evulsion of the Tonsils.—The nature of the tonsils is explained (Glands 7)³ as round bodies placed on each side of the throat to absorb the secretions from the head and send them back there again, and to do likewise for the vapors. From acute and chronic inflammations they may become greatly swollen. For enlarged tonsils he advised evulsion with the fingers. Although we find in Hippocrates no mention of tonsillotomy, it is evident, from what is thought to be a genuine book of Hippocrates, viz: (The Prognostics, No. 23)⁴ that he was familiar with uvulotomy. In a book of less assured authenticity we read his description of the operation: "When the uvula alone is inflamed seize it with the finger and press it up against the palate and cut off the end."⁵

Fractures of the Nose.—As has been intimated the Greek physician had every opportunity of familiarizing himself with fractures of

¹ For accounts of the pneumatic dogma and the pneumatists, see any of the histories of ancient medicine.

² Des Maladies, VII, p. 49.

⁴ The Prognostics, I, p. 210.

³ Des Glandes, VIII, p. 561.

⁵ Des Maladies, II, 29; (Littre) VII, p. 47.

the nose. The Hippocratic writers devote much attention to it. In "Mochlicus" 2,¹ Articulations 35, 36, 37, 38, 39,² we find minute and practical directions for its treatment. Indeed, comparatively little advance has ever been made over their methods. Great stress is laid upon the necessity of replacement within the first twenty-four or thirty-six hours after the injury. Satisfactory adaptation of the parts must be attained notwithstanding the patient's suffering, if a good result is to be reached. Hippocrates complains bitterly that the patient strongly desires the latter without being willing to submit to the former. For lifting the fragments of bone into place he preferred the fingers, making use of those of some boy or woman assistant, if possible, because of their small size and their softness. Internal splints from "Carthaginian leather" or other suitable substances were used. He condemns the use of sponges for the purpose because they soon become foul with the discharges. He relates how in one case he

FIG. 1



From Galeni Opera Omnia, Venetiis, 1586, Vol. 6, f. 299, B.

made use of a piece of the lung of a sheep, probably as a temporary expedient. Sacrificial altars to the gods were always near the fields where the games were held in which many of these accidents occurred, and we may imagine the resourceful surgeon quickly cutting a piece of the soft elastic tissues from the open chest of the slaughtered victim and inserting it into the nostril of some vanquished athlete. While perhaps it is not so curious, a more valuable suggestion is contained in his description of the method of treating lateral displacements of the nose, of course when recent. An internal splint was inserted as usual and then a long leather thong was glued at one end to the point of the nose which was pulled beyond the median line to the opposite side, and the thong wound around the head and fastened by gluing to the temples or in some other convenient fashion. This could then be pulled more taut or loosened as occasion required. It is not certain when it

¹ Mochlicus (Adams), II, p. 163.

² Articulations, II, p. 109-113.

first occurred to surgeons in tamponing the nose to employ cannulae that the patient could preserve nasal breathing. I am not aware that it is to be found in the Hippocratic writings, but in those of the Roman writers, especially the later ones and in those of the Arabians, a goose quill wrapped in linen, on which were applied salves of odoriferous material or honey mixed with the mineral astringents, the salts of copper and iron, is the ever recurring recommendation for internal nasal splints in cases of fracture of the nasal bones.

Hippocrates¹ indulges in some satirical and still instructive remarks concerning bandages for a fractured nose.

"Those who put great store by a senseless dexterity rejoice to meet with a fracture of the nose in order to apply a bandage. For a day or two the physician takes great pride in himself, and the patient rejoices; but the latter soon tires of wearing the bandage, which is annoying; as for the doctor, it is enough for him to have shown that he understands how to put various bandages on the nose. Such a bandage does, however, quite the contrary to what is desired; on the one hand, in those in whom the nose had been sunken, it becomes markedly more sunken if pressure is exerted over it; on the other hand, in those in whom the nose has been dislocated to the right or to the left, either in the cartilaginous, or in the upper part, these, evidently, far from deriving any advantage from a bandage placed on it, suffer harm from it." We look in vain for any reference to operation for straightening a chronic deviation of the septum. It is a little surprising that with the experience derived from the treatment of recent fractures and dislocations of the nose, they should have failed to remedy the chronic lesion which must have been frequent enough. He insists that external wounds or comminution of the fracture are not contraindications to his plan of treatment. He must have witnessed the results of tremendous blows, probably with the cruel cestus, the iron shod glove of the boxer, for he speaks of the sinking in of the bridge of the nose when there is also exfoliation of the bone of the hard palate. Evidently in these dangerous encounters fracture at the base of the skull was an occasional result. At least he was familiar with its characteristic symptom, for he says: "A contusion of the head without an external wound, either by fall, fracture, or compression, produces in some cases the flow of acrid humors which run from the head into the throat." Possibly, however, he may here refer to suppuration as a result of intranasal fracture.²

Syphilis (?).—We have just seen that Hippocrates was familiar with depression of the nasal arch as the result of injury. That he

¹ Articulations, 35; (Adams) II, p. 109.

² These excerpts from fractures of the nose I have taken from Adams' translation of the Genuine Works of Hippocrates.

was familiar with it as the result of disease would appear from¹ the relations of the cases of two² children who from ulceration lost their teeth and pieces of the bone of the palate. This caused a sinking of the nose. They also had a bloody mucopurulent discharge. This description sounds very much like that of syphilis, either congenital or tertiary. This is thought by the majority of writers to have appeared first in Europe two thousand years later, brought from America by Columbus' sailors. This sinking of the nose is again referred to in another place.³ It is to be gathered from Galen's commentary⁴ that he also was familiar with a sinking in of the bridge of the nose, due to a loss of substance in the structures beneath. Daremberg⁵ has suggested that syphilis is the disease referred to by Hesiod (Fragm. 27, 28), who betrays a knowledge of some skin diseases in aphrodisiac women. After a perusal of the text alluded to, it seems to me very doubtful if this was the Corona Veneris as Daremberg surmises, though crusts and blotches were found in the scalps of these women. The passages here cited from the Hippocratic writings and from Galen seem much better evidence of it. We are unfamiliar today with any other disease of the palate and gums of a chronic nature which is accompanied by exfoliation of bone and the sinking in of the nasal arch. The nasal arch will not sink from the loss of the palate bone, except the nasal bones themselves are affected at their junction with the bony septum. Of course it may possibly have been some severe case of scurvy or phosphorus poisoning, but producing such results as these it seems very unlikely.

While the records of antiquity contain descriptions which it is difficult to know whether to ascribe to leprosy or syphilis, the trend of historical opinion in the last ten years has been decidedly toward the belief in the existence of a world-wide syphilis in the days of Hippocrates, but of a mild and sporadic type. This leaves the mystery of its recrudescence in the middle ages a problem of immunity having a much wider scope in its involvement of general principles than is now the conventional way of regarding it.⁶

Nasal Polypi.—Probably there is nothing in the Hippocratic books so familiar to the modern rhinologist as Hippocrates' sponge method of removing nasal polypi.⁷ Indeed, this was a method practised by Voltolini and mentioned in his text-book.⁸ Until

¹ Des Epidémies, IV, 19; (Littré) V, p. 157.

² This is the reading of Littré's translation, and to my mind that of Kühn's text, but the latter's translation refers to but one child.

³ Des Epidémies, VI, Sec. I, 3; (Littré) V, p. 267.

⁴ Edit. Kühn: Vol. XVII, Pars. I, p. 823.

⁵ État de la Médecine entre Homère et Hippocrate, p. 3.

⁶ See Lancet, August 24, 1912.

⁷ Des Maladies, II, 33; (Littré) VII, p. 51. This book, from which I have quoted so freely, is said to have been written by Draco and Thessalus, sons of Hippocrates.

⁸ Die Krankheiten der Nase, Breslau, 1888.

the comparatively recent invention of the steel wire snare, it compared favorably with other methods of ablation. An interesting

FIG. 2

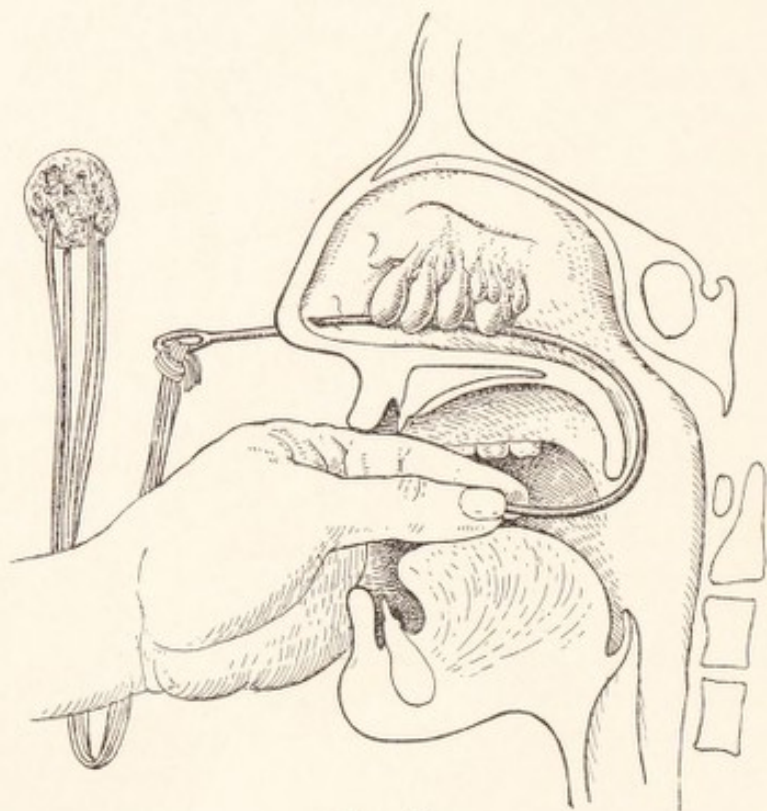


FIG. 3



FIG. 4

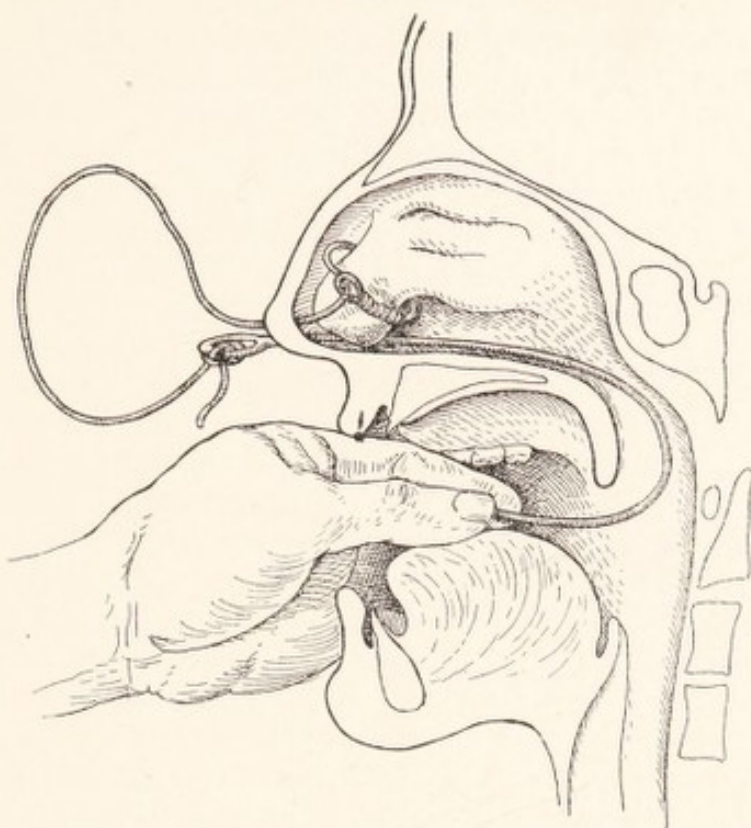
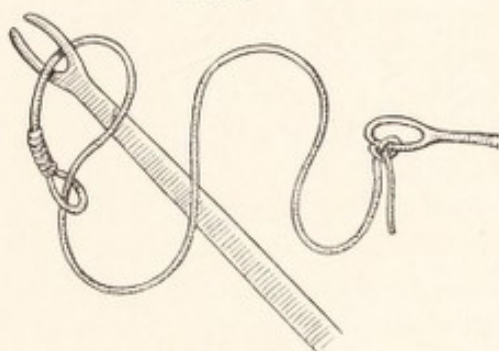


FIG. 5



From Baldewein.

paper on the "RhinoLOGY of Hippocrates," by Baldewein,¹ is largely taken up with a discussion of the various methods recommended by Hippocrates for the removal of nasal polypi, and the accompanying illustrations elucidate the procedures very much. There were several methods. The sponge method was used for those soft pendent polypi which move out and in the nostril on expiration and inspiration. It consisted of tying the ends of three or four strings to a sponge cut to the proper size and shape. The other ends knotted together were fastened to the eye of a soft, slender tin or leaden probe which was pushed through the nose into the pharynx. The ends of the strings thus secured were passed over

¹ Zeitschrift für Ohrenheilkunde, 1895-96, Bd. XXVIII, p. 101.

the end of a forked probe held in the pharynx. By traction across this, the sponge was dragged into the pharynx, if successful, bringing the polyp with it. In another method for harder growths, perhaps our fibrous hypertrophies, the principle of the snare was employed. The loop of a sinew was adjusted around the polyp, and the end having been carried to the pharynx and traction made as before, evulsion was attained. For still harder growths which Baldewein conjectured may have been bony cysts, he employed cauterization with a hot iron through a hollow tube used as a speculum. I do not see any reason for imagining this procedure was for this rare form of intranasal growth. It may easily have been many other pathological conditions, more likely to come frequently under the observation of the physician, such as cartilaginous spurs and hypertrophies. He speaks of a fleshy growth in the nostrils which he calls cancer, to be treated by the cautery, but as he says nothing about the strikingly fatal symptoms which ensue from any form of local treatment of malignant growth of the nose, it is doubtful if this term is equivalent to the present acceptation of it. He doubtless had encountered rhinoliths, for he speaks of something in the nose which, when you touch it with a probe, sounds like a stone. For this he recommended an external incision. After all these radical operations he advised the application of copperas powder and the insertion of tents in the nostrils, smeared with oil and honey, no doubt to prevent synechiæ and stenosis. I think that all rhinologists will agree that these procedures, for the time, were not bad intranasal surgery.

From the book on "Affections" we learn that all diseases come from the phlegm and the bile. The Hindu idea was that all bodily diseases come from Wind, Bile, and Phlegm. Indeed, there are many resemblances in this book, as well as the one I have just quoted from, which remind us of the Susruta. Polypi were supposed to be caused by the phlegm. It was derangement of these elements which produced diseases according to the Hippocratic authors. These books are not supposed to have been written by Hippocrates himself. Indeed, he explicitly discourages all theorizing as to etiology in his book on Ancient Medicine.

Epistaxis.—In various places Hippocrates has much to say of nasal hemorrhage as a symptom in many diseases, and in *Airs, Waters, and Places* remarks that persons under thirty years of age are liable to severe bleeding at the nose in summer. In the *Du Régime dans les maladies aiguës* (*Appendice 27*)¹ recommendations for stopping epistaxis include cold externally, a tent in the nostril, styptics, and purging. One of the Aphorisms shows that he was familiar with vicarious menstruation as a cause of the nose-bleed. "In a woman when there is a stoppage of the menses, a discharge of blood from the nose is good" (V, 33).²

¹ (Littré) II, p. 515.

² (Adams) II, p. 241.

Sinusitis (?).—Various other references to diseases of the upper air passages may be found in the Aphorisms, and among them one (VI, 10)¹ referring evidently to the symptoms of aural or nasal sinus disease:

"In a person having a painful spot in the head, with intense cephalalgia, pus or water, running from the nose or by the mouth or at the ears, removes the disease." It was supposed, as we have seen, that the origin of this discharge was the brain.²

The last of the Aphorisms applies with especial force to the nose and throat, though it is meant of course to be of general application (VIII, 87).³ "Those diseases which medicines do not cure, the knife cures; those which the knife cannot cure, fire cures; those which fire cannot cure are to be reckoned wholly incurable." A similar apothegm is found in the Hindu *Susruta*.

In the clinical notes which go under the title of *Coan Prognostics* we find an intimation that *phthisis pulmonalis* is a result at times of nasal catarrh, cases thus arising being considered most dangerous of all (II, XXI, 430).⁴ This is a superstition which still lingers in medicine and is continually reappearing in some form or other.

There is a passage in this book which is of considerable value in the differential diagnosis of hemoptysis, especially among a people who drink directly from brooks and springs and pools in the primitive fashion (II, 17).⁵ "In those in whom the throat becomes filled with blood several times, day and night, without preceding pains in the head or cough or vomiting or fever or pain in the chest and back, look in the nose and throat. You will find there either a wound or a leech."

It must be borne in mind that there are many other passages in the Hippocratic books of great interest to the laryngologist, but I have already cited enough to convince the reader that a compilation of them all would make a brochure on the diseases of the nose and throat which no modern student of laryngology could afford to despise.

FROM HIPPOCRATES TO CELSUS.

There now followed a period of more than four hundred years before a medical work was given to the world which was destined to survive the ravages of time, the vicissitudes of empire, and the vandalism of man, and to transmit to us at first hand the state of medical knowledge in the Roman world at the zenith of its power

¹ (Adams) II, p. 251.

² Vid.: Galen's Commentary. Edit. Kühn: XVIII, Pars. I, p. 20.

³ (Adams) II, p. 273.

⁴ *Prénotions Coaques*, V, p. 681.

⁵ (Littré) V, p. 653.

and vigor. From Hippocrates to Celsus is a long stretch in the history of the world. It is crowded full of events of absorbing interest and importance to our present civilization. It witnessed the rise and glory of Grecian civilization and its absorption into the world-wide domain of imperial Rome. In the Hippocratic era tiny Greece was battling with that huge menacing bulk of Oriental despotism, the enervating and soul-enslaving empire of the Persian kings. In that death struggle for our civilization she rolled back from Marathon (490 B.C.), Platea (479 B.C.), and Salamis (480 B.C.) that tide of stifling slavery and voluptuous sensuality, which was threatening to engulf the garden she had planted and to extinguish the torch she had lighted at fires long since quenched by this very Orientalism. From the rugged mountains and wind-swept isles of Greece this eastern terror recoiled to the plains of Asia. Ninety years later, ten thousand Greeks, a mere handful among millions, marched fifteen hundred miles into the heart of the Persian empire and after putting to flight an army of a million men turned around and cut their way out again. When next they plunged into Asia, seventy years later, it was with the youthful Alexander at their head. They dismembered the lifeless body of Orientalism which had been so long a menace to them, and for a thousand years it lay prostrate before it again threatened the civilization of Europe. When it was again about to inundate the budding civilization of the west, Don John, of Austria, at Lepanto (1571), and John Sobieski with his Poles, at Vienna (1583), again stemmed the rising tide and forced it back. In the century which now opens before us, the drama of two civilizations played on the stage of the world for twenty-five hundred years by the immortal gods is, let us hope, drawing to a close. Although the ancient Greeks shattered the cohesiveness of the mighty Persian empire they could not graft on the barren limbs of Orientalism the buds of their own fructifying activity. In vain did the generals of Alexander and their successors call around them the most brilliant minds of the age.

The Schools of Pergamos and Alexandria.—The libraries of Pergamos and Alexandria, with their hundreds of thousands of volumes, and the great schools which were founded with lavish expenditure of Oriental treasure wrung from slavish races by their Grecian rulers, advanced enormously the state of medical knowledge, but these institutions with the records of their own and of past scientific labor, planted in a land powerless to defend them, perished utterly at the hands of a succession of ruthless Roman and Saracen conquerors. The universal prevalence of the spirit which creates such monuments is the only bulwark which can defend them.¹ As

¹ Il n'y a pas de système qui puisse durer autrement que par des institutions. (Guizot.)

Gibbon suggests¹ the loss to literature pure and simple was probably not great, but to medicine and science it was irreparable, for only in such a collection of books can we hope to find those of ancient date which appeal to the understanding of man rather than to his emotions. It is the historian of science alone who fully realizes that the destruction of the great libraries accomplished greater wrong to humanity a thousand times over than any event history records. The great poets, historians, dramatists have many of them been preserved to us, but not so the records of those parts of civilization which administer directly to man's material comfort and health, and thus indirectly to his happiness.²

We are reduced, therefore, again to the necessity of scanning secular literature and of extracting second hand from the later works of Galen, Pliny, Oribasius, Rufus, Ætius the scanty records of the labors of more original workers than they.

Anatomy.—We have every reason to believe that enormous strides were made in anatomy by the schools of Alexandria where dissection of the human body was first certainly regularly pursued. It is even said that the school of Alexandria indulged in the practice of human vivisection.³ This is related with a shudder by the historians who delight to report the innumerable tortures inflicted upon innocent men by their fellow-men from motives of ambition, pride, lust, and revenge. The statement is received with horror by a cultured and refined public, who peruse with pleasure and avidity the other pages of history reeking with gore and replete with accounts of human misery. Erasistratus, Herophilus, and their confrères, if they did it at all, seemed to have pursued their investigations on gentle murderers and other virtuous criminals, out of the reprehensible motives of enlarging the boundaries of human knowledge and increasing the powers of man's benevolence and humanity. This practice attributed to the Alexandrian school has been denied and certainly not satisfactorily proven. Dissection of the dead human body as well as of animals, however, did, at this period, create the science of anatomy. The records of this fruitful activity have, as has been said, utterly perished, but we may see from the works of Hippocrates and of Aristotle how deficient was the knowledge of human anatomy before, and from the works of Galen how enormously increased it was after the foundation of the libraries and schools of Pergamos and Alexandria.

Singular to say, Aristotle (384–322 B.C.), who dominated the medicine and the philosophy of the dark ages, and who was said to have long practised physic before he devoted himself to pure

¹ The History of the Decline and Fall of the Roman Empire, Vol. V, p. 228.

² The School and the Library of Alexandria was founded 320 B.C. by the Ptolemies and was finally destroyed 640 A.D.

³ Celsus: De Medicina, Lib. I., Praefatio.

science, has left behind him very little pertaining directly to medicine, notwithstanding his profuse contributions to nearly all other branches of knowledge. Nevertheless we may find in his works a few indications of his conception of the anatomy of the upper air passages. He placed at the top of the nostrils a kind of a lid which rises at the time of inspiration to let in the odors. "There is no passage from the ear to the brain, but there is to the roof of the mouth." He described the larynx as the organ through which the voice and the breath pass, and as situated in the front part of the neck. He says the trachea is cartilaginous and surrounded by smooth rings and contains but little blood. "It lies at the upper part toward the mouth opposite the passage from the nostril to the mouth, wherefore if any liquid is drawn into it in drinking it passes out of the mouth through the nostrils." "Between the passages is the epiglottis, which can be folded over the passage which extends from the trachea to the mouth; by the epiglottis the passage of the tongue is closed; at the other extremity the trachea reaches to the middle of the lungs." "The heart is connected with the trachea by fatty cartilaginous muscular bands." The uvula is described as a very vascular organ. He speaks of the epiglottis as part of the tongue. He recognized¹ that the voice was produced within the trachea by the impact of the air, inspired by the soul which he taught resided in the heart and lungs, against it. "It is the voice and the larynx which emits vowels; it is the tongue and the lips which form the consonants, or the aphonic letters."² As we have seen (l. c.), Aristotle was free from the error of supposing that drink passes into the lungs.

Praxagoras was the last of the *Æsclepiadæ* of whom we have record. We read in *Coelius Aurelianus*³ that he recommended cutting off the end of the uvula or scarifying it deeply when it was greatly inflamed. He transmitted the medicine of Hippocrates to his pupil Herophilus (300 B.C.), the great anatomist of the Alexandrian school. He is said to have instructed the latter in the knowledge of the pulse, which he afterward so greatly developed. Pliny refers to Herophilus as the "*vatis medincinæ*,"⁴ the oracle of medicine. He, in all probability, contributed greatly to the anatomical knowledge of the upper air passages, but only the merest hints of it remain to us. Thus we learn from Rufus Ephesius⁵ that he called the hyoid bone the parastate because it was situated near the tonsils. According to Soranus, quoted by Orribasius (XXIV, C 31), Herophilus likened the cervix uteri gravidi to the larynx. Plutarch, from whom we have so often to quote,

¹ *De Anima*: II, VIII, vid. Translat on by St. Hilaire *Traité de l'Ame*, p. 225.

² *Hist. of Animals*, IV, Chap. IX.

³ *De Morb. Acut.*, III, C. IV.

⁴ *Hist. Nat.*, Lib. XI, Cap. 37.

⁵ *Œuvres de Rufus d'Ephèse* (Daremborg), Paris, 1879. *Du Nom des Parties du Corps*, p. 155.

after mentioning¹ some incomprehensible theories of Empedocles and of Asclepiades, says that Herophilus attributes a moving faculty to the nerves, arteries, and muscles, but believes that the lungs are affected only with a natural desire of enlarging and contracting themselves. From the citation made by Marx in his brochure on Herophilus (p. 34), I would infer that the latter thought that the lung drove the air into the pleural cavity, and then, receiving it back again, expelled it externally. Erasistratus and Herophilus both knew that the arteries contained blood and that the pulse was connected with the heart, and yet apparently the circulation of the blood remained unknown for eighteen centuries. We learn from Celsus² that the former used ligation of the extremities as a remedy for hemoptysis. Eudemis (279 B.C.), we learn from Rufus,³ compared the styloid process to the spur of a cock, but gave it no name. This is a small gleanings from a period of several hundred years which marked the beginnings of the study of anatomy, but as to the upper air passages we look in vain for more, at least until the time of Asclepiades.

ROMAN MEDICINE.

Pliny is often quoted as saying that Rome for 600 years was without physicians but not without physic. Cato, the Censor (b. 232 B.C.), we know had a very poor opinion of the doctors and in fact of learning in general. He was instrumental in driving Carneades and the other Greek savants from Rome in his day, but it cannot be conjectured that this arose from any skeptical turn of mind on his part, for in his book on Agriculture, amidst many receipts, amulets, charms, and invocations we find him prescribing his favorite, almost his sole, drug for nasal polypus: "If there is a polypus in the nose rub together some dry wild cabbage leaves in the hand and place it at the nose and draw up the breath as much as you can. In three days the polypus will fall away. Nevertheless, for some days do the same; so that you may render the roots of the polypi entirely healthy."

It was not until the year 219 B.C. that Greek medicine found its way to Rome. Archagathus was the first Greek physician, who, about that time, came to Rome.⁴ He was very unsuccessful. We may read in Plutarch's Life of Cato, the Censor, how the Romans treated Carneades, the Athenian philosopher and Ambassador, in order to appreciate the prejudice with which the sturdy but

¹ De Placit, Philosoph., XXII.

² De Medicina, Lib. IV, Cap. 12.

³ Œuvres (Daremberg), p. 152.

⁴ Cassius Hemina, among the most ancient authors, is authority for the report that the first of physicians to come to Rome from the Peloponessus was Archagathus, the son of Lysania, in the year of the City, 535.—(Plinii Naturalis Hist., Lib. XXIX, Cap. 1-6.)

rude old patricians of ancient Rome viewed the introduction of Greek civilization. It has always been noted in the history of the world that the first advances which have tended to ameliorate the asperities, to increase the amenities, and to introduce a wider knowledge among a rude and vigorous people have met with the suspicion and contempt of the conservative majority, who look upon the innovations as the first steps toward effeminacy and degeneration.

Cicero's Anatomy and Physiology.—It was not until the time of Asclepiades (100 B.C.) the friend of Cicero (106–43 B.C.) “is quo nos medico amicoque uti sumus, tum eloquentia vincebat ceteros medicos”¹ that the art of medicine really began to flourish in Rome, and we soon find Cicero describing the wonders wrought by the immortal gods,² not the least of which are the marvels of the human anatomy. “It will be more easily appreciated what has been done for man by the immortal gods, if the whole fabric of man is examined, and the perfection and method of human structure is brought to our comprehension. The life of living creatures is maintained by three things, by food, by drink, and by the breath (*spiritus*), and for making use of these the mouth is especially adapted because it is reinforced by the air from the adjoined nostrils. The food is masticated by the teeth arranged in the mouth, and by them divided and softened. The sharp front teeth divide the food when bitten, and the back ones, which are called the true teeth, prepare it, and this preparation seems to be aided even by the tongue. The *œsophagus*, adherent to the tongue as its root, receives from it that which has been received by the mouth. This, touching the tonsils on each side, is continuous with the end of the palate and this it is which receives the food after it has been pushed along by the movements of the tongue, and passes it downward. Those parts which are lower down than that which swallows (the food) are dilated, while those parts above are contracted. But since the “*Aspera Arteria*,” for thus it is called by physicians, has an opening joined to the roots of the tongue, a little above where the *œsophagus* is joined to the tongue, and since this reaches to the lungs and receives the air (or soul-*anima*) that being received from the breath (*spiritus*) and this being inspired and again returned, it is protected, as it were, by something like a lid, which is provided for the reason that if by any chance food should fall in it, the breath would be stopped. Since by its nature the belly, attached below to the *œsophagus*, is a receptacle for food and drink, and the lungs and heart form an exit for the breath, in the belly many things are admirably arranged, which it is about agreed, are (controlled) from the nerves (*nervis*). It (*i. e.*, the gastro-intestinal tract) is, however, multiple and tortuous, and it encloses and holds that

¹ De Oratore, I Cap. 14.

² De Natura Deorum, II, 54.

which it receives whether it is dry or wet, so that it may be altered and digested; it is by turns contracted and relaxed, and everything which it receives it compresses and mixes, so that all things, prepared and digested by the heat, of which it has much, and by the attrition of the food and especially by the breath (*spiritus*), are distributed to the rest of the body. In the lungs, however, there is a certain looseness of texture and a softness, similar to the sponges, most carefully adapted for drawing in the breath. They in turn contract on expiration and dilate on inspiration, so that the nourishment by which breathing creatures are principally supported may be frequently taken in."

In another passage (*Ibid.*, Lib. II, Cap. 57) Cicero intimates the existence of further knowledge of nasal physiology in his remark: "Likewise the nares, which are always open on account of necessary functions, have narrower entrances lest anything which might be injurious should enter them, and they always are supplied with a moisture not useless for arresting dust and many other things." Of course we cannot suppose that Cicero included bacteria in his "*multaque alia depellenda*."

After all, these passages from one of the greatest masters of human speech who has ever lived, and a man profoundly imbued with all the knowledge of his day, are perhaps not a bad index of the state of knowledge of the anatomy and physiology of the air and food tracts. It is a great advance over anything we can find in Hippocrates and Aristotle.

Asclepiades.—As to Asclepiades, that eloquent rhetorician of Bithynia, the friend of Cicero and Crassus, the great advocate of diet, exercise, and massage, and enemy of bitter doses and radical treatment generally, we have only a few fragments, collected by Gumpert. He made a great stir in his day; he declared that so perfect was his regimen, disease had no terrors for him; he was never sick and only died because he fell from a ladder and broke his neck in extreme old age.¹ *Synanche*² he said was "a flow of the humors or a wetness of the fauces, or rather of the very top of them, coming down from the head." Besides the purging and bleeding he scarified the tonsils and the fauces around them. Moreover, he approved of the practice of incision of the trachea as recommended by the ancients, which they called *laryngotomy*,³

¹ Pliny: *Hist. Natur.*, Lib. VII, Cap. 37.

² Coelius Aurel. de *Morb. Acut.* III, 1 (Amman), Amst., 1709, p. 181.

³ Coelius Aurelianus (de *Morb. Acut.*), Lib. III, Cap. IV, Edit. Amman, p. 193—Asclepiades—At si major (inquit) passio fuerit, dividendæ sunt fauces, hoc est tonsillæ et partes supra uvam constitutæ, etenim summa est in his æqualis sive par incisura, quam appellavit *homatomia*. Dehinc a veteribus probatum approbat arteriæ divisuram, ob respirationem faciendam, quam *laryngotomiam* vocant, varie ac multipliciter peccans.

This is the first mention we find of this operation unless it is referred to in the Talmud. It is a good illustration of how much must have been lost from the old records. Coelius expresses the belief that the account of the ancients doing it was not true but an invention of Asclepiades.

to relieve the respiration. Themison, the founder of the school of Methodists and a follower and disciple of Asclepiades, also approved of this surgical operation. Celsus (Lib. IV, Cap. IX), quotes him approvingly and recommends his prescription of swallowing strong vinegar in ulceration of the fauces, and says that he condemned the practice of Erasistratus ligating the extremities for hemoptysis. With this condemnation Celsus does not agree. So far as the throat is concerned, therefore, his practice to-day would not be called very mild or conservative.

CELSUS AND THE PRE-GALENIC WRITERS.

In the eight books of the "De Medicina," which remain to us from the writings of Aulus Cornelius Celsus, who was probably born in the last days of the reign of Caesar Augustus, about the beginning of the Christian era, are found several chapters which deal with the diseases of the upper air passages. Written by a Roman patrician, it is the first and almost the only work of medicine which has come down to us written in the Latin tongue as used by Virgil and Horace,¹ and all that brilliant coterie of men who adorned the imperial courts of Augustus and Tiberius, and sauntered through the gardens of Maecenas. As an interpreter of Hippocrates he was profoundly influenced by the precepts of Asclepiades, but he evidently was a man of virile understanding and original powers, whose works still contain much of value to the surgeon.

Coryza.—In his chapter on coryza,² he repeats the conviction of Hippocrates that some cases of phthisis owe their origin to catarrh of the upper air passages. "Destillat autem humor de capite interdum in nares, quod leve est; interdum in fauces, quod pejus est; interdum etiam in pulmonem quod pessimum est." For him, as for Hippocrates before him and Galen after him, the humor dripped through the cribriform plate. So far as the coryza is concerned, indeed, he says, there is nothing pestiferous about it unless it ulcerates the lungs. He recommended as treatment abstention

¹ The following lines have been held by some medical historians to refer to the physician Celsus, but there seems every reason to believe it was the somewhat earlier poet Celsus to whom Horace here, as several times elsewhere, alludes:

"Quid mihi Celsus agit? monitus multumque monendus
Privatus ut querat opes, et tangere vitet
Scripta Palatinus quecumque recepit Apollo,
Ne si forte suas repetitum venerit olim
Grege avium plumas moveat cornicula risum
Furtivis nudata coloribus."—(Horat. Epist. I, 3, 15.)

We see by this extract that the library on the Palatine Hill, founded by Augustus, was already in requisition by writers, and already the charge of plagiarism was much indulged in by the literati.

² Lib. IV, Cap. II.

from daily routine and protection from the weather, as well as abstention from the bath, wine, and venery. He approved of active exercise in the house and laid great stress upon massage. He advised against overeating and recommended that only a half-pint of water a day be taken as drink. Warm vapors, the head and neck wrapped in flannel, and especial care to be given to the diet, were also urged. These prescriptions were varied somewhat as the discharges became thicker, but at all stages massage and exercise were to be employed.

Angina, Kynanche, Synanche.—In regard to throat inflammations,¹ those which are confined to the fauces, he said, the Romans called angina, while the Greeks gave the name synanche to that form in which there was dyspnœa without any appearance of inflammation in the fauces, and cynanche to that form where the obstruction could be made out in the fauces. The Greeks supposed the former condition (*i. e.*, the synanche) to be due to the disease of the "pneuma" itself, and that this it was which caused a collapse of all the parts of the chest and neck.²

With Celsus, cupping, bleeding, purging were the remedies employed, the cups to be applied around the fauces. Hyssop, thyme, absinthe, bran, or dried figs steeped in water were the highly agreeable gargles he used, though all his prescriptions were not so mild. Vinegar, powdered pepper, and oxgall also formed part of his pharmacopœia. In certain cases he made deep incisions externally beneath the jaws and bled from the lingual veins. His incision into the palate above the uvula (VI-X) was more in accord with modern practice in quinsy. Without the necessary differentiation of diphtheria from quinsy or other inflammatory processes, we can readily understand his remark that "if the patient is not aided by these things, then we may know he is a victim to this disease." He apologizes for mentioning a remedy, which seems later to have been very popular in Rome for centuries, saying that it was somewhat out of place in a scientific work. Pliny and Galen mention the same and speak highly of its efficiency. A swallow either fresh or salted, having been kept thus in the house for the purpose, is to be burned to a cinder and the ashes, moistened in water, are to be applied to the throat in a threatened attack of angina. Pliny³ dwells on the same remedy at considerable length, and dilates on the difference in the efficacy of the different kinds of swallows. On a reference to the Hindu Susruta (Vol. II, Cap.

¹ Lib. IV, Cap. IV.

² There seems to have been great confusion among the Greek medical writers at this date in the use of the two terms. Galen in his Commentaries on the Prognostics of Hippocrates, Opera Omnia (Kühn), XVIII, Pars. 2, p. 267, intimates that the two terms arose out of a different reading of the initial letter in the word, as used by Hippocrates, by different writers, and that Hippocrates made no distinction. This is probably the correct explanation. We will find Areteus making elaborate distinctions in the use of the terms.

³ Hist. Animal, XXX, 4, 12.

XXII)¹ will be found the prototype of this prescription. "In affections [of the throat] arising from the blood and bile, cure is obtained by the use of swallows." This is one of the many instances of the Oriental origin of this sort of therapy. Celsus thinks no apology necessary when in the next chapter on dyspnœa he recommends a paste made of dried fox liver powdered. He also advises it should be roasted and eaten. Even for dyspnœa he recommends moderate exercise and does not forget massage.

Diphtheria.—"By far the most perilous of all ulcers [of the mouth] are those which the Greeks call *Ἀφθα*, chiefly in children, for in men and women there is not the same peril."² Evidently this is diphtheria. He remarks that ulceration of the fauces is frequently followed by a cough, for which, of every description, he recommended long sea voyages, sea-side resorts, and sea bathing.³ He devotes a chapter⁴ to the spitting of blood and recognizes vicarious menstruation among other more frequent causes.

Ozæna.—For ulcerated nares he recommended⁵ vapor of hot water from a narrow-necked vessel, and mineral astringents were applied to the ulcer. "But if these ulcers are around the openings and they have many crusts and a foul odor, which variety the Greeks call *Ὠζæνα*, it should be recognized that it is hardly possible to cure this disease. Nevertheless these things may be tried; let the head be shaved to the skin, and persistently and vigorously rubbed; let it be bathed with plenty of hot water; let there be much walking; moderate food, nothing very sharp or very strong; then in the nostrils let honey be applied with a small amount of the resin of turpentine, which may be used on a probe wrapped with wool; let this liquid be drawn in with the breath until the taste of it is perceived in the mouth; by the use of this the crusts are loosened, which may then be removed by the use of sternutatories." How accurate this prognosis was we still have reason to know; how excellent the local treatment was we still bear testimony to in our present therapy of irritating applications to the nostrils. We recognize here another method of treatment which has been thought to be entirely modern. He advises leaving pledgets of lint saturated with some medication in the nostrils, this to be done twice a day in winter and spring and thrice a day in summer and autumn.⁶

¹ Susruta (Hessler), II, p. 133.

² Celsus: De Medicina, Lib. VI, Cap. XI.

³ Ibid., Lib. IV, Cap. IV.

⁴ Ibid., Lib. IV, Cap. IV.

⁵ Ibid., Lib. VI, Cap. VIII.

⁶ " . . . linimentum involutum et oblongum eodem medicamento illinendum, de mittendumque in narem, et ab inferiore parte leniter deligandum. Idque per hiemen et ver bis die; per estatem et autumnum ter die fieri debet." Bertherand: Médecine et Hygiène des Arabes, 1855, p. 502, notes the treatment of ozæna among Arabs, of Algeria, by means of insertion in the nostrils of a seton of wool or a tuft of hair soaked in honey and some irritating substance. These, of course, are what we know as Gottstein's tampons.

In another place¹ he describes a very radical surgical operation for the cure of ozæna, which has also been urged by at least one modern author.² Celsus does not, however, himself indorse the operation, which consisted in the use of the actual cautery through an earthenware tube or the quill of a writer's pen, and the affected parts thoroughly seared, and the wound dressed with astringent and soothing applications.

Polypi.—Nasal polypi, which he likened in appearance to the nipples of a female breast,³ he treated by caustics. He described them as showing in front on the lip and sometimes behind, "by that foramen through which the breath descends to the fauces," hanging down so that it may be seen behind the uvula, and in cold, damp days it strangles a man. Some he calls *σαρχινώδης*, and these should not be touched. Elsewhere he shows how the other kind may be cured by operation.⁴ He used a sharp instrument like a spatula to separate it from the bone, and then by means of a hook it was to be removed. His surgical treatment for large and hard tonsils was to separate them from the sides of the throat with the finger⁵ and tear them out, or drawing them inward with a hook to cut them off. His operation for uvulotomy has not been improved upon. He cut the frenum linguæ for trouble in speaking, and this relieved many, but he had seen it fail once. He also was familiar with ranula. He mentions hare-lip, and elsewhere⁶ describes operations for the cure of that and other deformities about the face by plastic methods. He operated on bronchocele by making an incision through the skin and shelling the tumor out with the finger.⁷ It may be easily seen from these few extracts that Celsus was well entitled to the name which has been given him—the Roman Hippocrates.

The Therapy of Pliny.—We have already had occasion to quote from Pliny knowledge which he said he had derived from the Magi. He died at the foot of Mount Vesuvius on that dreadful day (August 25, 72 A.D.) after a cloud shaped like a pine tree had the day before shot up in the air above the smoking mountain. It was seen by Pliny from his villa on the shore of the beautiful Bay of Naples at Misenum, and summoning the Roman galleys he commanded, he sailed into the mephitic vapors to rescue his terror-stricken friends, and perished in the attempt. Pompeii and Herculaneum lay buried beneath the hot ashes and cinders, and thus kept treasured up for eighteen hundred years the relics of the power and pride of Rome, who thought herself mistress of the world, to excite the wonder and curiosity of travelers from lands she had never dreamed of. He lay dead upon the shore, a brave man and a philosopher, and

¹ De Med., Lib. VII, Cap. XI.

² Rethi: Arch. für Laryngol. und Rhinol., Berlin, 1895, II, p. 194.

³ De Med., Lib. VI, Cap. VIII.

⁴ Ibid., VII, Cap. X.

⁵ Ibid., VII, Cap. XII.

⁶ Ibid., VII, Cap. IX.

⁷ Ibid., VII, Cap. XIII.

the work which he left behind him, the *Historia Naturalis*, became all through the Middle Ages the source from which credulous humanity derived its pharmacopœia.

In the Dark Ages, among the half-civilized barbarians who flooded the Roman Empire and nearly extinguished the torch of civilization, the necromancy and the filthy drugs of Egypt and Chaldea found the ready market which Grecian culture and Roman civilization in the better ages never offered. The entrails and excreta of birds and reptiles and shell fish, all manner of fish, bird, and beast, besides innumerable plants and minerals, fill page after page of Pliny's treatise. Large numbers are recommended for nose and throat diseases, with very little discrimination as to the affections for which they were prescribed. In fact, one pursues the record of drug therapy through the history of medicine with very little profit. One may sum it all up by saying that human ingenuity has applied all medicaments to every disease.

Perhaps, after all, the best definition of a drug is that incidentally given by Montaigne in boasting of the health of his progenitors: "For them everything which was not in ordinary use took the place of drugs." For an illustration of these remarks one may turn to Dioscorides, whose botanical and pharmacological work dates from about this time. Here we may find the swallow prescription in many forms, not only for anginas, but for many other affections.

The Roman Empire, by the victories of Caesar and Pompey, had undergone an immense expansion. All roads soon led to Rome. Asclepiades we have seen as the friend of Crassus and Cicero, but he came to Rome for fame and practice from his native Bithynia.

Aretaeus.—It is not certain that Aretaeus lived in Rome, though it is probable he was acquainted with the practice of Italy. He was a native of Cappadocia. Even the exact date of the medical activities of Aretaeus seems very uncertain, but it is supposed that he lived shortly before the birth of Galen (131 A.D.), in an era extending perhaps from the reign of Titus (79 A.D.) to that of the great Marcus Aurelius (161 A.D.). It is singular that so few contemporary and subsequent medical authors mention Aretaeus, whose writings in perspicuity of observation and brilliancy of execution are surpassed by none in the history of medicine.

The Uvula.—Aretaeus' chapter on diseases of the uvula is an interesting exposé of the different appearances presented by that organ in disease. The inflamed, reddened œdematous uvula; the elongated uvula, sometimes with what was apparently a papilloma at the end of it; the broad uvula, with bat-like wings at the side—for all these he had separate names—besides the bifid uvula, for which he had no name ("but which was recognizable by all"), while that is especially the form to which we moderns have given a name. He also described a condition left behind after an oblique

amputation by the physician, a piece of membrane hanging down at the side. As the symptoms we may use the translation of Adams:¹ "A sense of suffocation accompanies all these affections, and they can by no means swallow with freedom. There is cough in all the varieties, but especially in those named *lorum* (a broad, flat strap) and *fimbria* (the border or edge; this is the variety having a club-shaped end to it). For a titillation of the trachea is produced by the membrane, and in some cases it secretly instils some liquid into the wind-pipe, when they cough. It is safe to apply the knife in all these varieties; but in the uvula, while still red, hemorrhage, pains, and increase of inflammation supervene." In the chapter on the treatment of disease around the uvula, he states that many of them require surgical treatment, but these he does not discuss, his work on surgery having been lost. In this chapter it is evident that some severe faucial inflammation, accompanied by œdema of the uvula and by symptoms of dyspnœa, many of the cases ending fatally, were familiar to Aretaeus. We can only conjecture that some of these were diphtheria.

Syphilis.—His therapy was not especially different from that of Celsus in such cases, but at the end of this chapter on the therapy of the diseases of the uvula, occurs a sentence which to me is inexplicable on any other ground than that of the existence of syphilis, or again of some disease with which we are now not familiar, as I remarked in citing a similar passage from the Epidemics of Hippocrates. In this sentence of Aretaeus the suggestiveness, to my mind, is still more striking. We may translate it thus: "But should the part become purulent, in some, the bones of the palate are destroyed, and having lingered a long time wasting away, they die." Now "consumption," as Adams translates it, does not produce necrosis of the palate except in very rare cases, and in these almost never beginning as a primary disease, but rather as a rare incident in the progress of general tuberculosis. Personally I have never seen a case of necrosis of the hard palate caused by anything but syphilis, though, of course, as before remarked, we must keep in mind the rare cases of scurvy and phosphorus poisoning.

Kynanche and Synanche.—I have already had occasion to refer to the use of the two words *kynanche* and *synanche*, and have quoted Galen's remark that the difference apparently arose from the different readings of the initial letter of the word by the transcribers of the Hippocratic treatises. *Kynanche* (κυνάγχη) is a word applied to the choking of a dog, and Aretaeus makes a part of his clinical picture of throat inflammation to consist of the tongue sticking out as a dog does, even in health. It must be borne

¹ Extant Works. Sydenham ed., London, 1856, p. 253. Book I, On the Causes and Symptoms of Acute Diseases. Chap. 8, on the Affections about the Uvula.

in mind that Aretaeus was supposed to be a disciple of the chief exponent of the Pneumatists, Archigenes, and hence we find him saying that he believed synanche to be a disease of the "pneuma" pure and simple, and he applies the term to those cases in which no obstruction is visible, or to those in which the inflammation has also descended to the thorax, but whether to one or to the other, they all have the common symptom of dyspnœa, and he adduces the significance of the word, not as Galen suggests, but from the collapse of the parts about the neck and chest. Of course, it is evident here again that there is a misleading classification of throat inflammation, if we take into account our present system, and we perceive the classification of Aretaeus is really founded upon the situation of the lesion rather than its nature. That some of these cases were also diphtheria admits of no doubt, but in the category he also included peritonsillitis and the graver forms of phlegmonous inflammation. As in Celsus, we find mention made of abscesses in these cases opening here and there around the ears externally, and it again becomes evident that they were familiar with more cases of severe and deep inflammation around the fauces than are we.

After admiring the many agreeable prescriptions recommended by Aretaeus, we are shocked in the description of an elegant poultice scented with bay leaves, to find him gravely advising, as very efficacious in promoting suppuration, that the surface shall be sprinkled with the finely sifted dung of pigeons and dogs; but, on the whole, the treatment of the simple inflammatory conditions by local applications we recognize as most judicious. When it is apparently diphtheria, or other obstructive disease of the larynx, Aretaeus and his confrères were helpless, and recognized the malady as deadly. He tried to bring the disease outward by sweats and counter-irritation.

Laryngotomy.—In this place, the chapter on the Therapeutics of Synanche,¹ occurs the much quoted passage in regard to laryngotomy, which I would translate thus: "But those who, as a precaution against suffocation arising from synanche, cut the trachea for the dyspnœa, do not seem to me to have shown by the attempt that the operation is warranted, for the heat of the inflammation becomes greater from the wound, and besides increases the dyspnœa and the cough; but if they are both cartilaginous and unsuitable—" [Here the fragment of this chapter abruptly ends.] Now, if we remember that Aretaeus supposed that the dyspnœa arose, not from obstructive causes as we understand them, but from a disease of the "pneuma" or breath itself,² we may understand how irrational

¹ Extant Works (Adams), p. 157-160; trans. p. 404-406.

² We may briefly define the pneuma as conceived by the ancients to be that part of the breath which contained the vital energy, but it would lead us too far astray to discuss all the various ramifications and forms and consequences of this idea, so necessary in some shape to any conception of the mystery we call life.

a procedure the opening of the air tube seemed, and we well know that in the worst cases which were the ones usually reserved for tracheotomy, even up to the time of the advent of intubation in our own day, the results, on account of the extension of the trouble below the trachea, fully justified Aretaeus' skepticism. We have seen that Asclepiades approved of the operation, and we shall find Paulus Aegineta, several centuries later, describing the operation and attributing it to Antyllus.

Diphtheria.—While, as we have seen, there is abundant evidence that the other chapters on diseases of the throat include reference to cases which were diphtheria, there is a special chapter devoted to a description "Of the Ulcers about the Tonsils,"¹ in which the disease is unmistakable. His description is very vivid, but as to the etiology he gropes in the dark, very much as men have done in all ages when seeking after the causes of phenomena. He says it occurs more frequently in children because they especially draw in deep and cold breaths; and there is more heat in them. They are greedy and hungry and their desires are capricious. They are petulant and do a great deal of bawling. It is common in girls until the beginning of the menses. It is especially common in Egypt and Syria on account of their diet and the dryness of the air. Hence they are called Egyptian or Syriac ulcers. We smile, but probably no more contemptuously than future historians will at our own ideas of etiology. They die he says from the foulness of the odors—from the toxins say we. In his symptomatology we miss only one characteristic, and that is the coughing up and the expectoration of the membrane; but this we find mentioned by Galen. His treatment included the use of escharotics and the cautery for the so-called ulcers. Various powders of an astringent nature were to be blown on them through a quill or a tube.² We hear little of massage and exercise from Aretaeus; this therapeutic fad, like all fads, had had its day since the time of Asclepiades and of Celsus. We cannot part from Aretaeus without quoting his description of the fatal termination of cases of these pestilential Syriac ulcers:

"The manner of death is most piteous; pain sharp and hot as from carbuncle; respiration bad, for their breath smells strongly of putrefaction, as they constantly inhale the same again into their chest; they are in so loathsome a state that they cannot endure the smell of themselves; countenance pale or livid; fever acute; thirst as if from fire, and yet they do not desire drink for fear of the pains it would occasion; for they become sick if it compress

¹ Adams ed., p. 253.

² Heymann credits Aretaeus with being the first to make local applications to the larynx in this way, but it is found frequently mentioned in the Hindu writings. It is doubtful, however, if the powder ever got as far as the larynx. Without modern appliances and the laryngoscope, this is a difficult matter.

the tonsils, or if it return by the nostrils; and if they lie down they rise up again as not being able to endure the recumbent position; and, if they rise up, they are forced in their distress to lie down again; they mostly walk about erect, for in their inability to obtain relief they flee from rest, as if wishing to dispel one pain by another. Inspiration large, as desiring cold air for the purpose of refrigeration, but expiration small, for the ulceration, as if produced by burning, is inflamed by the heat of the respiration. Hoarseness, loss of speech supervene; and these symptoms hurry on from bad to worse, until suddenly falling to the ground they expire."¹

Rufus of Ephesus.—As in the case of Aretaeus, a similar uncertainty as to the time and locality in which Rufus Ephesius lived is to be noted in history. He evidently was anterior to Galen, who speaks of him as one of the recent writers, while he does not refer to Aretaeus at all, who must have flourished about the same time. It is said that Rufus Ephesius lived during the reign of Trajan, which began in 98 A.D. He wrote much on anatomical subjects and quoted extensively from the works of others. His own work, or rather such of it as has remained to us, is of little value. I have extracted from it the following notices which pertain to our subject. He speaks of the tonsils² as four in number, two on each side of the pharynx (*σαρκώδη καὶ ἀδενώδη*), fleshy and gland-like. We note thus early the occurrence of the word "adenoid" applied to the structure of this tissue. Again, in the "Anatomy of the Parts of the Body," ascribed to the same author, occurs the following: "At the deepest portion of the tongue and at each side of this organ are arranged at its base excrescences called lateral glands of the isthmus to the number of six; they have a gland-like structure. The form is rounded. They are movable and easy to excise; they are attached by means of small membranes which hold them at the base. Four are to be seen at each side of the bottom of the mouth—two are less visible." We may conjecture there has here been some mutilation of the text. He noted they are more prominent when inflamed. He recognizes that the uvula is of little use and its amputation produces no alteration of function. As we shall see, in the description of the tonsils he is less accurate than Galen, but more in accord with modern teaching as to the uvula. Rhazes, an Arabian writer, quotes Rufus as saying: "In fracture of the nose it is well to fill the nostril completely with cotton (or silk) stuff, and not extract it until the nose has taken its shape."³

Tracheotomy of Antyllus.—Here is, perhaps, the place to introduce a quotation by Paulus Aegineta from the lost works of Antyllus, a surgeon of much note, who is said to have lived during the reign of Hadrian (117–138 A.D.). It is the first specific description of

¹ I have here used the excellent translation of Adams, p. 255.

² Œuvres de Rufus d'Ephèse, Paris, 1879, p. 141.

³ Ibid., p. 471.

the technique of the operation of tracheotomy. I avail myself of the Sydenham translation of Adams.¹ "The most famous surgeons have also described this operation (laryngotomy). Antyllus, therefore, says, 'In cases of cynanche (as we will explain under the head of Dietetics) we entirely disapprove of this operation, because the incision is wholly unavailing when all the arteries (the whole of the trachea and bronchi) and the lungs are affected; but in inflammations about the mouth and palate and in cases of indurated tonsils, which obstruct the mouth of the wind-pipe as the trachea is unaffected, it will be proper to have recourse to pharyngotomy, in order to avoid the risk of suffocation. When, therefore, we engage in the operation we slit open a part of the arteria aspera (for it is dangerous to divide the whole) below the top of the wind-pipe, about the third or fourth ring. For this is a convenient situation, as being free of flesh, and because the vessels are placed at a distance from the part which is divided. Wherefore bending the patient's head backward, so as to bring the wind-pipe better into view, we are to make a transverse incision between two of the rings, so that it may not be the cartilage which is divided, but the membrane connecting the cartilages. If one be more timid in operating, one may first stretch the skin with a hook and divide it, and then removing the vessels aside, if they come in the way, make the incision.' These are the words of Antyllus." Now, by the phrase in parentheses, "for it is dangerous to divide the whole," we are reminded of the passages I have cited from the Talmud and the Rig Veda. We may, therefore, entertain some conception of the antiquity of the operation of tracheotomy, though it is not mentioned in Pliny.

Coelius Aurelianus.—Coelius Aurelianus is another of the many medical writers whose epoch we cannot definitely ascertain, though it is supposed he was a contemporary of Aretaeus and of Galen. His barbarous Latin and his ignorance of Greek show that his knowledge of polite literature was limited, but his accurate description of disease, and especially his copious citations of earlier writers whose books have perished, make his works important in the history of medicine. He describes very vividly the symptoms of acute throat inflammation,² which he calls synanche, and he includes under this head everything of the kind. His treatment does not differ materially from that of Aretaeus. He was very fond of the use of oil both as a menstruum for gargles and for the inunction of the whole body, when he used it warm in severe cases. He disapproved of the practice recommended by Hippocrates and his followers, of bleeding from the veins beneath the tongue in synanche, saying it did harm rather than good. He notes Hippocrates' suggestion of passing a tube along the tongue into the pharynx

¹ The Seven Books of Paulus Aegineta (Adams), London, 1846-47, II, p. 301.

² De Morbis Acutis, Lib. III, Cap. I, II, III, IV (Amman ed.), p. 179-198.

(or larynx?) for the relief of dyspnoea. He strongly condemned the practice which he says Asclepiades falsely ascribed to the older writers of opening the trachea. He says the report is an invention of Asclepiades, that it is rash and dangerous, and it would be a crime to perform it.¹ Nevertheless, we have seen that Antyllus, who must have lived about the same time, carefully describing it, according to Paulus Aegineta. Aurelianus has a chapter on hoarseness² arising from colds and shouting, and notices the diseased uvula as the cause of chronic coughs; he has also a chapter on coryza.³

GALEN.

Gibbon begins his immortal work, "The Decline and Fall of the Roman Empire," with the sentence: "In the second century of the Christian era the Empire of Rome comprehended the fairest part of the earth and the most civilized portion of mankind. . . . If a man were called to fix the period in the history of the world during which the condition of the human race was most happy and prosperous, he would, without hesitation, name that which elapsed from the death of Domitian (96 A.D.) to the accession of Commodus" (180 A.D.). It was in this epoch, at the culmination of the mightiest empire that the world has ever seen, that Claudius Galen lived. It was under Trajan (98-117 A.D.) the empire reached its greatest territorial extent,⁴ and in the following reign of Hadrian (131 A.D.) Galen was born. With many vicissitudes of favor and exile he practised at Rome and elsewhere. His early life was passed under the beneficent reign of Antoninus Pius, and that of the great Marcus Aurelius, whose friendship he is said to have enjoyed; but in his last days he must have witnessed the disgraceful scenes which marked the reign of the brutal and licentious gladiator Commodus, to whom he was physician in ordinary, and those of his impotent and infamous successors, when mighty Rome had already begun to totter toward the long-delayed collapse of its widespread power. Hence it is that after Galen we are to meet no great work in medicine, which marks its material progress, for more than a thousand years. So intimately are all the forces of civilization interrelated and interdependent that the history of no one division can be intelligently followed without the side-light which other parts throw upon it.

We see in Galen the culmination of the medical progress of the ancient world, and in the light he transmitted the new world, when

¹ De Morbis Acutis, Lib. III, Cap. IV.

² De Morbis Chronicis, Lib. II, Cap. VI (Amman ed.), p. 378.

³ De Morbis Chronicis, Lib. II, Cap. VII, VIII, p. 379-388. For a more complete review of the work of Coelius Aurelianus, especially in regard to diphtheria and angina, vid. Münch. med. Woch., 1899, XLVI, p. 1382.

⁴ Freeman: Chief Periods of European History.

it first began to emerge from the chaos of Rome's destruction, made its first feeble move toward a renewed growth in the development of medical knowledge.¹ I have several times had occasion to anticipate in this history the account of some of Galen's views, and it is not necessary here to review these. I have also had occasion to animadvert upon the great advance of the anatomical knowledge of the upper air passages displayed in the works of Galen, beyond that to be found in the works of his predecessors. It needs very little perusal of them to convince one of the enormous strides made in the anatomy of the human body since the days of Hippocrates, five or six hundred years earlier. From Celsus, one hundred years his senior, and from Aretaeus, perhaps his contemporary, we can derive only slight information as to the anatomical and physiological knowledge they possessed. They were evidently men of commanding talent, but their works which have been preserved are too meager for us to form much of an idea of their fundamental knowledge of the human body and its functions.

The Anatomy of Galen.—It is in Galen's writings, therefore, that we first gain an idea of the advance made in those departments of medicine by the Alexandrian School of Anatomists. It is significant of the influence exerted by the great libraries of Pergamos and Alexandria that the birth and early education of Galen are accredited to the former city, and that he acquired at least some of his knowledge in the latter.² It would have been manifestly impossible for any one man to have himself originated the discovery of one-tenth part of the new anatomical facts we meet with in Galen for the first time, although he doubtless is the real author of some of them, especially of those in regard to the larynx. Far inferior to the author of the best of the Hippocratic treatises in talent and in genius, but greatly surpassing him in accurate knowledge, Galen is contentious, prosaic, and tiresome to the last degree. I would recommend that those who love to indulge in medical polemics should, as a punishment to fit the crime, be compelled to read seriatim the extant works of Claudius Galen. It is, however, to these very personal qualities we are indebted apparently, not only for all the medical learning of his own times, but for very

¹ It is true that for seven hundred years his works were not read in Europe, but after Gregory destroyed the library on the Capitoline, that might be said of every other medical writer of merit. Under the Eastern Empire, during this time he was confessedly or secretly, with Pliny, the origin of all medical knowledge, but the first translations of Galen from Greek into Arabic, and hence into Latin, are in the eleventh and twelfth centuries, while direct translations from Greek to Latin did not take place until the fourteenth century.

² If, as it appears probable, Galen was not acquainted with the dissection of the human body, it would seem to follow that the practice of the Alexandrian School in the time of Erasistratus and Herophilus had not persisted to the time of Galen. This cessation, if it really took place, we may conjecture to have been due to the prevalence of indigenous Egyptian prejudice over the tendencies of Greek science.

much which we possess of that which existed before his birth in the works of earlier writers. This it is which has raised the medical works of Galen above all others in importance to medical science, greater even than those of the school of Cos. Had the latter not come down to us in their own form, we would still have most of them reproduced either literally or in substance by Galen.

The Intermaxillary.—Galen described an intermaxillary bone¹ in man. This apparent mistake was probably due to his observations on the skeletons of animals which he seems to have dissected much more frequently than man. It led many hundreds of years afterward to a warm discussion between anatomists. Finally, in the last century, Vicq D'Azir and Goethe definitely settled the matter by showing that traces of this intermaxillary bone are found in the skulls of children and in the fetus. This was one of the forerunners of Darwinism, a discovery of one of the suggestive facts which, with Goethe's *Metamorphosis of Plants*, formed the germ of the doctrine of Evolution in the animal and vegetable world, and of the Spencerian philosophy. It is a striking instance of the Spencerian philosophy. It is a striking instance of the necessity of a proper soil for the germination of any observation of nature. Had the old Greek and Roman civilization persisted a few centuries more who can doubt that the circulation of the blood² would have been known a thousand years earlier, or that the enlightenment which has followed the promulgation of the doctrine of Evolution would have been similarly antedated. Galen fully recognizes the nose as the beginning of the respiratory tract.³ He describes the muscles⁴ of the external nose as two in number, one on each side; for the dilatation of the nostrils, and he understood the distribution of the facial or hard part of the seventh pair of nerves to them.⁵

Nasal Anatomy.—Galen's description of the internal nose in the "De Instrumento Odoratus"⁶ reads as follows: "The nose having a median dividing wall has two conspicuous openings, one for each nostril, and each one of them is divided in the upper part into two portions. One of these divisions leads to the mouth and the other one upward so that it starts from the entrance and ascends to the brain itself. There are two hollow oblong offshoots of these (it?) toward it (these?),⁷ having their beginning from the

¹ De Usu Partium, XI, Cap. XX.

² After a careful perusal of much of the writings of Galen I am unable to grasp thoroughly the idea he had of the circulation.

³ De Usu Partium, XI-II. I make use chiefly of Kühn's edition.

⁴ De Dissectione Musculorum.

⁵ De Usu Partium, Lib. XVI, 3.

⁶ Kühn, II, p. 858.

⁷ Kühn's Greek text, from which I translate, does not seem to me to warrant the Latin construction which accompanies it. Neither the text nor the translation of Kühn are here felicitous. We must imagine that the text itself has been mutilated by ignorant and careless copyists, but Kühn's translation in making use of an unwarranted construction does not thereby elucidate the anatomical description.

anterior cavities, reaching to that part of the skull where the nose has its origin. At this point is the situation of the sieve-like bones (ethmoid), the function of which the name indicates, and the thick membrane (the *dura mater*) with which that of the bones is continuous, is pierced by fine openings. Through these first the thicker parts of the excretions from the brain are transmitted (the custom was started by Aristotle of calling such things excretions), for things more vaporous mount to the sutures and escape from it. The thick part of these, such as phlegm in coryza, is carried downward, having first passed through the *dura mater*. After having been strained through the sieve-like bones, it thus passes into the channels of the nose. There is a part runs into the openings of those channels heretofore mentioned which lead into the mouth itself; and the mucus, especially such as is viscid, part of it falling at one end into the channels leading into the mouth, the other part into the passages on both sides which lead outwardly, is blown forcibly from the nostrils and is hawked out through the mouth. A bloodless (*sic*) membrane, thicker than the skin, lines those straight passages of the nose leading up to the sieve-like bones, and likewise those other oblique channels which I have said end in the mouth. This membrane is continuous with that lining the circumference of the whole mouth, and covering the tongue, and in addition to these the pharynx, the larynx, the trachea, and the esophagus. To this membrane, which is one from the beginning and continuous, and in all the parts mentioned, has the appearance of the same substance, but has not the same thickness in all parts, certain small nerves are distributed, springing from the brain, except those to the tongue." This idea of the brain as the origin of the secretions of the mucous membranes of the respiratory and digestive tracts, as has been said, was due to the ignorance of the existence of the muciparous glands and to the absolute mental necessity of finding some explanation for the presence of the mucus. As we have seen, the idea is found in the Hippocratic writings, and it persisted for two thousand years in medical belief. The eyes and ears were also supposed to void their secretions through the lacrimal sac and the Eustachian tubes into the nose. He describes the trigeminus nerve¹ as sending filaments to the mucous membrane of the nose and palate.

The Functions of the Nose.—In order to show how closely, in spite of the gross errors as to the internal anatomy of the nose, Galen's physiology corresponded with what is orthodox doctrine in laryngology to-day, I quote from another work of Galen.² Although the first sentence or two has now become obsolete, the rest seems as though it might have been taken from a modern

¹ *De Usu Partium*, IX, 15. Lib. IX, Cap. XV, (Kühn) III, p. 743.

² *Ibid.* Lib. XI, Cap. XI, (Kühn) III, p. 886.

text-book of the nose and throat: "It has been said concerning the uvula, in the commentary concerning the voice, that it contributes to the strength and beauty of the latter, and both in an admirable manner, since the entering air first is divided by it and the force of its current is broken, and thereby that of its frigidity, so that some of those who amputate it at its base not only clearly injure the voice, but the increased coldness of the inspiration is felt, and many breathing this into the lungs and the thorax are thereby killed, so that it is not right to cut it off rashly, nor as chance would have it, but to leave some part of it at the base." "It has been stated before in regard to the perforations within the nostrils, how wonderfully the bone situated in front of the ventricles of the brain receives them, being similar to a sponge, and in regard to the passage of these into the mouth, which is in the palate, how it is arranged that the beginning of the inspiration is not directly into the trachea, but there is a certain deflection of it, as a curve, before the breath arrives in the trachea, which arrangement it seems to me has a twofold advantage: first, because the air surrounding us is at times quite cold and the lungs then would be chilled; and, secondly, because small particles of dust or of ashes or anything of this kind may not fall into the trachea. In this bend, indeed, the breath may be carried further, but small particles of this kind are arrested so that they first, at this turn, fall upon soft and wet surfaces which are somewhat mucilaginous and are thus able to retain those which fall. If any get as far as the mouth, they stick to the palate and uvula. An exemplification of this is what daily happens to those who wrestle in much dust, as well as to those who are on a dusty journey. In a little while they blow dust from their nostrils or spit it out; but unless the channels of the nostrils were first directed straight up in the head, and thence obliquely backward to the palate, and unless the uvula were there, it is evident that nothing would prevent everything falling into the trachea, for this sometimes happens when one breathes by the mouth. I have even seen many athletes beaten in this very way, because the dust being breathed in by the mouth, they are nearly suffocated. When, indeed, any inflammation or tumor is present or any other affection obstructing the nose, then they are compelled to breathe through the mouth; from which thing it is possible to know that the nose is first in order as an organ of respiration, while the mouth, if nothing affects the animal, is in no way the organ of respiration, but in certain cases mentioned is an aid to respiration, which all directly points to the fact, which I have urged at the beginning of every disquisition, that our Maker formed all these things with one end of His work in view."

The Voice.—Galen's book upon "The Formation of the Voice" has been lost. Doubtless, had this been preserved, we would have been able to find much of interest in it. As it is, we read

much concerning the external muscles of the neck,¹ and we learn that he distinguished twelve intralaryngeal muscles, *i. e.*, six pairs.² He described the cartilages of the larynx as three in number, the thyroid, the cricoid, and the arytenoid. He supposed the latter was a single cartilage. We have seen how Aristotle described the anatomy of the trachea. For him it was made up of entire cartilaginous rings superimposed one on the other; but Galen knew better, describing the membranous portion behind and recognizing its function³ of facilitating deglutition.⁴

He is somewhat confused in his description of the production of the voice, at least in the books which have remained to us; but it seems as near as possible to the proper explanation in an age when the vibratory movements of the air as well as its other physical properties were so imperfectly understood. He claims to have been the first to discover and describe the ventricles of the larynx, and he well understood that the glottis was the point at which the voice was produced, likening it to an ancient flute. He describes the vocal cords as a membranous substance so constituted as to resist the impact of the air and lubricated by mucus to prevent injury from the vibrations of a dry surface.⁵ "For it is pointed out there ("The Formation of the Voice") both that the trachea prepares and prearranges the voice for the larynx, and it being arrived there, they (the cartilages) increase it, and it is still further augmented by the vault of the throat which acts like a sounding board, the palate like a plectrum."⁶

He reproves those who think the voice is sent forth by the heart, but declares that the larynx is the instrument of the voice.⁷ He corrects Erasistratus⁸ for saying that the pulmonary vein, like the bronchi, is free of blood; the latter, he says, contains blood only when there is a tear, or an anastomosis with a bloodvessel, when it mounts to the pharynx and is voided.

We have seen that Galen, in a very qualified manner, was inclined to share the belief of his predecessors that fluids when swallowed passed at least to some extent into the lungs, and he seems to have believed that it is possible, by allowing medicaments to slowly melt in the mouth and by restraining the inclination to cough, for some of the material to find its way into the larynx and thus benefit those suffering from affections of that organ, which he often noted in actors, singers, etc.⁹ The drugs he commended for

¹ De Usu Partium. Lib. VII, Cap. XVII et seq., (Kühn) III, p. 588.

² De Musculorum Dissectione, XVIII, pars 2, p. 926.

³ De Usu Partium, XII, 3, (Kühn) IV, p. 6.

⁴ De Musculorum Dissectione, (Kühn) XVIII, pars 2, p. 926.

⁵ De Usu Partium, VII, 13, (Kühn) III, p. 560.

⁶ Ibid. Lib. VII, Cap. V, (Kühn) III, p. 525.

⁷ Placitis Platon. et Hippocratis. Lib. II, Cap. V, (Kühn) V, p. 240.

⁸ De Usu Partium. Lib. VII, Cap. III, (Kühn) III, p. 518.

⁹ De Compositione Medicament, (Kühn) XIII.

these troches are much the same as we use today. This was a favorite method of medication with Asclepiades. Perhaps it was for this reason that Galen declared that ulcers of the wind-pipe are easily cured. His explanation of speech was couched in almost the same words as that of Aristotle, saying that the voice produces vowels and the tongue, nares, lips and teeth form the consonants.¹

The Glands.—He seems to have appreciated the identity of the lymph glands in the neck with those of other localities, for he says: "There are around the pharynx and larynx certain glands similar to those in the mesentery, but these latter are small, and on this account are not commonly recognized, but those around the fauces and larynx are large and prominent."² This, of course, could only have been learned by careful dissection, and from the context we may imagine that he confused pathological with physiological conditions.

Galen³ quotes Marinus as saying: "The use of all the glands is twofold; (1) for they either support the deep vessels which are accustomed to be suddenly swelled (?) and undergo the dangers of divulsion on account of more rapid movements; (2) or they are able to moisten by the generation of humors the parts which are in need of viscid and widespread lubrication, lest easily becoming dry they may be unfit for motion. (And as for the other kind of glands which reinforce the vessels whose function it is to open (?), we will leave that for the time, as we have no use for it in this place.)"

Elsewhere Galen⁴ explains "that since the glands, which fill what space there is in the midst of vessels distributed to various parts, act as a foundation or support for this distribution, they are of no very great use to living beings, but nature out of its abounding provision has formed these glands as it has many other things."

Galen's⁵ reference to glands around the larynx and pharynx similar to those of the mesentery, may mean the thyroid and the tonsils. He refers in the same manner here to glands as elsewhere. This, quoted by Morgagni,⁶ I am unable to find in Kühn's Galen. Galen, or whoever is the author of the book, "De Voce et Anhelitu," says: "The neck, however, has two glands in which humidity is generated. But from these two glands which are in the neck veins are not given off in which the humor runs as in those which come from the glands of the tongue." Evidently the thyroid gland.

The Recurrent Nerves.—He vaunts his discoveries in the larynx thus: "Attend, therefore, especially to this exposition which I

¹ De Locis Affectis. Lib. IV, Cap. IX, (Kühn) VIII, p. 266.

² De Aliment Facultat. Lib. III, Cap. VI, (Kühn) VI, p. 673.

³ De Semine. Lib. II, (Kühn) II, p. 594.

⁴ De Methodo Medendi. Lib. XIV, Cap. XI, (Kühn) X, p. 982.

⁵ De Alimentorum Facultatibus. Lib. III, Cap. VI, (Kühn) VI, p. 673.

⁶ Morgagni: Adversaria Anatom, I, 26.

have in hand, because I was the first to discover it. None of the anatomists have hitherto known anything of these nerves (the recurrents), nor of those things hitherto mentioned concerning the structure of the larynx. Therefore, having turned your attention to that which is most to be respected, and having become a pupil worthy of the instruction about to be imparted, listen to the exposition setting forth a most wonderful phenomenon of nature."¹ This wonderful arrangement was the reflection of the recurrent laryngeal nerves around the vessels of the thorax; but when he proceeds to explain it on the principle of the pulley, so that they may approach the laryngeal muscles from below, his solemnity and impressiveness in preparing the wondering pupils for the great secret seems a trifle ludicrous to modern readers. However, no one has really ever succeeded any better in attempting to explain this anatomical phenomenon, though there have been many theories advanced since the days of Galen.

Elsewhere² he again claims that he was the first to discover and give a name to the recurrent nerves, those only being known to his preceptors which were near the arteries (pneumogastrics). In several places he makes the statement that chilling of the recurrent nerves during operations damages the voice, and he, therefore, advised against operations in this region during cold weather. He relates the case of a boy who was operated on for a struma, which was removed by evulsion, causing aphonia, due to injury of the recurrent nerves. In this connection it may be well to mention a belief of the old Greek philosophers, the origin of which Galen, in confuting with much prolixity, ascribes to Zeno the Stoic, it having been transmitted by Diogenes Babylonius and subsequently taught by Chrysippus.³ Cicero⁴ expresses it thus: "The trachea reaches from the lungs to the back part of the mouth through which the voice, taking its beginning from the mind, is perceived and has its origin." Galen says the Stoics reasoned thus: "It is evident the voice cometh from the mind. It is also evident it cometh from the larynx. Hence the mind is not in the brain." Galen demolished this sophism thus: "They will wonder when they hear the voice is produced from the brain, and much more after having heard that all voluntary motion is performed by the muscles. . . . For the muscles move certain parts upon which the breathing and the

¹ De Usu Partium. Lib. VII, Cap. 14, (Kühn) III, p. 567. For a discussion of this subject, with an interesting account of a modern theory, see *The Lancet*, 1893, I, p. 128.

² De Locis Affectis. Lib. I. Cap. VI, (Kühn) VIII, p. 48. According to Baas, Marinus (100 A.D.) discovered the inferior laryngeal nerves. He gives no reference.

³ Vid. Galen: De Placitis Platon. et Hippocrat., Lib. II, Cap. II, (Kühn) V, p. 215.

⁴ De Natura Deorum, II, 59: Primum enim a pulmonibus arteria usque ad os intimum pertinet, per quam vox principium a mente ducens percipitur et funditur.

voice depend, and they themselves in their turn are dependent on the nerves from the brain. If you surround any one of these with a ligature, or if you cut it, you will render the muscle to which it is distributed motionless, as well as the limb of the animal which has moved before the nerve was cut." Another evidence of Galen's familiarity with experimentation on animals in elucidating the function of the laryngeal nerves is to be found further on in the same chapter: "The bones being removed from the brain, or its ventricles in some manner compressed, immediately there is not only no voice or breathing, but the animal is at once deprived of all sensation and of all motion during the compression."

Humoral Pathology.—Galen adopted Hippocrates' idea, and thought health resulted from the proper equilibrium of the four humors, the temperaments, so called, resulting from the preponderance of one or more humors. He applied the four qualities to the four elements thus:

Water	Cold and wet.
Earth	Cold and dry.
Air	Warm and wet.
Fire	Warm and dry.

He applied to the humors the theory of the elements. Every disease is engendered by one of the humors or several combined. "The phlegm is an imperfect blood which may become true blood by the action of the natural heat of the body. In the phlegm water is abundant. It is cold and wet like water. It nourishes the brain and all cold and wet parts. It tempers the blood and aids the movements of the articulations." We thus see it has directly to do with the mucous and serous membranes. In its other ramifications the description of the applications of this doctrine is prolix and fatiguing. Its adoption tended to suppress originality of thought, just as any system always does.

I have detailed at considerable length the indications of the anatomical and physiological knowledge which Galen possessed of the upper air passages, not only because in his work we first meet with any considerable notice of such knowledge, but because this knowledge formed the basis upon which rested for more than a thousand years the superstructure of theory and practice, until, indeed, it received from Vesalius and his followers a rational criticism, and eventually a refutation of his doctrines of pathology. The abolition of the latter by the physicians of the Renaissance and later, was a boon to suffering humanity. It was one of the many fetters which bound the human intellect—may we never see its like.

As to other passages of interest concerning the nose and throat in the works of Galen, those treating of their diseases need not detain us long.

Anosmia.—We have seen the defects in Galen's knowledge of the anatomy and physiology of the nose, and hence we need not be surprised that he instances obstructive anosmia as a condition in which the air may pass through the cribriform plate to the brain without the odor—the particles of the latter being too large to pass through the perforations in the membrane lining the cribriform plate.¹

As a further illustration of the supposed entrance of the air or rather of the "pneuma" into the brain, he instances the case of a man who after forcible inhalation of an irritating substance into the nose, suffered acutely with headache referred to the frontal region.²

Polypi and Ozæna.—Galen seems to have divided diseases of the nose into two classes, polypi and ozæna—corresponding, perhaps, to the modern classification of hypertrophic rhinitis, including œdematous hypertrophy and polypi, and atrophic rhinitis including possibly syphilis, if it then existed. Elsewhere, however, among the Definitions³ (No. 371), he states that ozæna is a deep ulceration in the nostrils, emitting a breath of a bad odor, and says: "Sarcoma is the unnatural growth of flesh within the nostrils. Indeed, a polyp is a kind of sarcoma. . . . A sarcoma differs from a polyp in size and structure." His differentiation of nasal disease was, of course, very faulty. He gives a very large number of prescriptions, both of his own and others, for the so-called ozæna and polypi, but his therapy for these affections is decidedly inferior to that of Celsus. In the treatment of ozæna many compounds of iron or copper salts with honey, myrrh and other sweet-smelling herbs were introduced into the nostrils through tubes. Archigenes Asclepiades, Antipater, Charixenes, and many others are referred to by Galen as recommending these mixtures both for "polypi" and for ozæna. Oily applications, goose fat, calf tallow, and irritating medicaments like turpentine were also employed. A fuller account of this therapy may be found culled from Galen in Kassel's book, but as the differentiation of intranasal disease is entirely lacking in the modern sense, it would be a work of supererogation to repeat his extracts. There is no reference made to Hippocrates' method of removing nasal polypi. Considerable attention is given to epistaxis as a symptom of various general diseases, but not as much stress is laid upon this point as in the Hippocratic treatises. He, as did his predecessors, recognized the dependence of diseases of the larynx upon affections of the parts above, but they explained this by the assumption that the brain was the common origin of all catarrhs. We find in Galen abundant evidence of the influence of what I have called Chaldean medicine, the excrement of men and animals being freely used in throat inflammations. Bleeding

¹ De Usu Partium, Lib. VIII, Cap. VI, (Kühn) III, p. 636.

² De Instrumentum Odoratus.

³ (Kühn) XIX, p. 440.

from beneath the tongue was also a favorite remedy in all affections of the pharynx and larynx.

Varieties of Kynanche.—We have seen how Celsus and Aretaeus subdivided inflammations of the throat into kynanche and synanche. Galen refers¹ to the book of Prognostics of Hippocrates to prove that all these inflammations were at first called kynanche. Galen himself, while not disposed to increase the number of names, divides throat inflammations into five varieties. First, inflammation of the fauces. Second, difficulty of breathing with no inflammation of the fauces or swelling of the external parts. Third, when the region of the fauces externally is inflamed. Fourth, when the fauces internally and externally are inflamed. This all seems very nonsensical, but we must remember the influence of the school of pneumatists. Although Galen supplanted all schools, he was by no means himself free from the influence of many of their theories. Fifth, in both Galen and Hippocrates there is a description of a throat affection which Galen explained as a dislocation of the odontoid process of the axis vertebra. I am entirely at a loss to identify this affection, unless it was a postpharyngeal abscess. They both speak of it as an affection more or less commonly met with, and Galen created a fifth class for it.

Diphtheria.—If any doubts have arisen as to the correctness of the assumption that diphtheria was known to earlier writers, the following passage from Galen should set the matter at rest. It occurs incidentally in Galen's treatise on therapeutics.² "For thus the youth having an ulcer of the pestilential disease in the trachea regained his health, and others in the same manner after him. In another youth, about eighteen years old, a cold having gone on for many days, a little fluid blood came up after a cough—not much—but after this he coughed up some part of the membrane itself, which, having remained behind in the trachea, came up through the larynx into the pharynx and mouth. It seemed to me from the apparent thickness of it and from the patient's sensations, it came from the body of the larynx. Thenceforth the man's voice was injured, and this for some time, but he eventually recovered."

Iatros.—Thus far in making citations from the works of Galen I have refrained from quoting from "Iatros, or The Surgeon," a book usually included in the more authentic works of Galen. While the latter may have written the introductory parts, nothing can be more certain than that he is not responsible for the body of the work. Evidently it is the work of another and a much inferior hand. It is full of anatomical and physiological errors which Galen himself in his other works has refuted or shown that he did not share. Galen's great familiarity with Hippocrates would

¹ De Locis Affect., Lib. IV, Cap. VI, (Kühn) VIII, p. 237.

² De Methodo Medendi, Lib. V, Cap. XII, (Kühn) X, p. 360.

have prevented him from making the statement we find in the "Iatros" that if the nasal bones are broken they cannot be straightened. Galen in his "Commentaries on the Hippocratic Treatises," dealing with this subject, shows his perfect familiarity with the treatment of such cases.¹ We find also that the author, whoever he was, made the same distinction between *kynanche* and *synanche* as did Celsus and Aretaeus, a distinction which Galen, as we have seen, distinctly repudiates. He agrees with Galen in attributing great importance to the epiglottis as a protection to the larynx, but he fails to add any precept of caution to his mention of the operation of amputation of the uvula to which Galen attached such necessary physiological functions. He speaks of the tonsils as four in number, one at each side of the fauces, and one at each side of the base of the tongue, this being the first mention of the lingual tonsil. He used a sharp, narrow spatula to separate nasal polypi from the bone, and afterward shaved off the roots with a sharp knife. It is in this book that the assertion is positively made that Asclepiades actually performed laryngotomy in extreme cases of *dyspnœa*, but there is no comment with the statement.

THE GREEK WRITERS OF THE EASTERN EMPIRE.

And now begins that long and dreadful epoch in the history of mankind when civilization was almost overwhelmed in the slowly crumbling ruins of the Roman Empire. Julius and Augustus Caesar, in extinguishing the anarchy of the last days of the Republic, extinguished with it much of that burning fire, the love of human liberty, which has always blazed high in lighting the progress of civilization. Tiberius, Caligula, Claudius, Nero, Domitian spilled the best blood of patrician Rome and demonstrated the horrible evils of a despotism under weak and wicked men. Nerva, Trajan, Hadrian, the Antonines demonstrated the enormous but temporary advantages to mankind of a despotism under virtuous and capable rulers, but by the time they had passed away, the virtue, and the sense of responsibility, the power of initiative, had long since perished. Anarchy and ruin began to spread over the world, and the powers of darkness, oriental sorcery, the incantations of ignorant priests, the vulgar fanaticism of a nascent religion with all its superstitious dross, unrefined and unrestrained, held high carnival in the temples of science and the advance in the art of medicine ceased, and for many hundreds of years the best we can say of medical writers such as Oribasius, Aetius, and Paulus Aegineta

¹ Also in the *De Fascibus*: In the Basel Edition of Galen, 1586, VI, p. 299 et seq., may be found a number of wood-cuts illustrating in the most graphic manner the methods Galen describes for nasal bandaging, including those suggested by Hippocrates, Phalera, and Amyntas.

is that they copied with tolerable accuracy from the writings of others, intruded few of their own ideas, and the admission to their pages of incantations, the descriptions of amulets and cabalistic figures, the recommendations of Chaldean drugs are no more than the perusal of the history of their times should lead us to expect. Attempts were made to check this tendency toward magical therapy. Thus Serenus Sammonicus,¹ the elder, was put to death by the orders of the savage Caracalla (211 A.D.) because he recommended amulets as remedies for intermittent fever (Sprenkel). He or his son wrote a medical poem (Edit. Ackermann) in which, among numberless other remedies, he advised the application externally by friction of bull's grease or bear's grease to the neck in cases of sore throat, besides the popular prescription of vinegar as a gargle. Such remedies are still popular ones on every country hillside.

Constantinople.—Constantine founded his great city at Byzantium and moved thither the capitol of the world² (330 A.D.). Julian the Apostate, his grandson, in his attempt to revive the old pagan religion engaged also in the more laudable endeavor to resuscitate the learning of the ancients. Oribasius accompanied him in his campaigns in Gaul before his accession (361 A.D.) to the throne of Constantine, and to him was delegated the task of collecting and epitomizing the works of former masters in the art of medicine. The works of Galen are the chief sources from which he made his compilation, but unfortunately, unlike Caelius Aurelianus and Paulus Aegineta, and indeed Galen himself, Oribasius only reveals to us knowledge of the diseases of the upper air passages which is accessible to us at its source. There is scarcely a passage of any importance concerning the nose and throat which we have not already noted in the works from which this author drew his information.

It was in vain that Julian in his short reign attempted to revive ancient learning. Succeeding rulers of a groveling despotism, although themselves occasionally enlightened and virtuous, were unable to bring back the old free spirit which produced the age of Pericles and the era of Augustus. I may again quote the remarks of the sententious Gibbon: "The subjects who had resigned their wills to the absolute commands of a master were equally incapable of guarding their lives and fortunes against the assaults of the

¹ Serenus Sammonicus was a firm believer in the magical efficacy of the triangular arrangement of the word *Abacadabra* written on a piece of paper folded into the form of a cross, tied up in a piece of linen cloth and placed over the pit of the stomach, to be worn nine days, and then before sunrise cast over the shoulder into running water.

² Christianity began in Gaul in the middle of the second century, in the time of Galen, Lyons having the first church, and so rapid was the spread of the new faith that two hundred years later Constantine the Great found it to his interest to embrace the forms of Christianity as his ostensible faith and to free the church from taxation.

barbarians, or of defending their reason from the terrors of superstition." The Roman world was divided at its line of natural cleavage between the oriental and the occidental races of mankind. The Eastern Empire lived many centuries at Constantinople in the reflection of the light of the old world of Galen and Hippocrates, but it was around the western shores of the Mediterranean, as formerly along the coasts of the Aegean, that civilization was, after many hundred years, again to assume a new life and a new vigor. On the death of Theodosius (395 A.D.), the last great Roman emperor, the mighty fabric fell apart forever, and under Honorius and his equally impotent successors, after the death (408 A.D.) of Stilicho, the great commander, the Western Empire was deluged by the hordes of Goths and Visigoths, by the Huns and Vandals, and anything like medical learning utterly perished with the other arts from that part of the face of the earth. The barbarians were converted to Christianity, and their monks, in the search for means of saving their souls from eternal torment, found it necessary to study the Holy Scriptures. Their rude chieftains in their search for methods of legal procedure and orderly administration found it necessary to study the codes of Roman law. These circumstances finally brought about their familiarity with Latin and Greek literature. Virgil, Cicero, Livy, contributed to the amelioration of their manners and the expansion of their intellects, while Galen, Pliny, and Celsus eventually transmitted to them the seeds of medical science, which had matured in the old civilization, and had been almost lost in its annihilation. Cassius Felix was a medical writer who is supposed to have lived in the fifth century. His book,¹ as he confessed, was mostly made up of extracts from the earlier Greek writers. He thus speaks of what is apparently diphtheria:

Diphtheria.—"Ulceration of the fauces, if accompanied by acute fever in sickness, is found to be very bad and fatal, especially if it has begun with severity. There is moreover another inflammation besides the acute fever, which forms in the deep recesses of the mouth, white or black, or rather dusky gray patches, which they call tephros (ash colored). It is usually called by the Greeks, Aphtha, which we call 'coction' of the mouth. And it is worse, even deadly, in young nursing infants on account of the tender age."

There is no mistaking this blending of aphthous sore mouth with true diphtheria.

The Eastern Empire.—The Eastern Empire preserved the vestiges of Greek learning, all but suffocated by the sorcery and witchcraft which apparently have always found such a fertile soil beyond the Hellespont. Nemesisius, a bishop of Emesa in Syria, lived during the reign of Theodosius (376–395 A.D.) and wrote a book on the

¹ Cassii Felicis De Medicina (Edit. Val. Rose). Lipsiae, 1879.

"Nature of Man," in which the old critics, envious of the fame of Harvey, used to pretend to find the discovery of the circulation of the blood. In this book there is a chapter on the respiration, and in it we find the author describing the larynx under the name of the bronchus, and following Galen in saying it is made up of three cartilages. It is Marcellus, very aptly called "Empiricus," however, who best illustrates the condition of medical learning at this time. He was a Gaul, born at Bordeaux, and though a high officer of Theodosius and his son Arcadius, exhibits, as Sprengel remarks, the soul of a slave in his works, recommending certain remedies because they were used by the Diva Augusta or the Diva Livia. His work "*De Medicamentis*" is said to have been much mutilated by later editors. Chapter X deals with the diseases of the nose, coryza, polypus, ozæna, nose-bleed, or rather with their treatment; for few writers after Galen devote much space to anything but the transcription of multitudinous formulæ. We will not pretend to mention the innumerable drugs, but we note that he recommends the prescription of Pliny that a man whose nose stinks should kiss the nostrils of a he-mule, and if the patient is a woman she should kiss the nostrils of a she-mule. Besides drugs which are orthodox now, all kinds of stercoraceous applications are recommended. When the nose is bleeding it is helpful to say three times in the ear of that side some unintelligible jargon. However much we may have to criticise in Marcellus, there is one axiom which he lays down which is not always found in preceding authors and is often disregarded by his successors. In his chapter on affections of the throat, he says: "For a swelling of the fauces and of the palate everything used in the prescription should have no irritating quality;" but the very efficacious prescription which follows contains the juice of sour grapes—Sprengel surmises, because the Latin word *uva* means both grape and uvulitis; but we have seen that the juice of unripe fruits was a favorite prescription for this affection among both the Hindus and the early Greeks. This, however, is his incantation for pain in the throat, which he who suffers should sing to himself: "*Crissi crasi, cancrasi*—put the hand on the throat and repeat it three times."

Incantations and Amulets.—Besides the usual inevitable swallow prescription of the ancients we find also this remarkable modification of it: "This cure will help one suffering with chronic sore throat. You must shut up a live swallow in the cavity of an African shell and this being tied up in the linen cloth of Egypt, you shall hang it around the neck and on the ninth day you will be free of your trouble." And this is another elaboration of the swallow prescription apparently derived from Dioscorides: "But especially against synanche it is useful if you will take young swallows alive in the nest, and will burn these alive so that a powder is made from them (their ashes) on the day of Jupiter

in old moon, but look to it that you find unequal numbers¹ in the nest and that you burn as many as there are, and you will give this powder mixed up with warm water as a drink, and with the finger covered with the powder you will touch the place of the synanche from the inside. You will greatly admire this prescription." And then come some more incantations, long and involved. As an amulet some Greek jargon was to be written on a paper which was to be wrapped in linen and hung around the neck for a sore throat. Another mysterious formula was to be used in the same way for a bone in the throat. While I have not exhausted Marcellus' savory pharmacopœia in any of its branches it is understood, of course, that these selections are made from many others of a more rational nature which have not even the virtue of originality nor the interest which always attends the mysterious in therapeutics. Indeed, to do him justice, he only speaks of the incantations, as a rule, after mentioning many of the routine prescriptions which are found in the writings of an earlier and a happier age.

As we have seen, there was an interval of two hundred years (660-460 B.C.) between the introduction of written records into Greece and the birth of Hippocrates. This doubtless included that period when the record was engraved on the column of the temple of Aesculapius at Epidaurus of a sacred dog curing a cervical tumor by licking it. From the birth of Hippocrates to that of Galen, six hundred glorious years of medical progress intervened. We have seen the high state of anatomical knowledge revealed in the works of Galen. From the death of Galen to the time of Marcellus approximately another two hundred years had elapsed. The holy dog of Epidaurus finds a mate in the live swallow of Marcellus. "*Facilis descensus Averno.*" As illustrative of the times and as containing a matter of some interest to our subject, I again quote from a page of Gibbon (III, Cap. XXXVII). A war had been raging in Africa between the Arians who denied and the Catholics who upheld the Trinity. It resulted in the discomfiture of the latter (530 A.D.).²

"A military count was dispatched from Carthage to Tipasa; he collected the Catholics in the Forum, and, in the presence of the whole province, deprived the guilty of their right hands and their tongues. But the holy confessors continued to speak without

¹ *Terna tibi haec primum triplici diversa colore
Licia circundo, terque haec altaria circum
Effigiem duco; numero deus impari gaudet.*

—Virgil *Eclogæ* VIII, 73-75.

"For there's luck in odd numbers, says Rory O'More."—Sam'l Lover.

² The motto of the Church later, "*Ecclesia abhorret a sanguine,*" was hardly applicable to this period. Macchiavelli, referring to these African religious troubles in his *Istorie Fiorentine*, says: "*Vivendo adunque gli uomini intra tante persecuzioni portavano descritto negli occhi lo spavento dell' anime loro.*"

The men living then amidst such persecutions carried written in their eyes the terror of their souls.

tongues; and this miracle is attested by Victor, an African bishop, who published a history of the persecution two years after the event. 'If any one,' says Victor, 'should doubt of the truth, let him repair to Constantinople, and listen to the clear and perfect language of Restitutus, the sub-deacon, one of these glorious sufferers, who is now lodged in the palace of the Emperor Zeno, and is respected by the devout Empress.' At Constantinople we are astonished to find a cool, a learned, an unexceptional witness, without interest, and without passion. Aeneas of Gaza, Platonic philosopher, has accurately described his own observations on these African sufferers; 'I saw them myself; I heard them speak; I diligently inquired by what means such an articulate voice could be formed without any organ of speech; I used my eyes to examine the report of my ears; I opened their mouth, and saw that the whole tongue had been completely torn away by the roots, an operation which physicians usually suppose to be mortal.' " The operations now done for the extirpation of the tongue have proved that the tongue is not the indispensable organ of speech, but what would Galen or Aeneas say if they should now be shown that the larynx is not the indispensable "instrument of the voice?"

Aetius.—Aetius is said to have lived as a medical officer of the court at Constantinople about the middle of the sixth century. He was an Asiatic of Amida in Mesopotamia. After Oribasius, he was perhaps the best of those who transcribed the works of Galen and the older writers. There is a great deal in his works (*The Tetrabiblion*) concerning the nose and the throat, but very little we have not met with elsewhere. Uvulotomy and tonsillotomy and the incision of a quinsy are the surgical operations described. He warns against the dangers of secondary hemorrhage in tonsillotomy and directs that only that part of the gland which projects shall be cut off. If even a small portion of the normal underlying tissue is removed there is danger of hemorrhage. He was familiar with diphtheria and with adhesions in the larynx resulting therefrom, or possibly he refers only to the acute stenosis. Alum, nutgalls, mercury, besides bryonia, and many other vegetable and mineral astringents and emollient drugs are recommended by him. He fully equalled Marcellus in stercoraceous pharmacology. Incantations are less numerous perhaps, but not by any means absent from his writings. He recommends the use of forceps in extracting bones and foreign bodies from the tonsils. When they were in the gullet, the patient swallowed a sponge with a string attached to it, by which it was then hauled up. For this trouble he also advises the repeated swallowing of bread boluses. It is said the following is the first mention of the Saviour in medical writings:¹ "Moreover for the removal of those things which are

¹ *Tetrab. II Sermo IV, Cap. L.* Galen is said to mention the Christians in a book extant in Arabic (*Historia Anteislam Abulfedæ*. Ed. Fleischer, p. 109).

stuck in the tonsils, immediately take a seat in front of the patient and command him to harken to thee, and thou shalt say: 'Come out, bone' (if indeed it is a bone or a straw, or whatever it may be), 'in the same way as Jesus Christ raised Lazarus from the grave, and in the same manner as Jonah came from the whale.' Then seizing the patient by the throat, exclaim: 'Blasius, the martyr and servant of Christ, says come up or go down.'"

This must have been excellent treatment for *globus hystericus* among the faithful.

Shortly after Aetius, lived Alexander to whom the surname of Trallianus is given, he being one of the five talented sons of a citizen of Tralles. He was the brother of Metrodorus, the grammarian, and of that Anthemius who was the architect of the great church, now the mosque of St. Sophia in Constantinople, which was built (532 A.D.) by Justinian and his consort, the fair Theodora, the licentious Cyprian prostitute who disgraced even the stage of Constantinople before she sullied the much-stained purple of the Caesars.¹ Although there are many instances of thaumaturgy in his works, Alexander Trallianus practised at Rome with honor and profit, and was perhaps the most enlightened physician and the least tainted with superstition of any who had succeeded Galen, but while he has written chapters on the diseases of the nose and throat, there is nothing in them to especially arrest our attention. Of a very different character was Sextus Placitus Papiensis, who outstripped even Marcellus and Aetius in the use of the viscera of animals and equaled them in other departments of Chaldean pharmacology.²

Olfactory Nerves.—Theophilus, a colonel of the guard under Heraclius (610 A.D.), seems to have been one of the very few medical writers who, in copying³ from the works of Galen and others, troubled themselves with transcribing any of the anatomy or physiology or semeiology, of which they were in such need. Even he is very inexact. The teleology so prominent in the work of Theophilus is by no means absent from that of his great predecessor, Galen, but the former wishes to explain every function in a manner tending to the glory of God, and he remarks upon the use of the epiglottis in protecting the larynx, that if a crumb fall in it, owing to the lack of proper action on the part of the epiglottis, the patient is suffocated, which is a gross exaggeration of even Galen's remarks in the same vein. His ideas of the purposes of the Almighty in perforating the dura mater and the cribriform plate of the ethmoid would hardly be orthodox today, illustrating how dangerous are dogmatic statements outside of the domain of theology. The only advance over the ideas of Galen which I am able to note in Theophilus

¹ Gibbon: *The Decline and Fall of the Roman Empire*, Vol. IV, Cap. XL.

² *De Medicamentis ex Animalibus Liber*. (Aekermann.) Norimbergæ, 1788.

³ *De Homin. Fabric.*, Lib. III, Paris, 1555.

is the point to which several historians have drawn attention. He accepted the Galenic and Hippocratic idea of air inspired and excretions drained through the perforations in the cribriform plate. He also supposed that through the perforations go the odorous particles. It is perfectly evident that he recognized¹ "the first pair of nerves as starting from the anterior ventricles of the brain and going to the foramen of the nose on each side, on account of which the brain perceives odors," but as the presence of the nerve fibers in the perforations would be inconsistent with the idea of their patency, we must conclude that Theophilus knew nothing of the distribution of the olfactory twigs. As his was a text-book in the schools of the pre-Renaissance period, this interpretation would certainly have been recognized if justified by the text.

Neither the Pandects or legal reforms of Justinian, nor the virtuous reigns of Tiberius II and Maurice (578-610 A.D.), were of avail in arresting the degredation of the Empire of the East. Justinian abolished the philosophical school of Athens and the consulship of the old Roman regime, but they were long since become mere shadows which were brushed away without harm and without profit to the world. What barbarians had spared the suicidal fanaticism of the despicable Christian citizens of Constantinople, or their equally cowardly and incompetent rulers, destroyed. Even under the great Constantine, every manuscript that could be seized was forthwith destroyed if it contained anything of pagan learning.

Paulus Aegineta.—Under Heraclius, whose victories shattered the resources not only of the hostile Persian Empire, but the already faltering forces of his own (610-641), we note the last of the Greek physicians whose works it is worth while for us to review in our search for knowledge of the diseases of the nose and throat. We are indebted to Paulus Aegineta for much which he has borrowed from sources inaccessible to us in the original. It is frequently impossible for us to know how much was original with him.² At least, with the exception of Alexander Trallianus, he is almost the

¹ See the 1555 Paris edition. The Greek text is so antiquated that I am compelled to judge from the Latin translation of the passage which occurs at page 67.

Theophilus was one of the medical writers whom it was necessary to study and to teach at the University of Paris when it took its rise in the thirteenth century. (Sprengel.) It may be surmised that this choice was due rather to the theology than the physiology of his works.

² Dr. Francis Adams' Sydenham edition (London, 1844-47, 3 vols) of the translated works of Paulus Aegineta, which I follow, contains the translator's comments on the different subjects treated, and these consist mainly of citations from all the ancient writers on medicine, including the Arabians. No better work can be consulted for a review of ancient medical knowledge, although rarely there seem to be grave errors, and the citations do not usually guide one to the quoted sources in the texts of the originals. Unfortunately the text of Paulus does not accompany the translation.

only one after Galen whose works prove their author capable of any originality of his own. Living in the seventh century, he was probably contemporaneous with Theophilus.

We still find aphtha¹ in infants confused with the graver disorder of diphtheria. He says that the black variety of the ulcers is the most fatal.

As in many of the older writers there is in Aegineta a chapter (l. c., sec. 19) on the exercise of the voice, not only for strengthening it but as a general exercise of the body. After mentioning the operations for nasal polypi² which we have noted in Celsus and Galen, he remarks: "After the operation, having sponged the parts carefully, we inject oxycrate of wine into the nose, and, if the fluid descend by the roof of the mouth to the pharynx, the operation will have been rightly done; but if it does not descend, it is clear that about the ethmoid bones, or the upper part of the nose, there are fleshy bodies which have not been reached with the polypus instruments."

The Knotted String for Nasal Polypi.—Then follows the description of a barbarous method which, it seems to me, Paulus must have derived from a faulty reading or a misunderstanding of the sponge method of Hippocrates. Certainly nothing of the kind can be found in the Hippocratic treatises, as Adams in his comments intimates, but we shall subsequently find the Arabians sedulously following this plan. They apparently derived much of their knowledge from Paulus. "Taking, then, a thread moderately thick, like a cord, and having tied knots upon it at the distance of two or three fingers' breadth, we introduce it into the opening of a double-headed specillum (probe), and we push the other extremity of the specillum upward to the ethmoid openings, passing it by the palate and mouth, and then drawing it by both hands, we saw away, as it were, with the knots the fleshy bodies. After the operation, we keep the opening separate by means of a tent resembling the wick of a lamp."

As for tonsils³ he pulled them forward with a hook "and then we cut them out by the root with the scalpel suited to that hand, called *ancylotomus*, for there are two such instruments having opposite curvatures." He used a tongue depressor in this operation as well as in that of uvulotomy (l. c. sec. 31) but he adopts Galen's caution not to cut off too much for fear of injuring the voice and making the patient liable to inflammation of the lungs. If the patient refuses a cutting operation the redundant portion may be removed by caustics applied by a special instrument, called "*staphylocaustos*."

In his comments upon the operation of Antyllus for tracheotomy which I have quoted, Paulus makes it plain that he himself was

¹ Book I, Sec. 10, Vol. I, p. 14.

² Book VI, Sec. 25, Vol. II, p. 289.

³ Book VI, Sec. 30, Vol. II, p. 297

familiar with the operation, for he says (l. c. sec. 33): "We judge the wind-pipe has been opened from the air rushing through it with a whizzing noise and from the voice having been lost." In closing the wound he freshened the edges of the transverse incision and sewed the skin, but not the cartilage, the latter not being divided.

He follows Hippocrates in his treatment of fractures of the nose, (l. c. sec. 91). We miss all invocations, incantations, and amulets from the throat pharmacopœia of Aegineta, and he does not lay much emphasis on the Chaldean prescriptions, though they are mentioned with approval,¹ stercoraceous drugs and the swallow prescription being advised.

THE ARABIANS.

In pursuance of the plan of this book we must now devote an unusual amount of space to the rapid enumeration of the political events which shifted the leadership in science and medicine from the Greeks to the Arabians, events which are connecting links in the progress of civilization.

Greek physicians existed at Constantinople as long as the Christian religion flourished there, but while their works are of interest to the student of the phenomena presented by a dying civilization, they are of less interest to the historian of the progress of medical knowledge. Guizot,² speaking of Roman Gaul in the last days of the Empire, asserted that "The Library at Constantinople had a librarian and seven scribes constantly occupied, four for Greek and three for Latin; they copied the new works which appeared or the ancient ones which were degenerating. It is probable that the same institution existed at Trèves, and in the larger cities of Gaul." Notwithstanding periods of vigor exhibited by the Eastern Empire, notwithstanding, as Freeman declares, many of the Emperors were great conquerors and rulers who beat back their enemies on every side, and made conquests in their turn, although the last Constantine died a death worthy of the first, hopelessly battling for his empire in the breach of the city wall, notwithstanding all these things, learning did not send forth any new shoots, and Gibbon sums the matter up thus: "They read, they praised, they compiled, but their languid souls seemed alike incapable of thought and action." Finally, their political existence sank to the level of their civilization. The walls of Constantinople protected its feeble inhabitants, except for its conquest by the crusaders, for more than a thousand years after its impregnable situation had

¹ Book III, Sec. 27, Vol. I, p. 464.

² Hist. de la Civilization en France.

been selected and its defences constructed by the foresight and energy of the great Constantine. At last it fell (1453) before the conquering Turk, as falls every work of man, however wisely built or however stupendous, unless its bulwarks are the continued energy, virtue, and intelligence of the people who enjoy its protection.

We have seen how, five hundred years before the Christian era, the great kings of Persia drew their physicians from the Greek schools of medicine. The Alexandrian dynasties had long since passed away, and it is significant to note to how low a level Greek medicine had sunk among the bastard descendants of that noble race to find another line of Persian kings sending Arabian physicians to Constantinople to minister to the many bodily ills of some of the Greek emperors; but it was first through Greek physicians, through the exiles whom the fanaticism of the theologians of Constantinople had driven into Persia, that the Arabs received the first inoculation of the virus of learning. It was through the exiles driven by anarchy and the forebodings of impending ruin, as well as by its culmination that Italy first received the direct impetus from Greek sources which resulted in the Renaissance. From the Nestorians the Arabians not only absorbed profane knowledge, but from them the youth Mohammed on his caravan trips drew the inspiration of his religion. Not only the Nestorians, but still more perhaps the Jews, who taught their religion to both Christ and Mohammed, aided in this transfer of learning to the Arabians.

The Arabian Conquest.—Four years after the death of Justinian, Mahomet, the only son of Abdalla, was born at Mecca in 569 A.D. Heraclius, after his great victories over the Persians, was weighted down by age and disease, and his empire was exhausted by years of destructive warfare. Therefore the feeble races under the sway both of the Persian and of the Holy Roman Empire of the East were easy conquests for the sturdy Arab. The forces of nature are eternal, their laws immutable, and the results of their activity when surveyed over long periods of time and sufficient expanse of space, appear analogous even to the finite understanding of man. The expansion of the Mohametan crescent rapidly grew until in a period of less than a century from the death of Mahomet in 632 A.D. one horn rested in the fertile valleys of Spain (710 A.D.) and the other menaced the walls of Constantinople itself. The fanaticism which is easily engendered in the populations of Asia has made it the cradle of religions. The poverty and hardships of the human beings who struggled among the burning sands of Arabia weeded out the weaklings of the race and trained the endurance of the survivors to resist the effects of thirst, hunger, and fatigue, and when fired by the visions of Mahomet with the prospects of glory and power and with the hope of the indulgence

of libidinous passions both in this world and the next, they swept away the feeble civil power, and with it the babbling theological dissensions of the Christians of Africa and Asia Minor, crossed the Mediterranean and overwhelmed the Goths who had had time to be enervated by the luxury of the fertile plains of Andalusia and Granada.

But from the northeastern confines of the temperate zone in Asia, the Turks, having previously accepted the religion and despised the civilization of the followers of the Prophet, checked the advance of his race. From the northwestern provinces of Europe the Germans and Franks, unsullied by a religion which inculcates the righteousness of polygamy and human slavery, checked the advance of the Saracens at the mountainous line which separates the Spanish peninsula from the rest of Europe. Charles Martel with his stout heart and iron mace annihilated their army before Tours in 732, and eventually they were driven back beyond the Pyrenees to develop a wonderful civilization and to suffer from its luxury and the enervation of the climate, which after nearly eight hundred years made them a prey to the powers of Fredinand and Isabella (1493) grown to an effective force amidst the more arid and mountainous regions of Aragon and Castile.¹

We have cause to be grateful not only that the victories of Mahomet produced empires which protected science and letters at Bagdad, Alexandria, and Saragossa, but because they shattered the belief of large numbers of European mankind in the vain and presumptuous claims of the Christian ecclesiastics to a monopoly of the favor of heaven, and so perhaps did something to start the idea that the abodes of bliss are not exclusively a private park for the priests and their friends. At any rate they must have suggested the idea that images and relics were as little efficacious in ensuring victory as the gods of the pagans over whose destruction the early Christians gloated.

The Destruction of the Alexandrian Libraries.—Julius Caesar had first, by the accident of war, caused the burning of the Alexandrian library in the Museum. This was later replenished by Anthony in his devotion to Cleopatra, at the expense of the library at Pergamos. Four hundred years later Theophilus, the Bishop of Alexandria, destroyed also the library in the Serapion. His nephew, the saintly Cyril, followed him in the bishopric and added further laurels to the family fame by killing the fair Hypatia with a club. She was a learned pagan lady, addicted apparently to lecturing on theosophy. Finally the remnants of the books in Alexandria, which had survived the vicissitudes of a thousand years, were burned by the Arabians, when they were fresh from the barbarism of the desert, Omar

¹ The Arabs conquered Persia in the seventh, Spain in the eighth, and the Punjaub in the ninth century, and finally all India.

sending word that what was not contained in the Koran was false and what was also to be found in the Koran was on that account superfluous. The great temple of the Serapion, the annex to the Museum, where science had flourished for centuries, with its splendid gardens of birds and beasts and its laboratories supplied with its instruments of precision, were destroyed by the fury, the folly, and the fanaticism of man. It has been denied that the Arabians found anything to destroy. However that may be, these fiery fanatics, intent on entering the gates of Heaven, filled with objects of sensual delight, suddenly developed such a love for material science as the world had never seen before and perhaps has not been familiar with since.

The Arabian Renaissance.—As Draper says, the Byzantines obliterated science in theology and the Saracens illuminated it in medicine. Vast libraries again were collected at Bagdad and elsewhere in Asia, Africa, and Spain. The works of Ancient Greece were translated into Syriac by the Jews and the Nestorians, both of whom, the former for denying and the latter for modifying the Catholic acceptance of Christ, had been persecuted and expelled from the Byzantine and Roman dioceses. A good deal of Chaldean medicine was introduced by them to the Arabs who were at first apt scholars in these matters. We have seen how its amulets and incantations and its filthy drugs abounded in the later Greek writers. With these things, however, astrology and the germs of alchemy were brought from the plains of Asia, and out of these aided by the traditions, if not the records, of the school of Alexandria the Arabs developed the great sciences of astronomy and chemistry. While they soon rejected with contempt the belief in incantations and amulets, they persisted in the use of stercoraceous drugs. Unfortunately for medicine they neglected the study of anatomy through the dissection of the human body. In this fact we recognize the influence of their religious scruples in preventing any material advance of rational medicine over the teachings of Galen and Hippocrates; for without this underlying study, medical science comes to a standstill and will ultimately perish entirely, however enlightened its votaries may be in other directions. Indeed, whatever may have been their contributions to other sciences, I confess, after reading something of Arabian medicine, to have been neither edified nor impressed. It would seem that in six hundred years they might have done more when we consider the six hundred years which elapsed between Hippocrates and Galen. We look in vain for any material advance in the knowledge of the nose and throat and their diseases made by the Arabs. It is to them, however, we owe the introduction into our pharmacopœia of the syrups and elixirs, so useful in affections of the throat as vehicles for drugs administered in them, which often derive from the vehicle an ephemeral reputation.

The Inferior Maxilla.—It will be remembered that Galen supposed the inferior maxillary bone was not a single bone, but composed of two halves. This error, according to Sprengel, was pointed out by Abdollatif, who made the discovery by examining with care one of the many heaps of human bones which were so plentiful in the days when religion was propagated with sword and fire; and this was almost the extent of their contribution to the anatomy of the head and neck. They were familiar with uvulotomy and tonsillotomy and the removal of nasal polypi by the barbarous string method of Paulus Aegineta, Mesua using horse hairs twisted into a knotted string for the purpose. Rhazes, also an early Arabian writer (died 923 A.D.), was familiar with these methods.

Tracheotomy.—Tracheotomy was known to them only from Aegineta's description of Antyllus' operation. Even Albucasis, a late (died 1122) and perhaps the boldest, certainly the most brutal, of the Arabian operators, knew of no one in his time who had performed it. He had seen a nurse girl who had cut her windpipe and who had completely recovered when he sewed up the wound. Avicenna (980–1036), the Prince of Physicians and the greatest of the Arabian authors, simply describes the operation according to Paulus, while Avenzoar (died 1161) went so far as to try it on a goat. Avicenna, and many others of the Arabian writers, showed they were practical observers in likening some of the nasal polypi to hemorrhoids and advising the ligature for them. In this they were followed by many of the writers of the Italian Renaissance and even of much later times. Avicenna, whose work was a text-book of almost exclusive authority during the later Middle Ages, describes the anatomy of the nose and throat in a very poor transcription of Galen. He gives, however, a very good description of the disturbances of olfaction, recognizing the two varieties, viz., obstructive anosmia due to nasal stenosis and the essential form due to some central brain lesion.¹

The Cautery.—The use of the cautery, carried to such great extremes by Albucasis, was a favorite remedy for all sorts of affections. Baas relates² how Mahomet, instead of resorting to a more spiritual and miraculous method, advised a friend suffering from angina that he should have an application made of the actual cautery. Johannus Mesua Damascenus advised³ the use of forceps for the removal of polypi and afterward the cauterization of their roots, or else the use of hot forceps, but if this method was impossible he used the horse-hair string. In this author we may find this remarkable recommendation for the cure of inflammation of the palate.⁴ "The second method of cure is the diversion of the cause,

¹ Edit: Venice, 1562, f. 581 et seq.

² History of Medicine, N. Y., 1889, p. 219.

³ Lib. II, De Aegritud. Narium, Cap. 6, Opera, Venice, 1589, p. 231.

⁴ Opera, Lib. II, p. 238. Lib. II, Sect. II—Summa 1, Cap. 2.

and this is performed in a manner which causes the trouble to shift its seat, in short rubbing of the ears and pulling them forcibly upward, and the painful stretching of them, and the application of cups to the opposite part. For these things raise the inflammation and bear it upward; and among those things which are useful in the elevation of it is that a handful of hair should be grasped in the hands and the patient told to keep silent. Then put thy feet on his shoulders and drag strongly on the handful of hair, until the skin is pulled up, for by such dislocation will the pharyngitis also be raised." These patients probably complained as do our own that their "palates were down."

Some confusion exists among the Arabians as to whether the dung of a white dog or the white dung of a dog, to be obtained by feeding him on bones, was the proper medicament in angina. The swallow prescription is always mentioned in some form.

In removing foreign bodies from the throat Janus Damascenus recommends, apparently as a variation of the sponge method we have noted in Aetius, the tying of a piece of half-cooked meat on a string and bringing it up after it is swallowed. Nearly all even of this sort of surgery may be found among the late Greek writers of the Eastern Empire.

Nasal Speculum.—Guy de Cauliac¹ refers to Haly Abbas using "un instrument appelé mirror au soleil" or in the Latin edition "speculum ad solem," for opening the nostrils in examining a nasal growth. On referring to the Latin translation of Haly Abbas by Michael de Capella in 1523,² it may be seen that the passages to which Guy apparently refers hardly warrant this rendering. In the work of Constantine the African, "De Communibus Medico Cognitu," which is said to be an abridgement of Haly Abbas, nothing of the kind is to be found. We may conjecture that Cauliac read the text wrongly or that he had access to others which are not now accessible to us; but at any rate it is evident that Cauliac had some knowledge of such an instrument. Indeed, the use of the cautery in the nose from the time of Hippocrates to the present presupposes the use of a tubular speculum at least.³

From the fact that the processes are occasionally multiple with a common base of attachment and the Greek conception of them was embodied in the name polypus or many feet, we find the medieval translations from the Arabic converting the name into the word "Scorpio." How accurately this expresses the Arabic word for polypus, I do not know.

Albucasis who used the cautery savagely for almost everything

¹ Edit: Nicaise, Paris, 1890, p. 328.

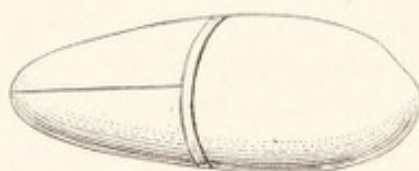
² Liber Totius Med., Lugduni, 1523. Liber IX, Cap. 32, f. 279, Col. C.

³ According to Cloquet the speculum of Guy de Cauliac, or Haly Abbas, is figured in L'Interpretations des Dictions Chirurgicales which Laurent Joubert printed at the end of his edition of the Grande Chirurgie de Guy de Chauliac, printed at Rouen in 1615.

and apparently often at random, recommends burning the skin beneath the eyebrows for a bad odor from the nostrils.¹ We may conjecture that this is related to the Libyan custom as related by Herodotus (l. c.). Some of the remarks of Albucasis in regard to operations on the nose and throat may be inserted here as interesting and illustrating somewhat the figures of the instruments taken from Channing's Latin version of his Surgery. The existence of these figures in the original manuscript was one of the forerunners of the introduction of wood-cuts,² which antedated the invention of Guttenberg. It must be confessed that Channing's Latin text of Albucasis does not clearly correspond with the figures which accompany it.

Tonsillotomy.—"And when glands occur in the throat similar to the glands which occur externally, they are called the two tonsils. When thou hast treated them with those things which I have mentioned and they are not cured, look and if the tumor is hard and of a dark color, of slight sensibility, do not touch them with the knife. And if it is of a red color and the base is broad do not touch it with a knife for fear of hemorrhage, but delay until it has ripened, for then thou canst perforate it or it will break of itself. But if it is of white color, round and has a slender base, this is the kind which is suitable and thou shouldst cut it. Thou shouldst examine before operation if the swelling has entirely disappeared or in what manner it has diminished. Then thou seatest the patient in the clear sunlight and takest his head in thy lap and openeth his mouth and taketh the instrument in thy hands which will depress his tongue, a concave instrument somewhat of this form

FIG. 6



(Fig. 6); thou canst make it of silver or of brass; it should be thin like a knife; with this the tongue is depressed and the swelling will be apparent to thee, and let thy vision fall upon it. Then thou shalt take a hook and fix it in one tonsil, and with it thou shalt draw it out as far as possible; but of course thou shalt not draw out with it any of the membranes. Then thou shalt incise it with an instrument of this form (Fig. 7). It is similar to a forceps except that the ends are curved and the edge of each is opposite the other and is very sharp. It is made from Indian or fine Damascus iron.

¹ Albucasis de Chirurgia: cura J. Channing, Oxonii, 1778, I, p. 35, Sec. XIV.

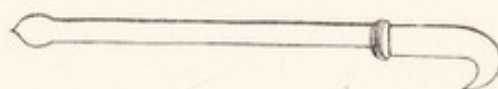
² The earliest wood-cut remaining to us dates from 1423, but there is ample evidence of the existence of the art long before this, in Venice and elsewhere.

But if this instrument is not at hand thou mayst cut it with a knife with this shape (Fig. 8)—sharp on one side, less so on the other. And sometimes other tumors than tonsils grow in the mouth. Thou wilt cut these out as thou doth the tonsils." (Liber II, sec. 36.)

FIG. 7



FIG. 8



A Postnasal Tumor.—In short, they were to be cut out with scissors or a sickle-shaped knife. Then follows the very interesting report of a postnasal growth. "Once I treated the tumor of a woman which had grown in her throat. It was of a dusky color and not very sensitive. The woman was almost strangled, and from the constriction of the passage breathed with difficulty, and she was prevented from drinking or eating anything, so that she was reduced almost to the point of death, and she had been in this condition a day or two. The tumor so projected forward that two branches of it protruded from the nostrils. Therefore with the greatest promptitude I hastened to fix in one of these a hook and dragged on it, and that whole portion was pulled forward. Then I cut it off where I had pulled it out at the nostrils. Then I did the same for that which projected on the other side. Then I opened her mouth and depressed her tongue. Then I fixed a hook in the tumor itself and cut off a part of it and only a little blood came from it, and the throat of this woman was free and she immediately drank water. Then I offered her some food. I did not cease to cut pieces from this tumor for a long time, but the new growth filled the place of the excised pieces until her patience and my own were exhausted. Wisely then did I act, and I cauterized the tumor up in the back of her throat and thereupon it did not recur. Then the woman left me and I know not what God did with her after me." These quotations, as literal as possible, from Channing's deplorable Latin, will indicate the manner of man this modest Arab was, and better than words of mine will portray the state of laryngological practice among the Arabs. It may be profitably compared with the procedures of Hippocrates in cases of nasal polypi, in order to realize the backward steps taken in 1500 years. Albucasis describes about the same methods of treatment for uvulotomy, following the injunctions of Galen. His directions for removing foreign bodies are much the same as those of the later Greeks. His remarks on laryngotomy I have referred to above. Love of the hot iron and dread of the knife characterized Arabian surgery, and they seemed more afraid of drawing blood than of inflicting atrocious pain. In all this we behold the result of defective anatomical knowledge.

And these were the votaries of science who guarded the portals of medicine for six hundred years. In other departments doubtless their achievements were great, but despite the great debt modern civilization owes to them, medical knowledge languished and we have only to be thankful that it did not entirely expire, that it was not wholly given up to amulets and charms and stercoraceous drugs, that mysticism and the occult, which we still have with us in the Faith Cure and the Mind Cure and all that foul brood of Darkness, did not in this period of weakness, when anatomy had perished entirely, overwhelm the Art of Medicine as it did in India. The spectre Orientalism still haunts us. It is a vague disembodied spirit, but it is the ever-present foe of civilization.

For several centuries it was through the Arabs only, or perhaps it is better to say, chiefly, that Europe knew anything of the medicine of Hippocrates and Galen, but when the better editions of the early Greek writers came into the possession of the Italians, it was soon perceived how gross had been their rendering of them.

THE PRE-RENAISSANCE PERIOD.

To the superficial reader of mediæval history the causes of the Renaissance may seem mysterious and puzzling. It requires, however, only a moderate amount of reflection and study to understand that the infusion of the vigorous new northern blood into that which flowed in the veins of the old races, dwelling around the Mediterranean, produced a new and, from the cross-breeding, a more vigorous race of men. Amid the ruins of Rome, ignorance, superstition, and fanaticism, the interminable wars, the terrible devastating plagues had induced a groveling misery and a poverty, for many ages foreign to the sunny slopes of the Cis-Alpine hills and fertile valleys of Italy. The primeval forces of Nature thus working through evolutionary laws again produced in this garden spot of the world a race of men from which the weak in body and mind had been weeded out. The soil was ripe for the seeds wafted from other civilizations now rapidly approaching collapse.

Learning in the Middle Ages.—Darembert¹ does not succeed in convincing us that much, if anything, that may be called medical learning really was to be found in Europe in that period which lies between the deluge of the barbarians from the north and the introduction of Arabian science. The ruthless hand of Gregory the Great (Pope 590-640) had long since demolished the library on the Capitoline Hill which the munificence of Augustus had founded. His motto: "Ignorance is the mother of devotion," supplied then a sufficient defence as it now furnishes an ample

¹ Hist. des Sciences Méd., Paris, 1870, Vol. I, p. 277.

explanation of the deed. He himself was one of the most learned men of his times, but the intellectual treasures of the Ancient World had been lavished on his barbarian soul in vain. Some manuscripts, it is true, with other weaklings had found a refuge in the hidden recesses of the cloisters of sordid monks, who sought as eagerly for safety in this world as for Paradise in the next, but these manuscripts escaped rather through the negligence than the respect of the priestly rabble.¹ Famous schools, it is true, existed at Monte Cassino, Amalfi, Naples, and Salerno during the Middle Ages, but what their learning consisted of it is impossible to know. Professor Ordranax's elegant edition of the *Regimen Salernitanum* gives a hint of it in many places. We may easily form a picture of a circle of lusty, merry, dirty monks sitting around a rough table, and with beer mugs and drinking horns held on high roaring forth the refrain:

"Si tibi serotina noceat potatio vini
Hora matutina rebibas, et erit medicina."

Influence of Arabian Science.—The origin of the School of Salerno is unknown, but there is little doubt that such learning as there existed was derived through the Jews and possibly through other sources from the Arabians. It was there, or at Monte Cassino (1086), that Constantine, an African prelate, after a sojourn of thirty-nine years among the Arabians, where he is said to have been a pupil of Avicenna, wrote his plagiaristic works which he did not dare, and perhaps did not wish, to credit to the pagans, Hippocrates, Galen, Avicenna and Haly Abbas, from whom everything in them of value was miserably transcribed. By such means, at first secretly, then openly, the knowledge of the Arabs found its way into Europe through Italy and Spain, and this process was greatly facilitated by a few enlightened individuals, who, like Constantine, had spent their youth at the courts of the Arabian monarchs.

Averrhoes introduced skepticism, "*le flambeau de la science*," as some Frenchman calls it, to the Arabians and was duly hated by the Mahometan and Christian dogmatist alike, but this was a mere undercurrent in Christian Europe for a long time, too feeble to be perceived amidst the robust but groveling superstition of the times. Pope Sylvester II had been educated at Cordova, spoke Arabic like a Saracen, and had been elevated (999 A.D.) by the politics of the time to the chair of St. Peter as a creature of the Emperor Otto III. The influence of the Arabians on the

¹ Daremberg: *Hist. des Sciences Med.*, Vol. I, p. 256, quotes from a mediaeval author as follows:

Clerici nostri temporis potius sequuntur scholas Ante-Christi quam Christi, potius dediti gulæ quam glossæ: potius colligunt libras quam legunt libros; libentius imitantur Martham quam Mariam.

science of the Middle Ages may be strikingly witnessed in the *Inferno* of the pious Dante where Hippocrates and Galen are joined to the shades of Avicenna and even to that of the hated Averrhoes. (Canto IV l., 144.) There is a curious observation to be made casually in reading Kassel's excerpts from Averrhoes which gives one a hint of the mental vigor of the Arabian, who excited the execration of the churchman and earned a warm place in the *Inferno* of Dante for himself by his skepticism.

Speaking of the five senses, he declares that animals differ from men in the fact that some of them can smell without possessing the organ for that sense, this being the case with bloodless organisms. In other words, this free thinker, Averrhoes, accepted the testimony of observation even though it went against the Galenic and Hippocratic acceptance that for voice production we must have an *instrumentum vocis*, for smelling an "*instrumentum odoratum*." This is the essence of scientific thought, this is the spark that made the conflagration in Christendom later. It has taken nearly a thousand years to make it a familiar thing to scientific men that bloodless things, like some spiders, can smell with their whole bodies even though they have no nose, but Averrhoes stands alone in the Arabian civilization. If it had lasted longer he might have had associates. It is gratifying to be able to pick out even in our subject this live thing in the dead mentality of mediæval thought, one of the things that earned Averrhoes a place in Hell.¹

Influence of the Church.—Nevertheless, as Guizot says, it is difficult to imagine what would have happened after the downfall of the Roman Empire in Europe if the Christian Church had not been organized. It stepped in first as the handmaid and then as the mistress of the civil power, and thus, by furnishing some sort of authority, having its real foundation deep in the souls and superstitions of men, brought order out of chaos. It was Gregory the Great who was active in the destruction of learning in Italy, but who nevertheless was a great power of cohesion where all things tended to disruption. Gregory VII was the great Hildebrand who, when elected pope, substituted ecclesiastical for imperial tyranny, and in 1077 King Henry of Germany waded barefooted through the snow of the Alps to humble himself at the feet of the pope at Canossa. Again, the civil power gained the ascendancy under that liberal man of genius, Frederick II (1194-1250), king of the two Sicilies, who had imbibed much learning and freedom from superstition by his Arabian education and affiliations. He rendered the greatest service possible to the art of medicine by his decree ordering the dissection of the human body.

¹ For an account of Averrhoes and his works by a sympathetic critic, see Rénan; Averroes et l'Averroïsme.

Influence of the Greeks.—As has been said, Greek men of learning, rats from a sinking ship, flocked into Italy with their precious manuscripts from Constantinople, many coming before the crisis and many escaping at the final shipwreck in 1453. They found for themselves and their learning an asylum in Italy, where the great families of the Medici, the Farnese, the Este, the Colonna, the Gonzaga, enriched and enlightened for the most part by maritime trade, and urged by the influence of Petrarch, gave them a welcome and an enthusiastic reception which fanaticism had denied the Arabians. But Petrarch's welcome extended rather to other branches of letters than to medicine, whose practitioners he lashed with a fierce satire from which Molière later drew his inspiration. A hundred years before the fall of Constantinople, on hearing of the loss at sea of a vessel carrying a valued and a learned Greek friend, Petrarch's first thought was to inquire if perchance the surviving sailors had not saved some Greek or Latin manuscripts which might have been among his effects.

It has been noted that from the time of our first knowledge of the School of Salerno to this epoch medical learning was derived almost wholly from Greek sources through the Arabians. This pre-Renaissance period of perhaps 300 or 400 years includes Henri di Mondeville, Mondino di Luzzi, Guy di Cauliac, Arnold di Villanova, Petrus d'Abano, Brunus, and others, the first fruits of the seeds of learning of modern Europe from the old stock of Hippocrates and Galen.

Influence of the Crusades.—Even the most cursory review, such as this professes to be, of the salient influences in the spread of knowledge cannot ignore the crusades. As two thousand years previously the Grecian hosts are said to have attacked the walls of Troy, the holy city of Jerusalem was the scene of another furious onslaught of western brute strength on an eastern metropolis. Homer draws a more artistic and vivid but no more fearful picture of the sack of Troy than later historians drew of the capture of Jerusalem by the crusaders. Returning, if his thirst for blood and holy relics was not satiated, the crusader at least brought with him, as doubtless did the ancient Greeks, more enlightenment than he set out with. The survivors of the mighty hosts brought with them back to their homes not only the bones of the saints and the splinters of the true cross, but a broadened knowledge of men and things. The aggregations of such large bodies of men, under the necessity of acting more or less harmoniously, laid the foundation for the spontaneity with which various movements of European social, political, and religious activity subsequently occurred. Different nations and different conditions of men became, to some extent, mutually helpful in their various struggles toward liberty with that ecclesiasticism which had fattened on their estates and their temporal power during the absence, which the priests had urged upon them.

Italian Science.—"The eagerness with which the Arabians had collected the medical works of the Ancients hardly surpassed the zeal with which the Italians of the Fifteenth Century pursued the same course, and Cosmo Medici may be compared in this respect with Khalif Mamun, but let us mark the difference. The Arabians translated, they often even destroyed the originals, and their own ideas so permeated the results that they theosophized Aristotle, turned astronomy into astrology and made use of these in medicine. The Italians on the other hand read and learned. The true Aristotle eventually crowded out the Arabian;¹ out of the unaltered writings of the Ancients they learned their Science, Geography directly out of Ptolemy, Botany out of Dioscorides, the Science of Medicine out of Galen and Hippocrates."²

The Ancients not only supplied them with knowledge as they did the Arabians, but they inspired them with such a thirst for it that their own authority in science was soon destroyed, something which had never happened with the Arabs. The popes and the clergy in fostering at first these beginnings of intellectual life were conjuring up genii which in a few centuries were to rob them of all but a vestige of their power, riches, and veneration. It is this progressiveness which in medicine distinguished the European from the Arabian civilization.

Although the Greek physicians from Constantinople brought their language and their manuscripts, they themselves had perhaps directly little influence. Their scientific attainments were insignificant as compared to the Arabians. They were the unworthy custodians of the relics of a former civilization, the puny descendants of a once vigorous race. They were full of lies, superstition, and effrontery, and they imposed on the credulity of those still more benighted than themselves, if we are to believe what Petrarch says of them. "To lie like a doctor," he declares was a proverb in his day. This depravity is easily perceived in the counsels of worldly wisdom, which the pre-Renaissance medical writers scattered so plentifully through their works. Henri di Mondeville or Hermondeville in the frank discourse of his surgery is very amusing, but he, quite as much as Boccaccio (b. 1313) and later Benvenuto Cellini (b. 1500), displays the general disregard of ethical or moral considerations in his relations to his patients and confrères.

In the history of medicine, keeping step as it does with the history of civilization, it is a long, dreary stretch of a thousand years from the sack of Rome by the Vandals (455) to the fall of Constantinople by the Turks (1453), and even Sprengel, the most

¹ Guizot (*Hist. de la Civilization en France*. Edit. 16, T, 12, p. 182) asserts positively that the knowledge of Aristotle was not, during the Middle Ages, derived exclusively from Arabian sources. Alcuin did much in the time of Charlemagne to keep alive the acquaintance of the learned with the works of the Ancients.

² Ranke: *Geschichte der Päpste*, Bd. I, Cap. 2.

phlegmatic of historians, breaks into pæans of rejoicing when he arrives at the Renaissance. In medicine this properly begins with Berengarius, or Berengar del Carpi, but there is a pre-Renaissance period, to which I have referred above, which it will be interesting to glance at for information as to the nose and throat.

The School of Salerno.—Among the Salernitan verses from Prof. Ordranax's translation we may select "De Raucidine Vocis" or Hoarseness:

"Oil and raw apples, nuts and eels, 'tis said
With such catarrhs as settle in the head,
And leading to a long intemperate course
Of life, will render any person hoarse."

And the cure for it is

"DE REMEDIS CATARRHII."

"Fast well and watch. Eat hot your daily fare.
Work some and breathe a warm and humid air;
Of drink be spare; your breath at times suspend,
These things observe if you your cold would end."

"Si fluat ad pectus, dicatur rheuma catarrhus,
Ad fauces bronchus; ad nares esto coryza."

It is singular that, in quoting from the school of Salerno, we so frequently offer evidence of their convivial habits, snugly ensconced as they were in their cloisters sheltered somewhat from the stormy experiences so abundantly detailed in mediæval history. Johannus Platearius¹ (1225?) relates that his father cured a "certain Salernitan who was playing at dice, and suddenly felt that he was attacked by 'squinantia.' When he began to be suffocated and had showed the painful place with his finger, as he was unable to speak, my father, of blessed memory, a remedy having come to his mind, placed a wedge between the patient's teeth, and forced into his throat a piece of wood and the skin of the apothume was ruptured, and thus, blood flowing in great quantity, he was relieved."

"**Squinantia.**"—Apropos of this word "squinantia," we may note an instance of transformation through the vicissitudes of time, language, and translation from the technical Greek to the English vernacular. We have seen how in the time of Aretæus and Galen they were disputing as to the etymology and significance of the words kynanche and synanche (vid. pp. 67 and 86). How this word was translated into the Syriac and Arabic dialects I am not sufficiently versed in Oriental linguistics to know, but when it emerged into mediæval Latin it was "squinantia," a term unknown to classical Latin. In the English of Huxham,² not a bad example of a classical English medical writer of the eighteenth century,

¹ Jo. Platearii. . . . Practica Brevis. De Squinantia. In Practica Jo. Serapionis Dieta Breviarium. Venetiis, 1497, f. 176, b.

² An Essay on Fevers, to which is now added a Dissertation on Malignant Ulcerous Sore Throat. London, 1775.

we find the term changed into "squinzy," and from this to the familiar *quinsy* is but a step.

Gurlt (*Geschichte der Chirurgie*) quotes from Brunus de Longobardus, who ended his work in 1252, a passage by which we may see the inane confusion into which this old dispute of the Greeks had thrown their witless heirs:

"Nam hujus apostematis tres sunt species, quarum una dicitur *quinantia*—alia dicitur *sinantia*—alia dicitur *squinantia*." He tries to define the difference between these, but he leaves the modern reader in a fog, and there can be no better illustration found of the paucity of original thought and observation, and even of feebleness of imitation which is so characteristic of pre-Renaissance medicine. In the *Glossulæ Quatuor Magistrorum* the same differentiation is adopted by Rolando.

A still further example of obfuscation and pedantry may be obtained from the same source. Lanfranc was a surgeon who died in 1306, and this is his idea of the topography of the neck; it is untranslatable:

"Quidam tamen faciunt differentiam inter collum et cervicem; gulam et guttur; quæ tamen omnia sub colli nomine comprehenduntur multotiens. Intra collum et gulam ab intra locatur meri sive ysophagus—ex parte vero interiori versus gulam locatur canna pulmonis—super has duas vias et epiglotus ex tribus cartilaginibus compositus. (The epiglottis was the usual mediæval name for the larynx, 'canna pulmonis' for the trachea.) Guttur dicitur eminentia epiglotti; latus gutturis dicitur gula." Arnoldo di Villanova¹ (1285) speaks of "*squinantia*" as a throat inflammation "*inquodam folliculo quod est inter ysophagum et tracheam*." Going back to the first of these writers, who drew their knowledge principally from Arabian sources, we look in vain through the ponderous tome of Constantine the African (1015-1087)² for anything varying from Hippocrates, Galen, and Avicenna except in the obscurity of diction and the misapprehension of its sense. It is largely a catalogue of drugs, including, for the throat, the swallow prescription and the usual line of stercoraceous remedies. The same may be said of Gariopontus (1040). They were Salernitans and the school had then been in existence, for a time under the Saracens, for several centuries. It only formally went out of existence with many other old things in the time of the great Napoleon, but it had begun to decline even in the time of Roger of Parma (1230), and his disciple Rolando, who were the first writers in whom there is any evidence of originality, and this is seldom apparent.

Operation for Nasal Polypi.—From the text of Rolando³ we learn that for nasal polypi he at first purged the patient and then "Cum

¹ Opera, Edit., Lugduni, 1509, f. 166.

² De Morborum Cognitione et Curatione. In his: Opera Basileæ, 1536.

³ Glossulæ Quatuor Magistrorum. Edit. Daremberg, Neapoli, 1854, p. 129.

spatumine usque ad profundum evellatur et sagitella inscidatur." The sharp spatula referred to is evidently from Galen. The recommendation for the use of a saw may have resulted from the description of the use of the knotted string in the manner of a saw as described by Paulus Aegineta, just as the latter probably through imperfect manuscripts derived the string operation from the more rational and humane sponge method of Hippocrates. At least in some of the translations from the Arabian books reference to this "sagitella," usually in the way of comparative illustration of the knotted string method, may be found; but Sprengel¹ says that Rhases recommends the saw as well as the ligature for the removal of nasal polypi. Rolando seems familiar with the knotted-string method also, but nevertheless I imagine there is confusion here arising from the transcription.

Tonsillotomy, Uvulotomy, Tracheotomy.—Holmes refers to Roger and Rolando as having observed a neoplasm of the larynx. This, when we consider the general state of medical diagnosis in their day, seems very improbable. The passage in the "Glossulæ" to which he apparently refers does not seem to warrant that interpretation,² but it seems clear to me that enlarged tonsils was the condition the writer had in mind. The last sentence doubtless refers to tonsillotomy. Immediately thereafter follows the reference to the treatment of elongated uvula. For this he had a good deal of faith in an ointment, doubtless carried in the boxes of the peripatetic practitioners of the day, the quacksalbers. This salve was supposed to destroy proud flesh, and cause the growth of better. If no other remedy was efficacious the cautery was to be used as recommended by the Arabians and "Ypocras." He quotes Avicenna in a warning to be observed after uvulotomy, clearly derived in exaggerated form from Galen. The patient should not lie on his back, lest epilepsy, apoplexy, and paralysis should be caused. He also had reason to recommend as a gargle the water in which a fat hen had been boiled, a prescription which may be found in the Arabian works. Petrus d'Abano³ warns against incision of the trachea as dangerous and gives his puerile reasons for the opinion. Arnaldo di Villanova (l. c.) repeats the Arabian hair-pulling formula for relaxed palate, and the fat-hen prescription for sore throat. As for the ridiculous "Lilium Medicinæ" of Bernard Gordon, a teacher at Montpellier from 1285 to 1307, the title reflecting the stilted style of chivalry with which Cervantes

¹ Essai. . . . sur la Médecine. Paris, 1809-10, II, p. 337.

² Est autem quædam passio que nascitur in gula juxta epiglotum quod dicitur folium (?) que quandoque est una et quandoque sunt due carunculæ tenues et late et modus folii que tracheam arteriam et vocem impediunt; cum vero patiens aperit os ad loquelam, se elevant et foramen trachee arterie; cum vero os claudit, subsident, unde patiens vix potest formare aliquod verbum intelligibile. Que passio numquam curatur nisi beneficio cyrurgie.

³ Concil. Diff. Venetiis, 1522. He lived 1250-1320 A.D.

later played such havoc, this seems an utter annihilation of cerebration. Dyspnœa was supposed to be due to "weakness as in children on account of the debility of the nerves and paralysis, on account of spasm and many such things," he recognizes uvulotomy and hints at the advisability of tracheotomy in very desperate cases. The intractability of chronic hoarseness is expressed, however, in the tersest language, to which modern science could hardly add anything. "*Raucedo post unum annum non recepit curationem. Raucedo ex rheumate numquam curatur, nisi prius rheuma curatur.*" Platearius (l. c.) gave expression to the same opinion. All these authors shared the credulity of their age. In the records of sorcery, so abundant in the Middle Ages, the accounts of cries and coughs and barkings, especially among the hysterical recluses of the convents, were the symptoms of the convulsive spasms of the pharynx and larynx still occasionally seen, and perhaps, as Dupouy suggests,¹ prodromata of the more general convulsive seizures. The ignorant credulity of the age was extremely likely to cause the burning of these poor wretches.

But greater men had begun to appear and in Henri di Mondeville and Guy di Cauliac, his pupil at the University of Montpellier, we have evidence of advancing intelligence and knowledge, which manifests itself however chiefly by a better understanding and rendering of Galen and the Arabians. Their productions in their naiveté are amusing, in their form approach somewhat to the standard of good literature, and in their substance are valuable as giving an insight not only into medical knowledge and ethics, but also to a considerable extent into the spirit and general conditions of the time. There is also to be noted some improvement in the latinity.

Henry of Amondeville.—Henricus de Amondeville,² as he styles himself, declares in his Proemium that he set out to write his Manual of Surgery in 1306. This is just ten years before Mondino di Luzzi is said to have dissected in public the human body, and it will be interesting to note the advances, small but significant, in anatomical knowledge which are evident in the work of Hermondeville (for thus he is also called at times), over the state of it revealed in the citations I have made. He describes the olfactory lobes, not according to Theophilus, whose description was not noted until recent historians have brought it to light; but according to Galen as a part of the brain and the true organ of smell: "Just in front of these is a certain fossa which is between the two eyes under the upper extremity of the nose, where the said fossa begins." (He is describing the internal nose.) "The reason for the creation of this fossa is twofold: (1) That it may receive the superfluities of the brain, and that they may be expelled through it. (2) That in

¹ *Le Moyen Age Médical.* Paris, 1895.

² *Die Chirurgie des Heinrich von Mondeville,* edited by Pagel. Berlin, 1892.

it the air, carrying a sort of odorous matter, may remain quiet until it is taken up by the organ of smell. From the said fossa spring two canals toward the mouth and the palate through the ethmoid bone. The use of the said canals are threefold: (1) That when the mouth is closed there may be an inspiration of air to the lungs. If this were not so it would always be necessary to keep the mouth open. (2) By blowing forcibly through these the said sieve-like bone (the ethmoid) may be purged of its filthy viscosities. (3) That they may aid in the enunciation of letters."

The description of the external nose which follows is a little better, but while an improvement may be noted over his immediate predecessors, it may be easily seen how much inferior this is to the passage in Galen (vid. pp. 137 and 142), from which it has been taken, especially in the physiological part of it. The same remark applies to the anatomy of the throat. "From the stomach by way of the . . . œsophagus¹ there goes a membrane, which surrounds the whole mouth on the inside, and the proof that it comes from the stomach is that when a man is touched under the mouth (in the back of the mouth?) he immediately has a tendency to vomit. Extending into the mouth is the upper end of the œsophagus and the air passage which is called the 'canna pulmonis et trachea arteria,' whose opening into the mouth the cymbalar cartilage covers which is the third part of the organ which is called the epiglottis, *i. e.*, the nodule of the throat, which cymbalar cartilage rises up when a man talks and covers very loosely the food way, and when a man swallows food it is depressed and then loosely covers the tracheal artery and the food way remains open, wherefore unless at the time of swallowing it should cover the airway food would enter it, as often happens when, etc."

We meet also with the queer remark of Hermondeville that the flesh of the tongue is white in order that it may change the watery saliva into a color similar to itself. He repeats the mistake of Galen that the lower jaw is made of two bones. Among his therapeutics invocations are occasionally recommended. In all the writers before Vesalius epiglottis was a term applied to the whole larynx, and this and other anatomical terms, as among the early Greeks, were used in a bewildering way when they tried to describe the throat.

Gui di Cauliac.—We now turn to the great surgeon of the pre-Renaissance period, Gui di Cauliac,² and so far as the nose and throat are concerned he does not differ materially from his preceptor, Hermondeville. He speaks of the ethmoid bone as belonging to

¹ A stomachio mediante meri vel via cibi, vel ysophago, quæ sunt idem." Stomachus in classical latin usually meant the œsophagus, but was frequently loosely applied to the stomach, while meri is apparently an Arabian word adopted into the Mediaeval latin.

² La Grande Chirurgie de Guy de Chauliac—Composée en l'an, 1363. Edit. of E. Nicaise, Paris, 1890.

the frontal, which he calls the coronal. In it are the holes for the eyes and "les colatoires des narilles divisez par certaine addition ossue en forme d'une creste di geline a la quelle est planté le cartilage qui despart les narilles." (P. 41.) Although Gui has something to say of wounds of the nose and bandaging, he passes over its diseases very superficially, quoting Avicenna that the obstruction of the nose is "humoral, or fleshy, or crusty," the symptoms of which are the inclination to hawk, the impossibility of breathing with closed mouth, tinnitus aurium, nausea; in short, not a bad summary of lesions and symptoms, but not very specific. His treatment was the snuffing up of water impregnated with various mollifacient and astringent drugs. He recommends for this purpose also the urine of camels, having copied this, of course, from the Arabians, who, in their long and terrible journeys through the burning sands of the desert, not infrequently were compelled to quench their thirst with it and to perform their ablutions with sand. His account of the diseases of the mouth and pharynx are also merely repetitions of the medical writings of the Greeks and Arabians. He quotes from Mesua a description of a cannula for cauterizing the uvula, "in the head of which at one side is a fenestrum in which the uvula is engaged; and then through the cannula is introduced a hot instrument like a knife, and it is incised by cauterizing." He also follows the procedures the Arabs had adopted from Paulus Aegineta, for the tonsils and for foreign bodies, quoting Haly Abbas, that if it is a leech in the throat, give onions with vinegar, or pull it off with the forceps. In quinsy the following treatment was used after pus was supposed to be present. Quoting from the practice of his predecessors, he says: "The abscess having matured, they first try to incise it with a lancet, if it is to be seen, and the mouth is rinsed out with parsley or with some other of the usual detergents. If, however, it is so far within as not to be seen, it should be broken with the finger nail or by rubbing with something if possible." We are reminded of the rough-and-ready operation of the old Salernitan on the dice player. He refers to this remarkable procedure of Roger, which we have noted elsewhere for another purpose. "A half-cooked piece of meat should be taken and tied to a long, strong cord, and the patient should be made to swallow it, and while he is swallowing it, it should suddenly be jerked out with violence by the cord, and the abscess thus ruptured. The same may be done with a sponge." This was the way Aetius and the Arabians removed foreign bodies, but certainly there is no lack of originality in this for a tonsillar abscess. Through Avicenna he quotes Hippocrates' intubation process by means of gold and silver tubes for the relief of dyspnoea, reproducing the Arabian remarks upon tracheotomy. The same may be said in regard to nasal polypi and ozæna. "Of the ulcers which are in the nose, some are without superfluous flesh and others

with it. . . . One should not despise these ulcers of the nose, since as all say they lead to polypus, and polypus of every kind is pernicious." For them he recommends the process of Albucasis, the knotted cord, etc. "Split open the bone according to the four masters, and burn it."

Botium was the name in the Middle Ages for goitre, and they knew nothing better, according to Gui, than the use of setons for the surgical treatment of it—quite a fall from Celsus.¹ Goitre during these times, as is well known, was cured by the laying on of royal hands, and the patriotic partisans of the kings of England and France carried on an active and spirited warfare in quite orthodox fashion, as to the claims of priority of their respective monarchs.

THE RENAISSANCE.

The Influence of Maritime Commerce.—The removal of the papal court in 1305 to Avignon, where it remained for seventy years, gave Italy an opportunity to develop her own wonderful terrestrial and maritime resources and to lay a solid foundation for the development of civilization. For without wealth there can be no civilization, and wealth, as Spain gorged with the gold of the New World later demonstrated, does not consist of heaps of the yellow metal drained by conquest or superstition from other countries. In Italy the crusades and the religious devotion which made them possible had swelled the leaking coffers of the church in vain, but when the enterprise of commerce had made her merchants princes, the arts and sciences again blossomed along the shores of the Mediterranean. When we remember the foundations laid in the lives of Darwin, Huxley and Hooker in our own day by the knowledge acquired on voyages in her Majesty's service, we may understand the influence such maritime development exercised on the budding civilization in Italy in the fourteenth and fifteenth centuries. The sails of Venice brought not only wealth but enlightenment to her wharves.

The Genoese sailor, the son of a wool comber, had learned indirectly from the Arabs, whom his sovereigns were just driving out of Spain, that the world was round and he was fitting out his three ships to prove it, less than forty years after the fall of Constantinople had extinguished science in the East. The church had denied it. In the process of the suppression of the Pelagian heresy and the establishment of the doctrines of St. Augustine, the book of Genesis had become the reference hand-book for the cosmography as well as the cosmogony of the church. Supported

¹ It was not until 1443 that Thomas of Sarrano, afterward Pope Nicholas V, discovered a manuscript of the *De Medicina* of Celsus. Hippocrates was translated from the original about the same time.

thereby, we find the infallible Roman pontiff fixing the age of the world at 6000 years, while as he walked in the gardens of the Vatican, his sandals were grinding shells which the sea had left there a million years before. At first the hierarchy did noble work in fostering the feeble shoots of learning which began to appear, but later when the vigorous plant began to overshadow them they strove to destroy it, or rather to train it to grow as they wished, but in vain. It had outgrown their powers.

Petrarch.—Petrarch (1304–1374) ridiculed the ignorance of the physicians, and Boccaccio (1313–1375) exposed and laughed at the vices of the clergy long before anyone understood or attempted to invalidate the slavish compliance with authority which so degraded the human mind. Now, 500 years after Petrarch, we are only reminded that this mental slavery once existed by noting some remnants of it in the waste places of modern civilization, and these are the very localities in which modern scientific and political achievement had their beginning in Europe under the Arabians and the early popes.

The School of Salerno began as early as the time of Charlemagne and Haroun al Raschid during the Arabian Renaissance, and became the *Civitas Hippocratis* to which Richard of the Lion Heart and other great personages resorted in the search for health. By the end of the Crusades the Artisan Guilds began to be formed, family names were adopted, commerce and industry sprang up. The commons in the cities wrested their charters of freedom from their sovereigns in the twelfth century. The great Gothic cathedrals arose at Paris, Rheims, Rhouen, Strasburg, Amiens. Saint Louis (1226–1270) founded hospitals in Paris, and his confessor thought he was doing more by establishing the theological school of the Sorbonne which took his name. The school of Bologna, where Mondino taught, was started in 1119, and before the fifteenth century universities were flourishing in nearly all the countries of Europe, and all under the jurisdiction of the church.

Revival of the Study of Anatomy.—The Arabians, as we have seen, shrank in holy horror from the contamination of a dead human body, and the students of the School of Salerno, animated as it was by Arab influence as early as the eleventh century, studied the anatomy of the pig. Catholicism also proscribed the study of anatomy by dissection, and at that time the church represented all the public sentiment there was, but the enlightened Frederick II, while successful in his warfare with the pope, commanded (1224?) that a human body should be dissected at one of the schools at least once in five years, but after him the emperors kept no abiding power in Italy. The church in those stormy times could not be long kept from temporal power.

Mondino di Luzzi.—An edict of Boniface VII, published in 1300, again prohibited dissection not only in Italy but in all the countries

under sacerdotal authority. Nevertheless only a little time after this, in 1308, the senate at Venice decreed a body should be dissected annually, and in 1316 Mundinus di Luzzi, called the restorer of anatomy, being the professor in the University of Bologna, had the audacity to dissect two cadavers in public. Besides the importance of this record in the history of medicine it is also a suggestive indication of rising insubordination against papal authority, much weakened by the dissensions which, as we have noted, had removed the court to Avignon, and had resulted several times in the existence of more popes than one. It was also the servile beginning of freedom from the exclusive authority of the Ancients. Mondino did little more than open the thoracic abdominal and cerebral cavities and refuse to see anything not described by Galen. He says¹ the functions of the tonsils are "to gather the humidity which they generate for the lubrication of the trachea, and to fill up the space so as to make it level between the 'gula' and the epiglottis, and to act as a shield to the apoplectic veins" (the carotids). He gives the name *cooperatorium* (a cover) to the epiglottis, the latter name as usual being applied to the larynx, which is described entirely in the sense of Galen and with the same superficiality and lack of original observation we have already noted in other writers of this period. For nearly two hundred years apparently little advance was made in spite of the greater prevalence of the practice of dissection. Let us not be astonished at this, but reflect on the few men to-day who see at the autopsy table or under the microscope anything not set down in books.

Achillini indeed made some important discoveries (1463-1512) in other regions of the body, but the editions of his work are so rare and so wretchedly executed, I have had to depend upon the citations of subsequent authors. It was not until the study of anatomy became a passion with the princes of Italy, as it had previously been with the Ptolemies in Egypt, that the great strides noted in Berengar began. Under their protection the arts and sciences flourished, and the study of the anatomy of the human body by dissection wrought great changes in the practice of the Medical Art.

Berengar del Carpi.—Mondino is called the Restorer of Anatomy, but it is to Berengar del Carpi, who taught surgery at Bologna from 1502-1527, that we owe the actual demonstration of any considerable number of new discoveries. Although he avowed himself to be only the commentator of Mondino, he used the work of the latter principally as a text from which to elaborate his own more extensive and accurate observations.

In Benvenuto Cellini's entertaining autobiography we read his very uncomplimentary reference to Berengar as a charlatan and a

¹ *Anatomia—Restituta per Joh. Dryandrum. Marburg, 1541.*

mounteback, an impostor and a miser who made enormous sums of money out of his new mercurial cure for cases of the French disease, which according to Cellini at Rome was "molto amici di preti." We receive a hint of his experience with syphilitic cases by the error he was led into through his defective acquaintance with its laryngeal manifestations. He notes¹ the declaration of Zerbi that certain French singers have their uvulæ cut off that they may acquire a "grossam vocem," but he does not believe it, because he has seen those having no uvula who were hoarse and had the worst kind of a voice. Following Galen he had great respect for the physiological importance of the uvula. Notwithstanding that we have cause to remember, in reading the works of Carpi, the declaration of Aristotle that authority in science is the worst enemy of the advance of knowledge, and notwithstanding the bad stories related by the uncharitable Cellini, Berengar in his *Commentaries* and especially in his *Isagogæ* showed that he was an acute observer of anatomical facts. He thought when he noted the nasal muscles he had made a new discovery, but he was not bold enough to be sure of it in the absence, as he thought, of any knowledge of them by others.

Cartilages of the Larynx.—He declared, at first with some hesitation in the *Commentaries* (1521) and later more positively in the *Isagogæ* (1535) that the larynx is made up of five cartilages, the arytenoids or "cymbalar cartilage" being double, but like his predecessors he speaks of the larynx as the epiglottis, and uses the word *cooperatorium* as did Mondino. He says that he had cured patients with perforation of the trachea, but clings to the old belief that cartilage will not heal, "because," he says, "it is spermatic." He speaks of the substance of the "membranoso coopertorio" the epiglottis; "around this there is some fat, especially in the place where it is bound to the thyroid cartilage." Most writers referring to this passage agree with Morgagni in believing that Berengar observed the laryngeal glands abundant at this point, but after reading the text it seems to me more probable that he referred to the lymphoid material in the glosso-epiglottic fossa which we now call the lingual tonsil. He was the first to describe the thyro-epiglottic muscle. He was the first to describe the sphenoidal sinus, which he considered the source of catarrh, and he denied that the ethmoid plate was pervious to the passage of the cerebral fluids.

Sphenoidal Sinus.—He supposed this to take place through the sphenoidal sinus, because he noticed that in one case the nutrient canal of the bone communicated with the sella turcica beneath the pituitary body, which was supposed to secrete the cerebral fluid. So far as I see this was the first departure from the idea of the

¹ Carpi *Commentarii*. Anat. Mundini, 1521.

ancients, and was an attempt to adjust physiological theories to new anatomical facts, which finally after more than a hundred years ended in the demonstrations of Schneider. He not only noticed the sphenoidal sinus and conjectured that this was the route of catarrhal discharges, but he is said by Cloquet to have been the first to note the existence of the frontal sinuses. Berengar speaks of the lacrimal canal and of the passage of tears through it, explaining that this is the reason we are able to smell odoriferous collyria. Otherwise his anatomy of the internal nose is very superficial indeed.

The Revolt from Galen.—Some of the pre-Vesalian writers on anatomy strove to explain the countless variations they observed from the anatomy of Galen by supposing that men in those glorious days were not made in the same mould as at present. They had degenerated and altered in their structure. This has always been a favorite idea with the poets from Ovid down. It is embodied in the very word *descendants*, frequently lingers in the fond recollections of age, and even haunts the title of Darwin's famous book, who indeed has demonstrated the mutability of anatomical structure, but not in a manner to support the assumption of the anatomists of the early Renaissance, who made timid excuses for the originality of their own observations. One may easily see by this servile acquiescence in authority that it was not only the temporal and spiritual tyranny of kings and priests which enslaved the minds of men. It was the distrust of intellectual infancy, terror stricken at the thought of the loss of support, and guidance if they impugned the authority of their predecessors. No fear of papal excommunication and the burning fagots, no dread of being impaled and racked and hung and quartered was at the bottom of this faltering. How ineffectual these instruments of orthodoxy were when used may be comprehended by noting that this intellectual slavery, without the fear of fire here and hereafter, endured quite as long as did that spiritual and political subservience for the perpetuation of which they were employed.

Vesalius.—A few years before the death of Berengar (1550) the open revolt against ancient authority in anatomy was to appear. Vesalius was born at Brussels about 1515, just one year before that mighty ruler, Charles V, who had inherited half of Europe from his various ancestors, ascended the throne of Spain and four years before he was crowned Emperor of the Holy Roman Empire. A great man is Charles V in political history, and not less great in medical history is his physician, Vesalius. He became professor of anatomy at Padua, and taught also at Bologna and Pisa, before the emperor called him to his court. He made many an anatomical blunder himself, but it is to Vesalius that this fundamental branch of our art owes its modern development. He possessed that attribute of genius, which has been expressed by

Carlyle as the ability to see with one's eyes, and the inability not to believe what one sees. He declared that Galen had never dissected the human body, but had depended upon examining those of animals. He ridiculed the excuses which had begun to be made for the discrepancies in Galen's anatomy when compared with the results of dissection. He was much readier to believe in the fallibility of the ancients than that the structure of man had varied in a thousand years. It is very evident that as to the anatomy of the nose and throat Vesalius committed more errors than he corrected, but his persistent refusal to accept either Galen or his preceptors' word for that which his eyes taught him was false, his unwearied diligence, and boundless energy wrought great changes in anatomical research. He published his great work which would have been a worthy monument for the labors of a lifetime in 1542, at the age of twenty-seven. He insisted upon the greater value to be derived from personal dissection of the human body, a matter left to barbers and underlings by his predecessors and by many of his contemporaries, than by the continued perusal of the anatomical descriptions of the old Greeks and Arabians, and we find him declaring in bitter scorn of one of his preceptors, who had turned against him, that he would be quite content that as many strokes of the knife should be inflicted on him as he had ever seen his master practise on man or beast. (*De Radic. Chyn. Epistola.*)

For him, as for his predecessors, and for his successors for more than a hundred years, the secretions of the brain percolated through the base of the skull, but he denied that it found passage through the cribriform plate, following Berengar thus far; but he supposed that it went through the lacerated foramina. Nevertheless he ascribed to the perforations in the cribriform plate the function of transmitting air and odors to the brain,¹ urging the necessity² of combating the idea of Galen as to the exit of fluids through them. His old teacher, Sylvius, whom he tried to treat with deference and respect, loaded him with opprobrious epithets and scurrilous abuse for impugning the authority of Galen in this and other particulars.

The Olfactory Nerves.—While Vesalius recognized the mammillary processes as the seat of olfaction he did not ascribe to them the functions of nerves, overlooking the filaments which pass from them and calling the optic nerves the first pair at the base of the skull (*l. c.*, *Lib. IV*, cap. 3). We have seen that Theophilus had given a better account of them many centuries before, but his observation seems to have been entirely lost to view until revealed by the industry of comparatively recent historians. We may readily understand that the mind of man must necessarily find some

¹ *De Humani Corp. Fabrica*, Veneti, 1542, *Lib. I*, cap. 6 and 12.

² *Ad Joachimum Roelants Epistola*. In *Vesalius, Opera Omnia*, Lugd. Batav., 1725, *II*, p. 621-681.

explanation for the cribrous condition of the bone here, and it was quite impossible to banish erroneous speculations until a correct understanding was ready to take their place. Zerbi, who lived at the end of the fifteenth century, and met a horrible death at the hands of the vengeful and suspicious Turks now in possession of Constantinople,¹ described the filaments which the olfactory bulbs give off, but he regarded them as prolongations of the mammillary processes through which the cerebral secretions find their way into the nose. Most of the anatomists of the sixteenth century regarded them as too soft to be really nerves, but Achillini, who died in 1512, described their distribution in the nose.² Massa, who is said to have died in the same year as Vesalius (1564), wrote³ this in regard to them:

"Notwithstanding the learned and never-to-be-sufficiently-praised Galen, on an examination of the nerves springing from the brain, first at the anterior part where the substance of the brain is, which is called the mammillary caruncles, there are to be observed two soft substances, yet they are not so soft as is imagined, like to the form of other nerves, and they descend, without any doubt, to the nares, and are attached and distributed to the inner substance of the nostrils, for furnishing the sense of olfaction." Nevertheless he hesitates very much to give them the name of nerves, but is inclined to believe they should be so regarded in spite of their soft consistence, and he wonders that the anatomists do not name them as the first pair. Thirty years subsequent to this Varolus,⁴ in 1572, described them as nerves, and in 1627 Spigelius added them definitely to the other cranial nerves. "Septem his paribus quae vulgo sic recenscentur octavum addimus, quod nervos olfactorios constituit,"⁵ but even he did not follow the filaments through the cribriform plate. Indeed, even Schneider made the egregious blunder of not accepting them as nerves. Bauhinus,⁶ in his commentaries on previous anatomical works, in 1621, still followed Plato in the idea that odor is a vapor of the nature of fire, which

¹ He had been sent for from Italy to treat a Turkish Bashaw, who improved so much under treatment that the busy practitioner did not think it necessary to remain longer, but sailed away loaded with the gifts of the grateful patient. No sooner had he gone than the patient had a relapse and died. His relatives, believing Zerbi had poisoned him (or did they want his fees?), overtook the ship in which he had sailed away, brought him back to Constantinople, sawed his son in quarters before his eyes and then did likewise with him. This story explains in itself why the Turks had to send away for a doctor, as did the old Persians in earlier times.

² I have derived from Sprengel, Metzger (*Nervorum Primi Paris Historia*), Cloquet and others this account of the work of Zerbi and Achillini, as the originals are, for me, illegible.

³ *Epist. Med. et Philosoph.*, Venetiis, 1550, *Epist.* VI, p. 58.

⁴ Cloquet (*Osphresiology*, Ed. 2, Paris, 1821) gives a most exhaustive history of these nerves, as indeed does Metzger (*l. c.*).

⁵ *De Corp. Humani Fabrica*, Lib. VII, cap. 2 (*Opera*, Amst., 1645, I, p. 193).

⁶ *Theatrum Anatomicum*, Francofurti, 1605, Lib. III, cap. 7, p. 543.

ascends through the cribriform plate. Fallopius accepted the old doctrine of Hippocrates that vapors ascend through the sutures of the skull. These vapors Galen, as interpreted by Jacob Sylvius, believed to be separated from the coarser impurities in the lungs which were voided as phlegm, the vaporous portions ascending to the head. Thomas Bartholinus,¹ as late as the time of Schneider, although he places the olfactories in the category of nerves, does not recognize the filaments as penetrating the nasal cavity. He speaks of the sphenoidal antrum and of the hole in the sella turcica as evidence of the entrance of air and the discharge of the pituitary secretions from the ventricles through them, but he also allowed that secretions passed through the cribriform plate, and had the Hippocratic idea of vapors.

We must now return to the epoch of Vesalius. He led the revolt against Galen, but he had many followers in it. In a matter which much later was the source of a very important controversy he agreed with Galen.

The Intermaxillary Bone.—He plainly figures an intermaxillary bone.² In this he was followed by Fallopius and Columbus. In his comments upon the descriptions of the pharynx we find that he was as much bewildered as we have been, for he says, "*Ingenti nominum pelago fluctuamus.*"

"Glands" of the Throat.—We are, however, still somewhat at sea when we read his chapter "*De Faucium Glandulis,*" though we find some advance over the Galenic anatomy. I will translate literally: "There are three kinds of these glandules, one of which, near the root of the larynx, is situated at the sides of the *aspera arteria* (thyroid?) we have mentioned in the previous chapter. The second is placed higher than the larynx, since it is seen when we open our mouths in the space which exists between the foramina of the nostrils and the larynx, one glandule being placed at each side, form and characteristics very similar to a gland indeed. It corresponds very much in structure to other glands, but is much looser, and in this respect distinguished that it forms the saliva and moistens the *aspera arteria* and the *oesophagus* together with the whole extent of the mouth." It seems probable, from what follows, that he had observed the parotid gland, but had supposed it to be coterminous and identical with the faucial tonsil. His third kind of glands was apparently the cervical lymph nodes.

His reference to the cartilages of the larynx is rather amusing as indicative of his weariness of the clamor of those who believed anatomy better studied in the work of Galen than in that of the Almighty. We have seen that Berengar had already pointed out that there are two arytenoid cartilages. Vesalius repeats the assertion of Galen that the larynx is made up of three cartilages,

¹ *Anatomia*, 1666. *De Ossibus*. Lib. IV, Cap. 8, p. 495.

² *De Humani Corporis Fabrica*, Basel, 1555, Lib. I, cap. 9, p. 248.

but he asserts that when you take off the membranes of this region you will find there are two arytenoid cartilages, but for the sake of pleasing those who follow the old anatomists in enumerating the cartilages of the larynx as three in number¹ without describing them, he will consider this as a double cartilage. He defines the glottis as the space between the *processus vocales* and confines the word *epiglottis* to its present signification, correcting and criticising the errors and confusion of the pre-Renaissance and mediæval doctors in this respect, though he shared the error of Galen as did all those who followed him until the nineteenth century in supposing it is the *epiglottis* which prevents fluids from entering the larynx in large amounts.² It seems singular that Vesalius who dissected the human body should have ascribed to it the muscles elevating the *epiglottis* in animals,³ while Galen, whom he charges with having only dissected animals, fails to mention these muscles in man, in whom they do not exist. He thus added two muscles to Galen's category of twelve, describing them as almost round, having their origin on the internal surface of the hyoid bone and being inserted at the foot of the *operculum* or *epiglottis*. In regard to the uvula and soft palate he does not differ materially from Galen. He repeated the latter's vivisection experiments on the recurrent laryngeal nerve.

Neither he nor Berengar, nor indeed hardly any early anatomist of great note, escaped the charge of human vivisection. With Vesalius, perhaps, this hackneyed accusation gave rise to the story that in expiation of this sin he made the journey to the Holy Sepulchre, dying from shipwreck and disease on the return voyage in 1564. The latter fact seems well established, but whether he had been making an expiatory pilgrimage or not, at least for this purpose, seems very doubtful.⁴

Anatomical Plates of Vesalius.—As has been said, the time furnished a host of anatomists. None, however, surpassed Vesalius, despite his errors, and no anatomical work has ever been published before or since, equaling or even approaching the artistic merits of his magnificent plates, which to be appreciated must be seen in their original reproductions. Indeed, as Roth says: "In the illustrations lies the fiery stimulation and power of his anatomy." Of course as to accuracy there may be much to criticise at present, but even in this they were far in advance of anything hitherto seen. So striking are they, that they were at one time ascribed to the pencil of the immortal Titian, and undoubtedly they resemble

¹ It will be noted that Berengar speaks of the cartilages of the larynx as five in number. He included the *epiglottis* as we do and made the *arytenoids* two. Other anatomists, Vesalius among them, speak of the larynx as being made up of three or four cartilages, according as they regarded the *arytenoids* as single or double. Aristotle had said the *epiglottis* belongs to the tongue.

² L. c. Lib. I cap. xxxviii, p. 184.

³ Lib. II, cap. xxi, p. 304.

⁴ Roth, *Andreas Vesalius Bruxellensis*, Berlin, 1892.

the impress of his genius left upon his more authentic productions. The identity of the artist has never been established, a fact in itself suggestive of the unrivalled artistic development of the epoch when Titian (1477-1576) in his long life, or Michael Angelo, who died in the same year as Vesalius, might have traced their outlines. In Grimm's life of Michael Angelo we find it said that Colombo, who was older than Vesalius (1490-1559), made his friend, the great artist, whose passion was anatomy, a present of the body of a young negro for dissection. It was Colombo, who according to Sprengel was the first to give a good description of the ventricles of the larynx. He also experimented on the action of the recurrent nerves.

The Pulmonary Circulation.—Colombo is said to have antedated Servetus¹ in the discovery of the pulmonary circulation. Vesalius had made the mistake in the *Epitome of the Fabrica* of describing an internal constrictor muscle of the aperture of the nares, and in this error he was followed many years later by Thomas Bartholinus. Colombo denied this statement and showed that such a muscle does not exist. He in his turn made a mistake in describing the cartilages of the larynx as being of the nature of bone, having apparently noted the ossification frequently found in old people. This was corrected by Laurentius (or Dulaurens)² and Casserius.³ Colombo speaks of the superior maxillary bone as the *os ampullosum* on account of the sinus.⁴

Valverde, a Spanish pupil of Colombo, corrected Vesalius' mistake as to the muscles of the epiglottis, although his work is largely a transcription of the great *Fabrica*. Another Spaniard, high in favor which Phillip II, who obtained for him an important appointment in Sicily (1563), was Ingrassias, who was the first to describe the anterior ethmoidal cells and likened the structure of the bone to pumice-stone. (Cloquet.)

The Turbinated Bones.—Colombo and Ingrassias both described the inferior turbinated bones, but Casserius a little later (1610)⁵ described them all, and gave them their present name. There are, he says, hidden in the depths of the nostrils "oblong little bones which may be called spongy, and seem like the steps of a bladder,

¹ The first description of the pulmonary circulation was published by Servetus in his "Restitution of Christianity," 1553, and the same theory was contained in the MS. copy sent to Calvin at the end of 1545 or beginning of 1546. The reformer refused to return the manuscript and lay in wait for seven years to slay its author (Whittington). He burned him, but it is only fair to Calvin to say that he made no use of his great discovery.

² *Historia Anatomica*, 1578 (Trans. by Sise, p. 1179).

³ *De Vocis Auditusque Organis*, 1600.

⁴ In *Re Anatomica*. I have derived my extracts from this author, as well as those which follow from Ingrassias and Valverde, second hand from many sources, the originals not being at my disposal. Colombo was the friend, pupil, and successor of Vesalius in the chair of Anatomy of Padua, though apparently much older than the latter.

⁵ *Pentaesthesia*.

because one is placed above the other. 'Cuculla,' some call them I know not through what comparison, unless perchance they wish to liken the two superior to a hood which, however, I would rather compare to the Concha Veneris. Hippocrates not inaptly calls them sleeves. Turbines I would call them from their form and function. They are bones, not cartilages. Turbinated bones (Turbinata Ossa) they are rightly called. They are usually three in number, indeed this many at least always."

In the "De Usu Partium"¹ Galen asserts that the bone in this region would better be called spongy than like a sieve (ethmoid), the term applied to the whole bony structure of the internal nose by Hippocrates,² but as for the turbinated bones as distinct parts, neither Hippocrates or Galen, so far as I see, betray any knowledge of them. The illustrations Casserius gives of them are very poor. He alludes to the cavities of the turbinated bones, evidently meaning thereby the ethmoid cells. The use of the turbinated bones, he says, is to break the force of the entering air and warm it and cleanse it, which as to the nose, we have found in Galen. Bauhinus (l. c.) refers to these authors and says that the turbinated bones fill the cavity of the nose, and are liable to be eroded in syphilis, and he described the anatomy of this region in animals.

Anatomy of the Larynx.—A treatise by Fabricius³ in 1600 contains very good chapters on the structure and functions of the larynx, but in this he was later surpassed by his pupil Casserius.

The work of Casserius on the Organs of the Voice and Hearing is a most exhaustive and admirable disquisition on the anatomy and physiology of the larynx and ear, comparative anatomy of the parts being there very fully described and pictured in finely executed plates. He gives an elaborate description of the laryngeal muscles.⁴

Fallopian was a man of fine character and great originality of research, to whom medicine owes much. He was the first to separate the glossopharyngeal and describe it as an independent nerve, it having been previously, together with the spinal accessory, which Willis subsequently described, considered as a part of the vagus.⁵ He speaks also of the nasal recurrent branch of the fifth pair of nerves. He devotes more attention to the description of the ethmoid bone than does Vesalius. Besides his numerous

¹ Lib. VIII, cap. 7, Opera, (Kühn) III, p. 651

² De Locis in Homine, Opera, II, p. 101. De Carnibus, I, p. 424.

³ Fabricius ab Acquapendente. De Visione, Voce, Auditu.

⁴ Vesalius, Fallopius, Colombo, Casserius and the other early anatomists had very faulty ideas as to the actions of the intralaryngeal muscles. Owing to the complexity of their mechanism this is not to be wondered at. Indeed even yet there is much room for difference of opinion and discussion. I would refer the reader to Holmes' History of Laryngology and especially to his treatise on the Voice for a more extensive and accurate description of this difficult matter than I am able to give here.

⁵ Observationes Anatomicæ, 1561.

and valuable observations on the internal ear he describes the lacrimal bones and the lacrimal duct. Fallopius correcting Vesalius declared he was able to find the hyo-epiglottic muscle only in the ox. He gives a tolerably accurate description of the pharyngeal and palatal muscles. While Galen speaks of but one pair of muscles for the palate and fauces, Fallopius differentiates them into three pairs and Bauhinus into four. Vesalius and Colombo had followed Galen in believing the removal of the uvula has an injurious effect on the voice, but Bauhinus¹ reports a case in which it was entirely removed without causing any inconvenience.

It is to Bauhinus (l. c.) much in the modern nomenclature of anatomy is due, especially as to the muscles. Galen had named the digastric, but in Bauhinus we note the sternohyoid, the geniohyoid, the crico-arytenoideus posticus, etc. He also was very copious in his references to the works of others. He was accused of a lack of originality, but the care he took to quote his authorities, a thing seldom done before him except in the way of criticism, was perhaps partially the cause of this singling him out from others less conscientious. He adds a comment to the statement of Galen, in regard to some of the liquids in the act of swallowing passing into the larynx, which is an indirect criticism of some conceptions which still linger with us. "For certainly unless something flows along the walls of the air tube in affections of the chest, ecclegmata, syrups and tablets are prescribed in vain." Bauhinus' idea of the tonsils was the same as that of the previous writers from whom we have quoted. Even Casserius in describing the pyriform sinuses,² which he calls cavernulæ, ascribes to them the function of holding for a while a certain portion of the liquid on swallowing which by gradually gliding down the walls of the larynx keeps them moist and lubricates them. One must keep in mind the necessity of accounting for the normal moist condition of the mucosa in the absence of any knowledge of the functions of the racemose glands. Laurentius (l. c.) indeed speaks of having occasionally noted glands in the mucosa of the larynx, but their nature was evidently unknown to him and his contemporaries. I have thus far met with no mention of similar structures in the nose.

THE REFORMATION AND THE DIFFUSION OF MEDICAL SCIENCE.

We have seen the Roman Pontiffs in conflict with the temporal sovereigns of Europe. We have noted the Renaissance of learning and the great anatomical discoveries which it produced. The

¹ *Theatrum Anatomicum*, 1621, III, LXXXIII.

² For an extended history of the valliculæ and sinus pyriformes, see A. Rosenberg *Arch. f. Laryng.*, Berlin, 1900, Bd. 10, hft. 3, p. 419.

princes of Italy, and at first the popes, fostered the advance of original investigations in science, but Buckle perhaps includes them in his remark concerning courtiers. "They are a lazy and feeble race, who, from the frivolity of their habits, are, under ordinary circumstances, predisposed to superstition and prepared to believe whatever the wisdom of their fathers has transmitted to them." Their transient enthusiasm for anatomy would have led to little had it not become a serious pursuit at the universities. The Italian dukes were soon involved in the contests between the popes and the emperors, and in the rude conflicts of the times many of the petty courts perished, as did that of Ferrara (1598), the dukedom of the Estes, the shelter and for years the prison of Tasso. Under the roofs of these little palaces, the scenes of intrigue, murder, and tyranny, even in the shadow of the walls of the Vatican itself, there frequently existed a contempt for the tenets of the church, and so long as the innovations were confined entirely to the intellectual activities of the favored few, there was no interference with the immense strides made by them in the arts and sciences. Soon, however, it became evident that this progress was interfering not only with the temporal power of the church, but was undermining that spiritual authority among the masses upon which the former rested.

The Inquisition.—The papal bull of Clement VII (1542) named six cardinals for the more thorough exercise of the Inquisition in Italy. Among them was Cardinal Caraffa, its most zealous advocate. He became Pope Paul IV in 1555. Having failed in driving away the Spaniards, he began that policy in the States of the Church which quickly drove the sciences, and eventually the arts, out of Italy. "He frequently allowed days to pass by which had been appointed for the *Segnatura* or the *Consistorium*, but never the Thursday on which the Congregation of the Inquisition was assembled before him. . . . He gave it the gruesome privilege to employ torture also for the detection of accomplices. He lived and strove for his reforms, made laws, imprisoned, excommunicated and held *auto-da-fe's*."¹

Index Expurgatorius.—Paul IV originated the *Index Expurgatorius* in 1559. A hundred years after the discovery of a new world to which the persecuted might flee, one of his successors inaugurated his pontificate by the pursuit and arrest of Bruno, "not only as a heretic, but as a heresiarch who has written some things which concern Religion and which are not seemly." Seven years later (1600) they burned him as Calvin fifty years earlier had burned Servetus, both ecclesiastical adversaries being anxious to thus supply "that protection against error which the spiritual classes are always eager to afford." (Buckle.) The protestant believed

¹ Ranke's *Geschichte der Päpste*, Buch III.

in his own infallibility quite as firmly as his opponent believed in the infallibility of the Pope. When they could not catch a heretic they went out and burned a witch.¹ About this time (1580) Montaigne made the sententious remark: "C'est mettre ses conjectures a bien haut prix, que d'en faire cuire un homme tout vif."

Galileo did not think it worth while to be cooked for facts which could take care of themselves and could not in any event be long suppressed, but on his bended knees they made him (1633) renunciate the truth as he knew it. One soon grows weary of reading of such senseless brutality, and there is little consolation to be derived from the thought that many were burned who were quite as ready to kindle fagots for others.

Decline of Commerce and of the Arts and Sciences in Italy.—It was not only the Church desperately struggling to retain its influence over the minds of men which did much to drive original investigation in Science out of Italy, but it was the ruinous policy of the Papal court trying to fill its leaking treasury which mightily contributed to the same end. "It is well known that the art of printing flourished at Venice at the beginning of the sixteenth century, but through the regulations of the Curia it gradually dwindled into insignificance. They never ceased in Rome to forbid the publication of books." (Ranke, l. c.) Besides the more or less respectable motive of stamping out heresy, a more worldly and contemptible tendency was exhibited, which was not edifying to the Venetians. Books forbidden by the Inquisition to be published at Venice were issued from the presses at Rome owned in part by cardinals active in issuing the Inquisitorial restrictions. They laid their blundering hands on the delicate fabric of Italian commerce. Restriction of trade and an iniquitous, meddling tariff drove the sails of Venice and Genoa from the Adriatic and the Mediterranean, as it has kept our own from the Atlantic and the Pacific. What the interminable and devastating Italian wars at the beginning of the sixteenth century failed to do, the blind interference of the Church with the channels of thought and the channels of trade finally accomplished.

The Diffusion of Knowledge.—The very wars of Italy, with which indeed the whole of Europe was convulsed as an indirect result of the birth of new ideas, were themselves instrumental in carrying civilization and enlightenment to the benighted shores of Britain and the opulent cities of Flanders. The great Paré learned his anatomy at Paris from Sylvius, the preceptor and later the enemy of Vesalius. Although for several centuries the University of

¹ The executions of witches during six preceding centuries were probably not as numerous as took place during a single decade of the fifteenth or sixteenth centuries. After this the practice rapidly declined, being longest popular in Calvinistic Scotland, though the last witch was burned in Switzerland in 1782. Lecky, *History of the Rise and Influence of the Spirit of Rationalism in Europe*, Vol. I.

Paris had flourished and anatomy had been taught there, it was in the army of Francis I that Paré obtained that experience which led to the great services he rendered surgery. Vesalius, born at Brussels, taught anatomy in Italy, but following the wide travels and the extensive expeditions of the great Emperor Charles, he came into contact with all the civilized centres of population on the continent. Thus and through the channels of commerce were the knowledge and the new thoughts of the Italian Renaissance spread broadcast over the face of Europe. Thus was a welcome prepared at Paris, Oxford, and Leyden for the arts and sciences soon to be driven from Italy by dominant theology just as they had been more effectually driven from Alexandria and Constantinople. Learning, of course, was never entirely banished from Rome. "Out of all the academies which arose from year to year one or two were devoted to science, as, for instance, to botany, although without any results as to original research, but all the others, with singular names, devoted themselves to poetry and oratory." (Ranke, l. c.) After 1600 the arts also became mere dilettanteism. The soul, the spirit had flown and the ambition of the ecclesiastics and the nobles, directed by bad taste, led even to the lamentable devastation of the few remnants which had remained from the glories of Ancient Rome. One must not forget the services rendered the medical art by Baglivi and Sanctorius and the Italian school, but, in spite of these, the leadership in Medicine passed away from Italy at the close of the sixteenth century.

Leyden erected, in 1574, within its walls a university as a trophy of victory over King Philip and his mighty generals in the Netherlands. Amidst the barren hills of Germany, Luther absorbed from the instincts of his race that stubborn freedom of thought and independence of action which stemmed the tide of subservience to some of the doctrines and practices of the Church. Paracelsus, a drunken mountebank, but a great iconoclast and doubtless a great thinker, performed a like service for Medicine.

By the middle of the seventeenth century the temporal power of the Pope outside of the contracted states of the Church sank into insignificance. The various sects of theologians who had fallen away from the parent stem were, in the nature of their differences, so disunited and so hostile to the Roman Church, that they were impotent to stem the tide of knowledge which was rising. The Royal Society of London (1660), the Academy of Paris (1665), and similar institutions in Germany (1677) were founded and became the centres of scientific thought and learning.

In the part of medical history which now follows it will be noted that the chief names are those of trans-alpine origin. Harvey and Willis were the great minds which dominated medical thought in England in the seventeenth century, not forgetting the immense

influence wielded by Sydenham. Malpighi, born at Bologna and working at Pisa, upheld worthily the ancient glory of Italian medicine. Leeuwenhoek, Sylvius de la Boe, Van Ruysch, Boerhaave contributed the share of the newly emancipated Netherlands to the general fund of scientific knowledge gathered in this epoch. It is, however, to Conrad Victor Schneider, the learned Wittemberg professor, to whom especially rhinology, but other branches of our profession also, are indebted for rescuing the pathology of catarrh from the slough of Galen.

We must now trace in short outlines the epoch-making discoveries in medicine which followed the acquisition of anatomical knowledge in the Renaissance, especially those which directly affect our subject.

The Beginnings of Physiology.—Berengar in his time had begun the differentiation of the veins. A half century later, 1553, we have noted that the unfortunate Servetus had declared the existence of the pulmonary circulation of the blood. Before Harvey the idea was that the blood surged back and forth through the vessels, according to the irritation of the parts.¹ It was believed that inspiration drives the blood to the vessels and expiration brings it back to the heart. At first even the discovery of the valves of the veins did not put observers on the right track, for Cannani is said to have discovered as early as 1547 the valves in the renal and iliac veins, and, even more important, that in the azygos vein. Fabricius ab Acquapendente, who was fortunate in having had Fallopius for his teacher and Harvey for his pupil, together with Sarpi in 1574 discovered these valves in nearly all the veins of the body.

The Circulation of the Blood.—Harvey carried this knowledge home with him to England, and in 1616, the year of Shakespeare's death, he began to announce his great discovery in his lectures, which, however, was not published to the world until 1628.² In this great revelation he had not only been preceded, as we have seen, by Colombo and Servetus as to the pulmonary circulation, but there is no doubt that Cesalpinus, who died in 1603, the great botanist and the physician of Pope Clement, who burned Bruno, had some inkling of the systemic circulation.³ When we come to study the history of tracheotomy we shall find Brasavola, who died in 1555, declaring, as quoted by Holmes, that "in angina, when there is no other possibility of *admitting air to the heart*, we must incise the larynx below the abscess." With the other errors of the ancients this had existed in medicine since the beginning of its records. If we should translate the word *pneuma* as oxygen, the conception of the Greeks would, perhaps, not seem so strange

¹ For an exhaustive review of the ideas of the circulation before Harvey, see Daremberg, *Hist. Générale des Sc. Méd.*, Paris, 1870, Vol. 2, p. 582, ff.

² *Exercitatio Anatomica de Motu Cordis et Sanguinis.*

³ See Césalpino in the *Dictionnaire Historique de la Médecine*, (Dezeimeris) Paris, 1828, I, p. 656.

to us in very many of their passages. However inaccurate and impossible this rendering would often be, it would help us to keep in mind the kernel of truth buried deep in the erroneous ideas of Hippocrates.

Before Harvey had published his great work, Faber,¹ in 1624, had ascertained by investigation that not the smallest amount of air passed into the heart from the lungs. Harvey also pointed out that the air in the trachea does not pass beyond its ultimate subdivisions. Thus was this fundamental fact in medicine, so important especially to modern laryngology, established, after the usual period of resistance and discussion.

The Correction of the Error as to Catarrh.—Now let us immediately turn to the further elaboration of the history of the other fact so important to the development of our knowledge of the diseases of the upper air tract, viz., the existence of the mucous glands and their functions. We have followed the error of the origin of catarrhs down to the time of Schneider. Just as we have perceived the necessity for some explanation of the moisture of the surface of the mucosæ, so we may understand the influence of the growing improbability that fluid percolated through the bony foramina at the base of the skull. Berengar we have seen imagining a way for the catarrh through the nutrient canal of the sella turcica and the sphenoidal sinus. Vesalius, in spite of Sylvius, also refused to accept the cribriform plate as a true sieve, and found a way for the drain of the supposed secretions of the brain through the lacerated foramina.

The Olfactory Nerves and the Theory of Willis.—I have quoted Zerbi's idea that the processes given off from the olfactory bulbs were wicks for the drip of the cerebral fluids into the nose. Anyone familiar with the old process of making dip candles will understand the idea. Perhaps this was the germ, transmitted of course from Galen, of the idea of Willis,² whose works were contemporaneous with those of Schneider.

Willis and his school believed firmly in the existence of an actual nervous fluid, just as we find it convenient to assume the existence of a nervous electric fluid. The nervous fluid of Willis was the secretion of the brain. Some of this was received through the infundibulum by the pituitary gland, which he seemed to regard as a sort of reservoir for the superfluous fluid which was carried away by the bloodvessels. He believed the nerves were porous and carried this vital animal fluid from the brain to different parts of the body, supplying them with nutriment and animal force. He says:³ "Within the cavities of the nose there are tubular

¹ Sprengel: *Hist. de la Méd.*, Paris, 1815-20, IV, p. 174.

² *De Cerebri Anatome, cui accessit Nervorum Descriptio et Usus*, London, 1664.

³ *De Anima Brutorum. De Sensu Olfactus*, Cap. 13. (*Opera Omnia*, Amst., 1682, p. 64.)

membranes which contain thickly woven sensile fibers. In these membranes there are a number of slender nerves given off from the mammillary processes through the cribriform plate." He insists that, although the base of the skull¹ seems closed by membranes in the dead animal, the serum is so limpid and the nerves so porous that "nothing is more certain than that the serous humors are distilled from the nerves like serum from the membranes in swollen joints." This idea is again expressed in the "*Nervorum Descriptio et Usus*," where he derives the mammillary processes from the cerebral ventricles that they may there receive the serosities and transmit them through the olfactory bulbs to the nasal mucosa, which, from the supposition that it contained tubules, was thought capable of transmitting vapors and odors from below to the brain.

The Vascular Theory of the Nasal Glands.—It is probable that this erroneous idea and that of Van Ruysch, who believed that the bloodvessels had tiny openings through which serum is distilled but not blood, arose from the observation of the little beads of clear secretion which may be observed by the naked eye to exude from the mouths of what we now know are the racemose glands. We must follow these erroneous ideas far beyond the time of Schneider and then retrace our footsteps in order to follow the right path upon which the latter entered. Van Ruysch, whose "*Thesaurus Anatomica*" was published nearly fifty years after the works of Schneider, thus² speaks of the mucosa: "Nasal glands may be plainly seen here, since they are suffused with redness, on account of the fulness of the arterioles, and these are nothing except bundles of the extremities of the arterioles,³ moistening the nose, which so-called glands, in the live man as well as in the dead man, escape detection, but in the specimen are plainly demonstrated by our method" (*i. e.*, the injection of wax into the arteries). Diemerbroek⁴ preferred Willis' explanation to Schneider's, but modified it somewhat, believing the holes in the cribriform plate were filled by "nervous tubular membranes derived from the dura mater, which open into the fungoid flesh of the nostrils, which is attached to the spongy bones, and through these tubules mucus is transmitted from the ventricles of the brain to the fungous flesh in which they terminate. This is the reason that something may come from the brain into the nose, but nothing can go from the nose into the brain, since when anything ascends it is stopped by the arrangement of the ends of the tubules in the flesh." He declares that these tubules may be seen with the magnifying glass if the upper bone of the roof of the nose is removed. The tubules

¹ *De Cerebri Anatome*, Cap. 12, p. 142.

² *Thes. Anatom.*, VI, 3, Not. 2.

³ The idea of the glands in the mucosæ being a bunch of bloodvessels was a favorite doctrine with Bellini (1665) and the Italian School.

⁴ *Anatome Corporis Humani*, Ed. 1672, Liber IX, Cap. 7 and Lib. III, Cap. 8.

may then be seen hanging to it. He denied the assertion that these structures are nerves, and refused them a place as the first pair. A cold for some reason causes not only an increase in the cerebral secretions, but the contraction of the cerebral membranes drives it into the nerves. We find Caspar Bartholinus, the son of Thomas, in 1679¹ after referring to Schneider, still agreeing with the doctrines of Willis. Although Dionis² refused entire credence to the idea of Willis as to the porosity of the nerves, and entirely rejected the permeability of the ethmoidal foramina, he still ascribed to the sutures of the skull the function of permitting the transpiration of the vapors which arise from the brain and its membranes. He also believed that they permitted absorption of external medication through them to the organs within the skull. Bryan Robinson, and especially Nicholas, in his treatise on Hypochondria (1719), finally entirely refuted the opinions of those who believed with Willis that the nerves were hollow channels, and called in doubt the existence of the fluid which was supposed to be carried through them.³

The Acini of the Glands.—To understand the persistent hold this idea, in the face of Schneider's work, had on the medical mind, we must remember that Hippocrates looked upon the brain as a gland, and the whole fabric of his system was permeated with this belief. It persisted even with Malpighi, who did so much with the microscope, demonstrating not only the red globules of the blood (1661), the air vesicles of the lungs, and many other phenomena, but the hollow nature of the acini of the conglomerate glands. Malpighi's friend, Carolus Fracassatus, writes to him thus concerning the brain:⁴ "I think it is a pneumatic instrument which is an aid to movement and sense through the nerves—air ascends through the nerves to the brain. In Malpighi's response to this letter it is evident that he knew nothing to the contrary. On microscopic examination of the cerebral ganglia he declared their structure to be glandular in character. Glisson, who also did so much to advance the knowledge of the viscera, and many others, had the same idea. Wharton refused to accept this view, though he believed the nerves acted as channels for the transmission of fluids."

The Predecessors of Schneider.—Notwithstanding the prevalence of all this error even among the very men who were gradually working out the truth, long before Schneider, we may recognize the advent of the conceptions which he founded as fact by actual observation. I am indebted to Sprengel (III, p. 280) for this quotation from a work first published in 1546:⁵ "Moreover Cardanus suggests that the mucus which runs from the nose and

¹ Thomæ Bartholini, *Acta Medica et Phil.*, Hafn., 1680, V, p. 61.

² *Cours d'Anatomie*, 1701.

³ Sprengel, V, 172.

⁴ Malpighi: *Epistola Anatomica De Cerebro*. In his *Opera Omnia*, Lugd. Batav., 1687, II, p. 113.

⁵ Cardanus: *Contradic. Med. Lib. II*, tr. I, Cap. 4, p. 443.

mouth does not really come from the head, but very often it is produced by the secretory organs of the nose and throat." Van Helmont,¹ who died in 1644, twenty years before the publication of Schneider's book on Catarrh, had a less accurate notion of the origin of pharyngeal secretions than Cardanus, but he at least did not ascribe them to the brain. Following Paracelsus in his mysticism somewhat, but greatly surpassing him in honesty and actual knowledge, he did much to introduce chemical principles into medicine. He seems to have been the first to assert that diseases are local in their actions and not dependent on a disturbance of the whole body or any vital principle.

Van Helmont says: "The mucosities which are expelled by the expectoration and in coryza, do not come from the head nor are they secreted by the arteries, but they arise from superfluity of aliments which remain adherent at the upper part of the pharynx."

Wepfer, whose work was first published in 1658,² has the following reference to the origin of catarrhs and the destination of the vapors. He says that the latter were supposed to extend from the stomach to the head, "just as though the head was to be compared to the smoky roof of a house or the lid of an alembic," but he denied the possibility of this except by means of the carotid vessels. "At the base of the brain are the thick meninges, at that point most impenetrable and almost four times the usual thickness. The cranium in the live animal, or in the animal just dead and not yet deprived of all the membranes, should not be thought to be similar to the representations of it in books on the bones. Especially all those holes which are seen at the base are occluded so that no ingress or egress is allowed to the vapors or the humors, as may easily be determined." How much of this may have been derived from Schneider's work on the ethmoid bone published shortly before, does not appear. We see, therefore, as we have noted in the discovery of the circulation of the blood by Harvey, that the idea of the local origin of catarrhal discharges had long existed in the world before Schneider, and we have seen that the error of their cerebral origin persisted many years after his death (1680).

The "De Catarrhis" of Schneider.—A view of the voluminous writings of Conrad Victor Schneider may well appall the stoutest heart. Never was the kernel of an important fact so wrapped up in the husks of verbosity.³ The dissertation on the cribriform bone is a treatise which opens the way, as must have done the

¹ Opera Omnia. Catarrh. Delirament, p. 412. Ed. 1682.

² Observationes Anatomicæ ex Cadaveribus eorum quos sustulit Apoplexia, 1727, Obs. CIV, p. 459.

³ The patient reader may be referred to:

Dissertatio de osse cribriforme, 1655.

De Catarrhis libri VI—1660—1661.

De Catarrhis liber specialissimus—1664.

Although exceedingly verbose, still his Latin style is perspicuous and by no means wearisome reading.

investigations on which it is founded for the author's thoughts, to the larger work on Catarrh, for in his opening remarks he insists upon the impermeability of the base of the skull to liquids or air. The grateful reader may well excuse any omissions in the following exceedingly compressed account of Schneider's dissertations on Catarrh. He showed that the origin of the catarrhal discharges cannot be in the cranial cavity, and they could not get out if such secretions were formed there, since neither the cribriform plate nor the nutrient canal of the sphenoid bone nor the lacerated foramina, as claimed by various writers, are pervious. As a matter of fact, no fluid so viscid as mucus is to be found there at all. Neither could it be born through the nerves. (Libri I and II.)

He described a new origin for nasal discharge in the anterior and posterior pituitary membranes, as he calls them. Mucus may be squeezed out of the membranes of these regions even in the dead subject. He does not once mention the glands as the source in the mucosa of this mucus. He speaks in the same way of the tonsils and of the ocular and lachrymal mucosa. The anterior and posterior pituitary membrane when normal exudes this mucus moderately. When more is exuded catarrh arises. He insisted that in coryza the brain is not affected at all. Even in a horse dying of glanders, the brain was found unaffected. There can be no doubt from his description of what he calls the posterior pituitary membrane that he had noted the existence of lymphoid hypertrophy, but he does not clearly recognize it as pathological. (Libri III and IV.) His etiology of catarrh is hardly worth transcribing and the same may be said of the treatment, notwithstanding the radical character of the advance he made in the knowledge of the physiology and pathology of the nose. Coryza he defines as a catarrh of the anterior pituitary membrane, while under the head of posterior pituitary catarrh he includes affections of the throat. *Branchus* is a name he gave to too great a secretion from the larynx. Apparently he derived this from Paracelsus. It did not long continue in use after his day. When the latter is accompanied by difficulty in breathing of all kinds he called it catarrhus suffocativus, and this term persisted for more than a hundred years in medical literature, notwithstanding the differentiation which was constantly going on, and for a time was synonymous both with diphtheria and with bronchial asthma.

The Evolution of Knowledge of the Mucous Glands.—While, therefore, it was Schneider who clearly demonstrated that the mucosa itself is the source of catarrhal discharges, he did not demonstrate those structures in the mucosa in which it is formed and from which it escapes, *i. e.*, the racemose glands.¹ If the reader will refer

¹ Let us for the sake of simplicity avoid the complicated question as to how much of the nasal secretions come directly from the bloodvessels without passing through glandular epithelium.

back to the quotation of Marinus I have taken from Galen (p. 82), it will at once be apparent that while what the ancients called glands had been noted, their function was for the most part unknown, and included many things which are no longer regarded as glands, the distinction between the conglobate and the conglomerate, or the lymph nodes and the racemose glands, being of course entirely unsuspected. In the course of this history we have found reference to the brain, the tonsils and the thyroid glands as moistening the adjacent mucosæ. While the nature of the brain and that of the tonsils have long been known, it is only of recent years that the thyroid physiology has begun to be elucidated, though Haller a hundred and fifty years ago asserted in his Physiology that it had to do with the elaboration of the blood. Many had speculated as to the function of the thyroid gland. Desnoues, who is said to have originated the method of injecting of blood-vessels with wax in his demonstrations, and Coschowitz, both of them seventeenth century observers, declared, according to Haller, they had found the ducts of the thyroid opening into the foramen cæcum of the tongue. This was refuted by Morgagni.

I quote from the "Adeno-Graphia Curiosa" of Nuck, published first in 1692, "Those who first began to examine the structure of glands, both conglobate and conglomerate, were Wirsung, Wharton, and Steno, who not only demonstrated the size and shape of the glands, but their inlets and outlets." It may be noted that Nuck, though he does not in his catalogue allude to the nasal glands, speaks of those of the membranes in general as clinging close to their substance. Knowledge of the true condition of affairs as to the origin of catarrh had advanced so far with many observers as to induce Nuck to write a humorous epitaph upon the pineal gland as such. The history of the racemose glands of the mucosæ is so inextricably interwoven with that of the glandular organs of the general system that they cannot well be separated.

The Chyliferous System.—Eustachius had already in the sixteenth century described the thoracic duct. Aselli, in 1622, announced the discovery of the lacteals in the mesentery, the existence of which, illustrating the fallibility of great minds, was obstinately and persistently denied by Harvey. In 1641-3 Hoffmann, Wirsung, Riolan Wormius discovered and confirmed the existence of the pancreas and its connection with the digestive process. Pecquet a few years later discovered the chyle in the vena cava coming from the thoracic duct by way of the subclavian vein, and again the rule of human fallibility was followed by Aselli, who denied the reality of Pecquet's addition to his own discovery (Sprengel IV, 209).

The Lymphatics.—Gradually the lymphatic system was proved not to be a part of the chyliferous. Fallopius, many years previously, having noted the lymphatics of the liver, Rudbeck distin-

guished them from the lacteals more recently discovered by Aselli. The liver became an excretory instead of a secretory organ after Glisson has elucidated its anatomy. Thomas Wharton,¹ whose name survives attached to the duct of the submaxillary gland, asserted the brain is of a different nature from the glands and other viscera. In spite of many mistakes he added greatly to our knowledge of the structure and functions of the glands.²

Franciscus de la Boe Sylvius,³ according to Haller, was the first to separate the conglomerate from the conglobate glands, our racemose and lymphatic glands respectively. His pupils, Steno and De Graaf, greatly extended this differentiation. De la Boe, following the thought of Galen in quoting Marinus, says that there are two primary kinds of glands. "For there are some as if made up of separate parts and from smaller conglomerate glands, stuck together, as it were, with some inequality of the surface, such as the pancreas and thymus. Others are observed to have a smooth surface and as if blown up and moulded together. (*Ex una quasi sibi continuata substantia, conflatae et conglobatae.*) Such as are contained in the mesentery and in the groin and elsewhere are supplied with lymphatic vessels. To this may be added, if desirable, a third kind, the renal glands and their accessories."

The Mucous Glands.—While there is much said by this author of the pancreatic and salivary glands as distinct from the lymphatic or conglobate glands, no mention is made of the muciparous glands. To Steno,⁴ perhaps, more clearly than to anyone else, belongs the credit of first describing them. He described the larger glands of the mouth and eyes and the *vessels* of the membrane of the nose, which, he declares, are of two kinds, and they exist in the mucous membrane for the purpose of keeping them moist. Steno first noted the duct which bears his name in 1660, but it had been known to others before him. Sprengel (IV, p. 236) quotes Walther for authority in asserting that Rivin was the first to discover the duct of the sublingual gland which Caspar Bartholinus, the son of Thomas, claimed the honor of first noting in 1682, ranula or dilatation of this duct having been known and operated on from the earliest times.⁵ Nuck (l. c.) added a greater exactitude and

¹ Adenographia sive Glandularum totius Corporis Descriptio, 1656.

² Those who desire to find an account of the services rendered to medicine by Wharton, as well as an account of the numerous and glaring errors mingled with his original observations, may refer to Daremberg, Hist. Gén. des Sc. Méd., II, p. 640 seq. He believed the nerves are vessels by which the glands intercommunicate.

³ Collectio Disputationum Medicarum, VIII, 1663.

⁴ Observationes Anatomicæ, Quibus varia Oris Oculorum et Narium Vasa describuntur, 1662. I know not how to account for the priority in date of Steno's book over De la Boe's, if we are to accept Haller's remark, except that the teachings of the latter were long unpublished, and, indeed, they seem much less advanced than Steno's.

⁵ Celsus, Lib. VII, Cap. XII, 5.

a wider observation of the glands to the works of the more original writers just mentioned.

Havers (1691) supposed the spaces known by his name which he first observed in bone were glands, and Pacchioni's name is attached to the structures in the dura mater which he believed to be glands (1705).

The Microscope.—I have not exhausted by any means the indications of the great activity in the latter part of the seventeenth century in the anatomical investigations of glandular structures, made possible by the improved microscope of Leeuwenhoek, though it was Malpighi, with a less effective lens, in spite of his egregious blunder as to the brain, who first demonstrated, as has been said, the hollow nature of the conglomerate glands (1689). As we have seen, Van Ruysch, many years later, attempted to refute this opinion, claiming the glands were bunches of minute bloodvessels, as Bellini had declared.

The old compound microscope, said to have been first suggested by Zansz in 1590, was a very imperfect instrument, and about a hundred years later was superseded by the vastly more efficient, simple high curvature lens of Leeuwenhoek, with which he studied the capillary circulation, the infusoria and a host of other hitherto unnoted phenomena. It was doubtless with such a magnifying glass that Santorini¹ examined the glands in the nasal mucosa. "If we wish to demonstrate them most clearly we arrange the membrane, previously cleansed and somewhat macerated under the crystal, and the light being conveniently and adequately arranged for it, we may recognize their number, their size, and their color. Their size varies indeed, some being a little ovoid, and these are about equal to a grain of mustard."

The Pharyngeal Tonsil.—Schneider² gave a rather poor illustration of the pharyngeal tonsil and thus describes it: "It is of a whitish color, the adjoining membranes being bloody or dusky. It is fuller than they and like fat. It is always moist and exudes a glutinous substance." He located very definitely this posterior pituitary membrane, as he called it, as existing between the vomer and the foramen magnum, being bounded laterally by the pterygoid plates. This being Schneider's description³ of the pharyngeal tonsil, we find Santorini describing it, as he did the glands, much more clearly than did his predecessors. "This membrane I have sometimes met arranged in shallow grooves (cavitates) as if with some kind of order. Sometimes I have found it in irregularly arranged forms and so cavernous that, with its gaping holes and

¹ *Observationes Anatomicæ*, 1724, cap. 5.

² *De Catarrhis*, III, Fig. 2.

³ This passage may perhaps be more readily referred to in the excerpt made from Schneider's text in the footnote to the first page of Zuckerkandl's *Normale und Pathologische Anatomie der Nasenhöhle*, 2 Aufl., Wien, 1893, I, p. 1.

deep sinuses it almost equalled the tonsils. From this a mucous fluid is apt to exude." Haller also described this organ.

Notwithstanding the opposition to Schneider's views and the persistence of the old pathology, they were at once accepted by many distinguished medical writers. Thus we find Ettmüller¹ saying in 1685: "The origin of all catarrhs is the conglomerate glands."

The Seventeenth Century Theories.—During the seventeenth century we hear a good deal about vital heat, somewhat equivalent, at least in a physical sense, to what we now mean by animal heat. This was connected at first with ideas of the soul, whose habitat the materialist Descartes fixed in the pineal gland, which was beginning to be vacated as the storehouse for nasal secretion. This "Vital Heat" was an outgrowth of the "Pneuma" of the Ancients. Gradually the true idea arose out of this, but much later, that this vital heat depends upon chemical action. Before this time, under the old theoretical pathology not only were diseases hot or cold or wet or dry, but their remedies must perforce partake of the same or of opposite qualities. It is very difficult for the modern student of medical history to attempt to fathom the reasons for according these properties either to drugs or diseases. He is apt to regard them as the "*ludibrium ingenii humani*," but it is a joke spread thick over the broad expanse of more than twenty centuries, and if in the course of this history, very little is said of them, it is not because they do not start from the page of every ancient author after Galen.

While the sixteenth century is marked in medical history by great advances in the knowledge of gross anatomical facts, the seventeenth is no less distinguished by the elucidation of an enormous amount of physiological data. This we have seen was a logical sequence, and as we proceed we will perceive, I trust, that the pathological observations which followed in the eighteenth were a natural outgrowth of physiological activities in a preceding epoch. Medical history has its lessons, no less useful than that of the rise and fall of empires.

The Iatro-Physical and Iatro-Chemical Schools.—Sanctorius (1516–1636) who had witnessed Galileo's invention of the thermometer improved it and adapted it to clinical purposes. The influence of the philosophy of Descartes had resulted in the advent of the Iatro-physical school, which had its earliest and greatest exponents in Italy. The alchemists and Paracelsus had finally subsided. Out of their activities was brought about the introduction into medicine of a more or less rational Iatro-chemical school which had perhaps a wider following. We recognize the importance of the observation which noted the change in the color of the blood

¹ Opera Omnia: Amst., 1696–97, II, p. 740, De Catarrhis.

in the transit of the lungs. This was made by several, among them by Lower, who in another publication showed himself the adherent of the new ideas of Schneider, for he published in 1671 a "Dissertation on the origin of Catarrh in which it is shown that it does not come from the brain." This change in the color of the blood led to what was practically the discovery of Oxygen by Mayow, who wrote treatises at Oxford in 1668 and 1674. He identified the gas which causes this change as nitre-air or aerial spirit and as the same agent which supports combustion.

In the seventeenth century medical monographs, the specialization of medical literature, became more numerous and instead of weighty, voluminous tomes, containing all the wisdom garnered from all the fields of medicine or even of universal science, we meet with the masterly essays of Harvey and of Malpighi. We more often remember the fight between the barber-surgeons and those who disdained to do anything but observe and evolve theories of which the age was prolific. These are only a few hints of the broadening of knowledge and the consequent necessary narrowing of the fields of individual human endeavor. Many old errors still lingered. Van Helmont who did not die until 1644, and Willis who was not born until 1622, when Harvey had been teaching his doctrines for six years, still conceived of the air as passing from the air channels through pores into the thoracic cavity. (Sprengel IV, 186.) As far back as the time of Euclid under the Ptolemies light was supposed to issue from the eye to the object. Although this was corrected by the Arabians, mistaken theories still prevailed, but we are now in the time of Newton through the effulgence of whose great intellect Medicine was guided in the study of the physiology of the eye.

The Disappearance from Medical Literature of "Chaldean Therapy."
—Far beyond the period of the early Renaissance and well into the seventeenth century may be found the recommendation of stercoraceous drugs for angina. Hollerius, writing in 1623, advises their use and faithfully transcribes one form of the old swallow prescription. In a curious old book, apparently for home use, published in 1692 by the Hon. R. Boyle, Fellow of the Royal Society of London,¹ among many others I find the following prescription: "Take about one dram of Album Græcum or white dog's turd, burnt to perfect whiteness, and with about one ounce of Honey of Roses, or clarified honey, make thereof a linctus to be very slowly let down the throat." Many better known writers still gave them a place in their pharmacopœia. Thus we find the prescription of both the swallow and the dog's excrement in the *Bibliotheca Pharmaceutico Medica* of Mangetus.² Gradually, however, much

¹ *Medicinal Experiments or Collection of Choice and Safe Remedies.* London, 1692-3, II, p. 165.

² *Genevæ*, 1703, I, pp. 470, 982.

of the Chaldean Pharmacopœia was relegated to the old-wives medicine chest, where it still lingers, supported by a credulity which has not all taken refuge in the same ménage. It was about as hard to get rid of this sort of medication as it was to introduce a more efficacious. One may see in the history of the introduction of quinine, about the only drug which we have that really cures a disease and annihilates its cause, how rebellious the human mind is to the plain demonstration of fact in therapeutics, when it contravenes the theoretical doctrines of the day. The Jesuits bark crept into Europe in 1638 and the orthodox practitioner of the day absolutely rejected it and for a time left its employment to be mingled with the hocus-pocus of priests and mountebanks. It is even charged against our profession that one reason for the resistance to its use was the promptness of its action and the simplicity of its preparation by the apothecaries, intermittent fever being then as rich a mine for the doctor and druggist as phthisis still is.

Amulets and charms, it is true, disappeared from medicine soon after the beginning of the Renaissance, but astrology, out of which grew the discoveries of Copernicus and Galileo, long continued prominent in medical thought as it did in its influence upon the actions of men. Pope Paul III, who became pontiff in 1534, learned as he was in Greek and Latin, never presumed to undertake the smallest personal business nor engage in the weightiest affairs of state without first consulting the stars. Two hundred years later we shall find a grave doctor discoursing on the influence of the moon on nasal polypi.

Soon, however, among men of science astrology became astronomy, alchemy became chemistry, and therapeutics soon began to look to physiology and pathology for help.

THE RESULTS OF THE RENAISSANCE.

It is unnecessary to enter further than we have already done into an account of the collateral events in the development of our knowledge of the nose and throat. The facts brought to light were numerous. Scarcely less abundant were the theories to account for them. Through this maze of truth and error we must try to trace the thread of our own story. To take this up we must return to the period succeeding the revival of anatomical learning, in order to see the effect it had on the ideas concerning the nose and throat and their treatment. It is of only incidental interest to remark here that the first separate treatise of laryngeal disease I have met with is that of Codronicus' "*De Vitiis Vocis*," published in 1597. It contains nothing of value, being a faulty copy of Galen's ideas. It is, however, significant of the tremendous amount of pulpit oratory which was going on then, often perhaps

under circumstances very trying to the organ of the voice, to find the author on the first of his 147 pages declaring that he writes the book for the good of the preachers of the Holy Word. This I believe is not now to be found in the prefaces of text-books on the larynx. Very little perusal of it will reveal evidence that clergyman's sore throat was then well known.

Sixteenth Century Practice.—A little before this, in 1591, Forestus, a very voluminous but a perspicuous writer, devoted, in his works,¹ 300, 12 mo, pages of fine print to the diseases of the nose and throat. In regard to anosmia he says: "If it is from ethmoidal obstruction, or from the humor discharged from a catarrh, the latter must first be cured. (By ethmoidal obstruction he does not here mean the stoppage of the holes in the cribriform plate.) If from flesh growing within the nose, or from a wart or a hemorrhoid, it is to be cured by the surgeons by operative procedures, either with a cutting instrument or cautery or snare." All of which is good treatment, but then follow therapeutic measures based on pre-Schneiderian anatomy: "If from an abundance of humours filling the ventricles of the brain or obstructing the sieve-like openings, it is to be carried off by the letting of blood, or by purging." The cautery is often mentioned with recommendations not only for its intranasal use, but as a remedy in nasal disease to be applied to the cranial bregmata and the posterior cervical regions, a method of treatment we have noted in Herodotus as existing among the Libyans, for the prevention and cure of coryza and catarrh. Indeed, his therapy seems a queer mixture, some of it taken from hoary antiquity, while some of it bears favorable comparison with modern treatment. He claims to have cured a girl of ozæna by copious nasal douching "with perfumed white wine in which were dissolved cypress, roses, and myrrh." He also used nitrate of silver and alum rubbed up with honey and applied with a probe. We are a little shocked to find, farther on, that he cured another by bleeding, purging, cupping, diet for six weeks, and administering a decoction of guaiac. Forestus dwells on the ravages of nasal syphilis, which prefers attacking the bone to the soft parts, and he reminds us that not every ulcer in the nose is ozæna, for often ulcers arise from a salty mucus which produces crusts, and these are easily cured. We find this crude pathology at a much later date. Boerhaave declared (1668-1738): "This mucus, being also corrupted, produces an ulcer which corrodes the adjacent bones." Of course ozæna, after the advent of syphilis, was frequently confounded with it.

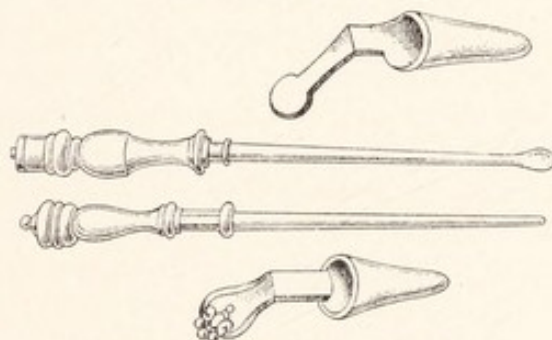
Dry Heat in the Therapy of Ozæna.—We may note here the method of treating ozæna detailed by Fabricius ab Acquapendente² who

¹ *Observationum et Curationum Medicinalium Libri*. Lugd. Batav., 1591, Lib. XIII-XV.

² *Opera Chirurgica; De Chirurgicis Operationibus*, Lugd. Batav., 1723, Cap. XXVI, p. 445.

wrote about the same time as Forestus, but whose works are of much more importance in the history of medicine. After criticising the treatment of Celsus, he says: "Wherefore I offer you a similar surgical procedure in ozæna, but a far milder one. An iron cannula is to be inserted in the nostril, so long that it will reach the end and equal the length of the ulceration and occupy the cavity of the nostrils; through this a glowing hot instrument is to be introduced, which, however, should not reach beyond the cannula; it should be so done that the hot iron heats the tube, and through this the nasal tissues and the ozæna; it is not intended that the nose should suffer pain from this heat, but only that the ulcerated part should be heated to a point short of pain (*citra dolorem*), in one having a good tolerance. This being perceived the cannula may be taken out of the nostrils, the secretions cleaned off and then replaced." This was to be repeated as often as necessary until the part was thoroughly cleansed of crusts, the mucous membrane

FIG. 9



The nasal cauteries of Dionis.

made red without the pain of burning, the secretions stimulated, and thus the ulcer healed. Dionis much later (1707) followed practically the same method, and I am sure every modern rhinologist will appreciate the value of the suggestion. Dionis used a cannula closed at one end.

Tonsillar Hypertrophy.—Forestus¹ referred to the tonsils, under the heading of Inflammation of the Glands, as small caruncles, which all men have at the back of the mouth on each side. His method of treating hypertrophies in this situation in a young girl of eighteen was atrocious. She was nearly suffocated with large tonsils, and had never menstruated. He administered the extract of swallow's nest (one could make a homœopathic pun on it in English but not in Latin) and gave her urine to drink. Bleeding and cupping were vigorously used and after five days "in spite of the treatment she fell into a *deliquium animi*," which he ascribed to "uterine suffocation." He then quotes Aetius as saying on the authority of Archigines: "Many virgins at the age of puberty, lacking their

¹ L. c. Lib. 15, obs. VII.

menses, are seized with this affection." This differs from modern ideas, whose interpretation would be, "Many virgins, at the age of puberty, lack their menses, because they are seized with this affection." Elsewhere he dilates on the virtues of the stercoraceous drugs in affections of the tonsils. Farther on we shall have to refer to the first account of an epidemic of diphtheria by Forestus, but in his chapters on the Nose and Throat we find plentiful evidence of sporadic cases, undifferentiated from other throat inflammations, and we read¹ a graphic description of the death of his own father from laryngeal stenosis, without apparently the thought of a tracheotomy, though he was perfectly familiar with the description of it by Paulus. Cynanche, paracynanche, and cynanche with phlegmonous facial erysipelas are terms which still remind us that the frequency of that type of disease must have then, as in the time of Hippocrates, been greater than now, perhaps from personal uncleanness and the greater exposure thereby to septic influences.

Fabricius ab Acquapendente, after describing the operation of tonsillotomy as performed by Celsus and Paulus Aegineta, says: "Wherefore we may gather—that it is neither entirely easy nor safe to carry out the operation." Consequently he advises "seizing the tonsil with a long, slender forceps to draw it out so that by skilfully making traction the tonsil, as if of its own accord, will follow."² There is another Fabricius, from whom much may be learned regarding the surgery of the throat at this time.

The Uvula.—Fabricius Hildanus³ relates the case of a young man with such a hypertrophied and elongated uvula that it nearly filled the mouth and touched the teeth. It was so large, swollen and vascular, they were afraid to operate, and sent the man home to die, as they thought. On a less dangerous-looking condition, in another patient, he advised operation. In a third, the growth seemed malignant, and he left it alone. For the insufflation of powders which he used in these and other cases he devised a powder blower (Fig. 10). The tip of the uvula was engaged in the cup, and powder was thus thoroughly blown on it. If the relaxation and inflammation of the uvula did not yield to these measures, it was to be cut off with the scissors, or ligated, or burned with caustic. For tying the ligature he used an instrument which was long in vogue (Fig. 11). He used another instrument for applying the actual cautery to the organ. It consisted of a long cannula, fenestrated at one end. The uvula, engaged in this aperture, was burned with the hot iron thrust through the open end, the other being closed. Following Galen, though the operation was done frequently, it was always performed

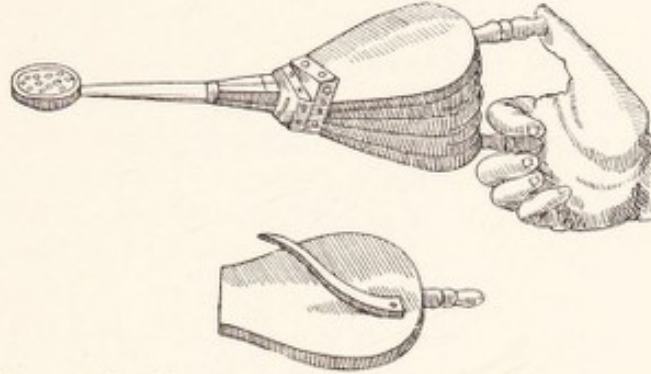
¹ Lib. XV, Obs. XV. (Scholia.)

² Opera Chir., De Chir. Operat., Cap. XXXVIII, p. 462.

³ Observationum et Curationum Chirurgicarum Centuria II. Opera Omnia, 1646, Obs. XIX.

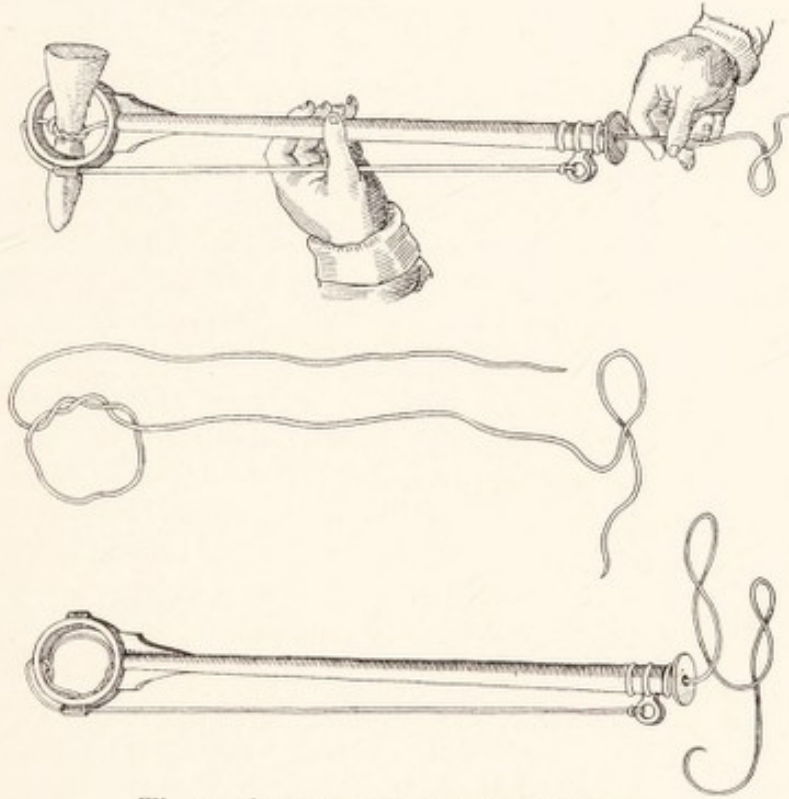
with a good deal of caution, as may be seen by referring to the earlier work of Paré,¹ where instruments similar to those of Hildanus are figured. Fabricius ab Acquapendente (l. c.) boasted that his dexterity was so great he did not have to use a forceps in cutting

FIG. 10



The powder blower of Fabricius Hildanus for the uvula.

FIG. 11



The uvulotome of Fabricius Hildanus.

off the uvula, but depressing the tongue with one hand he used the scissors with the other.

Tobacco Therapy.—The latter author,² who must have written it about 1600, makes an interesting mention of tobacco in intra-

¹ Les Œuvres d'Ambroise Paré. Lyon, Gregoire, 1664, p. 189.

² L. c. De Suffumigio Anglico ex Tabaco, et Chirurgia Naso Orique Communi, Cap. XXVII, p. 447.

nasal treatment. Sir Walter Raleigh had brought the knowledge of the weed to England several years before, but he does not seem to have used a pipe for smoking it until after the return of Sir Francis Drake in 1586 (Lizars). Fabricius says: "They are accustomed in England to prepare a fumigation from tobacco or *herba regina exisiccata*, the smoke of which when ignited they draw through a slender pipe into the mouth, and by this the mouth being filled, so that the cheeks are inflated, it comes out of the nostrils. In England, as I have said, it is most frequently used, and with the happiest results." Gregory Horst,¹ who wrote about the same time, and was enthusiastic as to the medicinal properties of tobacco in the treatment of catarrh and coryza, says: "Indeed, the smoke of this ignited plant taken into the nose and mouth seems to benefit them, so that, as it were, by its resolving, cutting, and attenuating properties it causes the secretion and consumption of the mucus and viscid humors. For which reason, authors declare, the inhabitants of Florida, at certain specified seasons of the year, live on the smoke of this plant, which they receive into their mouth through horns prepared for this purpose, whereby, they assert, thirst and hunger are stilled, and an incredible amount of phlegmatic humors are collected in the mouth." So beneficial was this that some called it the "holy plant" or *petum* or the Queen's plant. "When it is taken into the mouth through a pipe-stem, it pervades the whole brain, and in the same manner is borne into the ears and even the uterus. One of the signs of its efficacy is the paleness of the countenance." One may easily perceive traces of the experience of the first European novice to follow this curious habit observed in the new world. The old smoker needs only to recall his first pipe to understand the awe with which the first white man looked upon the potency of the new drug. The perusal of the literature concerning the medicinal virtues of tobacco in Queen Elizabeth's time should furnish a fruitful source for reflection to those apt to be enthusiastic over new drugs. Pursuing this line of thought, I may be allowed to insert a citation, not from the veracious history of Diedrich Knickerbocker, but from sombre, musty, medical annals. Bontekoe, a Holland sage whose singular name, "pretty cow," would attract attention without the knowledge of his other peculiarities, was so impressed with the virtues of the products his countrymen were bringing from the West and the East Indies, as to declare there was nothing so conducive to long life and robust health as smoking countless pipes of tobacco, and drinking innumerable cups of tea.

Syphilis.—Whatever may be our belief as to the existence of syphilis in the ancient world and in the Middle Ages, none can

¹ Gregorii Horstii Senioris Opera Medica, Cent. Problem. Therapeut., Decas III, Quaestio VII, Goudae and Amst., 1661, Tom. III, p. 47.

deny that, if we are to judge alone from the medical literature of the day, apparently in the latter part of the fifteenth century, possibly before, certainly after the return of Columbus' sailors, syphilis spread rapidly throughout Europe. The profligacy of the times, the wars of Italy, the indescribable misery and filth of the people, the wandering priests, jongleurs, beggars, and robbers have been collected by the medical historian into a picture to explain the reason for the birth of many new diseases, which appeared first during the fifteenth and sixteenth centuries, but all these pretended causes had existed for a thousand years. Columbus did not bring with him whooping cough, scarlet fever, diphtheria, and influenza. These all appeared, possibly with the exception of the last, to have arisen during the Renaissance of learning in Europe. It is difficult to be sure of the origin of any of them, but we may conjecture that all had previously existed and that the awakening of scientific observation at this time first brought about the literature, upon which we depend for their identification in modern nosology.

It is only the strikingly specific phenomena of diphtheria which permit our recognizing it in the works of Aretaeus and Galen. Syphilitic lesions with their multiform and deceptive resemblances, with the insignificance of the initial lesion, may easily have been classed with the various affections which are at present grouped differently. It has only been within the last hundred years that tertiary syphilitic laryngitis has been separated from tubercular, both being included by Morgagni, Louis, Trousseau, and Belloc, under the heading of laryngeal phthisis. There is no one word that is so comprehensive in its significance, when applied to the advance of knowledge in the history of medicine, or indeed in the history of all sciences, as differentiation, and this one word, I believe, will explain the birth of many so-called new diseases in medical annals. We can only conjecture that this holds true as to syphilis.

We have noted Berengar, reaping a rich harvest with the mercurial treatment of syphilis among the ecclesiastics in Rome, and we can scarcely peruse a medical book, published after 1500, that we do not find abundant evidences of the ravages of the disease, often unrecognized in its extragenital lesions. Sunken noses, perforated palate bones, laryngeal stenosis are forced on our attention. Forestus, who was familiar with the ravages of nasal syphilis, vividly describes the syphilitic ulcerations of the soft palate, recognizing the condition in a case he details, "though the noble youth denied it."

Prostheses.—Various devices soon came into use for remedying the results of syphilitic ulcerations. Palfin¹ says that Amatus

¹ *Anatomia Chirurgica.*

Lusitanus, a Portuguese Jew, who was born in 1511, and who succeeded in eluding the clutches of the Inquisition, invented an instrument "which is a blade of silver in the middle of which there is a hole, and through this a piece of sponge may be passed and fastened firmly to the metal plate. This is then applied to the perforation of the palate in such a way that the sponge swelling with the humidity, the plate is held so firmly against the palate, and closes so exactly the opening, that it only can be detached with difficulty." Paré and Fabricius Hildanus also speak of a similar prosthesis. Paré indeed it was who is said to have first performed the operation of staphylorrhaphy. Although he was familiar with the operation of Tagliacozzi, he suggested in cases of loss of the external nose the use of an artificial one in the form of a mask.¹ Although Paré's treatment of a fractured nose was far inferior to that of Hippocrates, he figured the hollow splints he used, and elsewhere he says: "Now it is well to understand that the solution of continuity occurring in the cartilage is called fracture by Hippocrates, like those of the bone, because he had no other name to express it better."

Rhinoplasty.—In Celsus² plastic operations on the nose are very superficially noted, and the same may be said of Galen (*Isagoge*) and of Paulus Aegineta (VI, 26). The Arabians, in spite of their communication with India, and their opportunity of acquiring some of the medical knowledge of that ancient land, do not appear to have left any records of Rhinoplasty in their works. This is the more surprising, because there is every reason to believe, as von Graefe asserts, that the Saracens introduced the art into Sicily.³ With such a degree of skill were some of the Oriental practitioners credited, that tales were told in the Middle Ages, and even at a later date, of the executioners throwing freshly amputated noses into the fire, that they might not be picked up by friends and relations of the victim and afterward sewed in place. Slaves, it is said, were in Sicily compelled to surrender their noses, at times, to masters who in the vicissitudes of the times had lost their own. A slight perusal of the history of Sicily will convince anyone that this interchange of commodities might have been brisk, as an ordinarily active man might easily be master and slave several times, in the course of a moderately long life. There is a record of Branca⁴ having made a new nose as early as 1442, and he is said to have been preceded by even earlier surgeons. Branca, the father, made a nose of the neighboring parts of the

¹ *Oeuvres*. Livre XXIII, Cap. 2.

² *De Medicina* Lib. VII, Cap. IX.

³ For a more extensive bibliography see Cloquet: *Osphrésiologie*. Von Graefe: *De Rhinoplastice*, Berlin, 1818. Zeis: *Die Literatur und Geschichte der Plastischen Chirurgie*, 1863. John Hamilton: *The Restoration of a Lost Nose*, London, 1864.

⁴ For reference to an old manuscript describing the rhinoplasty of Branca, father and son, see Gurlt: *Geschichte der Chirurgie*, II, p. 489.

face, but his son Antonius used the skin of the forearm. The art seems also to have been practised in Sicily in the sixteenth century by a family of the name of Viano.

Baas remarks "that syphilis, and a nose-destroying pope, who fixed upon amputation of the nose as a punishment for larceny, afforded the most frequent occasion for these rhinoplastic operations." He refers to much later times, viz., the pontificate of Sixtus V (1585-1590). Earlier than this, Lanfranc, Cauliac, Cerlata, and other surgeons, refused to believe these marvellous stories from Sicily, but the operation is mentioned before Tagliacozzi published his work (1597), by Vesalius, Fallopius, Paracelsus, and others. Benedetti, who died in 1525, is said to have been the first in Europe who speaks of artificial restoration of the nose, except those authors who ridiculed the possibility of it. I have mentioned Paré's idea of an artificial nose. Tycho Brahe, the early astronomer, a choleric philosopher, in 1566 lost his nose in a duel, and is said to have supplied the defect so skilfully with gold, silver and wax it was scarcely noticeable. Fabricius Hildanus,¹ in a letter to Griffonius, speaks of having seen a case in which the nasal organ had been restored by operation, after the method of Tagliacozzi, and from Griffonius' reply, we learn that he himself had learned the method from Tagliacozzi on one of his many journeys. Such a triumph of the surgeon was attained in this case, referred to by Hildanus, that the young lady who had her features corrected by the method of Tagliacozzi was married within a year. This, and many other such references in the literature of the time, indicate that to the latter is due the credit of having brought the method in vogue on the continent, though his book² was not published until long after the operation was well known. His operations were elaborate and ingenious. He used not only the adjacent parts of the face in the repair of the nose, but the skin of the arm, having apparently derived the idea from his knowledge of tree grafting. His restorations of the ears and lips were not less admirable and ingenious. Such operations have always excited much merriment among the wits of the laity, and we find Butler, in his famous "Hudibras," declaring:

"So learned Taliacotius, from
The brawny part of porter's bum,
Cut supplemental noses, which
Would last as long as parent breech;
But when the date of Nock was out
Off dropped the sympathetic snout."

Van Helmont³ gravely supplies science with the account of this tragic episode: "A citizen of Brussels, having lost his nose in a

¹ Opera Omnia, Francof., 1646, Obs. 31, p. 214; also Epist. 62, p. 1006.

² De Curtorum Chirurgia per Insitionem, seu de Narium et Aurium Defectu per Insitionem, Arte hactenus ignota sarciendo, Venetiis, 1597.

³ De Magnet, Vuln. Curat., 22, in his Opera Omnia, Francof., 1682, p. 707; Ref. Daremb. (l. c.), I, 477.

fight, applied to a surgeon, named Tagliacozzi. The latter, in order to cure him without resulting deformity, made use of autoplasty, and borrowed a strip of flesh from the arm of a servant. The wounded man returned home with his borrowed nose. Thirteen months later he was all at once disagreeably surprised to find the organ growing cold and becoming gangrenous. What had happened? After much lamentation and inquiry it was learned that the servant from whose arm the nose had been taken at Brussels had died exactly at the time the nose began to grow cold. . . . There are eye witnesses at Brussels of this fact."

In the *Tattler*, No. 260, Addison continues to make merry over the misfortunes of the early victims of syphilis, pointing out how appropriate it was, in the painting of Corregio, to represent the dimpled God of Love taking lessons in archery from Mercury. He affirms that his arrows were dipped in poison and the boy aimed them at his quarry's nose, not his heart. Taliacotius was the first "clap-doctor," whom Addison had met with in history, and was very celebrated, but he had made the awkward mistake, in the case referred to in "*Hudibras*," of grafting on a swarthy Portuguese's features epidermis removed from that part of the anatomy of a fair-skinned German which is not exposed to the sun's rays. There is much more of this sort of banter, which seems to have been acceptable to the readers of this classic English author in his day. In spite of such indelicate but merry satire of this kind, so brilliant were Tagliacozzi's real results that the theologians, continually on the alert for that sort of alliance in others, considered him in league with the devil, or, at least, exceedingly impious in presuming to engage in a work they were bold enough to ascribe exclusively to the Almighty. Some nuns declared after his death (1599) they heard a voice exclaiming that he was damned, so they dug up his body from consecrated ground and cast it out. Thereupon his colleagues in the anatomy school of Bologna raised a statue to him, where he stands immortalized, a nose in his hand. (Whittington.)

Epidemics of Influenza.—Having noted the advent of syphilis in medical history, and its influence upon the diseases of the nose and throat, we now take account of the other contagious diseases which become prominent in the records at this time. Except for accounts of sporadic cases of diphtheria, which we are able to recognize in the very oldest records of medicine, reports of influenza, unnoticed by the Greeks and Romans and Arabians, were the first to emerge from the obscurities of the Dark Ages. Professor Eugene Mittwoch¹ thinks he has reason to infer that in the annals of the Arabian writer, Hamza Ispahan² there is reference to the occurrence of an epidemic of influenza in Arabia in the year 871 A.D.

¹ Berliner klinische Woch., No. 10, March 10, 1913, L, p. 447.

² Annalium libri, X, Ed. J. M. E. Gottwaldt, Petropoli, 1844.

It rests, however, upon the evidence of a passage which, though it may be interpreted in that way, is hardly definite enough to warrant implicit belief in the inference. While Creighton¹ makes a doubtful reference to the disease, reported as early as 1173 A.D., Ozanam² says of catarrhal fever: "One of the oldest epidemics of this time, of which there is no mention since the beginning of the Christian era, is that of the month of August, 1239, which one finds noted in the chronicles of the Frères Mineurs. The same chronicle speaks of another in 1311 in France, where many perished from it." He speaks of it as occurring in Florence in 1323, throughout all Italy in 1327, and there was another epidemic in 1358, again in 1387 and 1400. In France records report it in 1403, 1410, 1411, 1414, 1427, 1438, 1482, 1505. Creighton finds traces of it as occurring in England during the reign of Henry VI (1427). If it is really influenza which is referred to, according to Creighton, by Rodolphus de Diceto as occurring in 1173, we may see from the phrase "Universus orbis infectus ex aeris nebulosa corruptione," that his idea of the etiology was quite excusable. Anglada³ quotes Felibien as follows: "In 1414 there prevailed a north wind so contagious that it caused a very frequent disease which they called 'coqueluche,' 'the tac' or 'the horion.' It was a kind of a cold, which caused such hoarseness that the Parlement and the Chastelet were obliged to interrupt their sessions. There was loss of sleep, great pains in the head, in the loins, and throughout the rest of the body; but the disease was not mortal except in old people." The French names for it were influenza, coquette, petite-poste, follette, horion, tac, grippe. The word influenza was not adopted in England until 1743, the early English designation being "mure" or murre," probably from the same root as "murrain." It was occasionally called "the new disease." De Thou in his *Universal History* speaks of it as occurring in 1580⁴ thus: "A new disease, called in Italy vervecinus (pertaining to a sheep or a wether) which first proved deadly in the East, then in Italy and later in Spain; for from this Anna, the wife of King Philip (II of Spain), died, and Gregory XIII (who reformed the calendar) was dangerously ill with it." It is probable that King Philip had also been ill with it, for we read in Prescott an affecting account of his devoted Queen, his third consort, praying that he might be spared and she taken, a supplication which was granted. De Thou speaks of the astounding rapidity of the progress of the disease, and enumerates some of its striking symptoms. He also

¹ *History of Epidemics in Britain*, Cambridge, 1891, p. 398.

² *Hist. des Maladies Epidémiques*, Paris, 1817-23, Tome I, p. 260.

³ *Études sur les Maladies éteintes et les Maladies nouvelles*, Paris, 1869, p. 16.

⁴ Ozanam has made a mistake, evidently from misconstruing the Latin text, referring De Thou's remark to 1510.

says that "coqueluche" is a name first given to it in 1510, but we have noted this name in Felibien a century earlier. It was in this latter year, according to Creighton, that Erasmus suffered from it. According to the same authority, that lovely, wicked, puzzling heroine of history, Mary, Queen of Scots, is said to have suffered from it in 1562.

Confusion with Pertussis.—We find in the old Latin and French works the word *coqueluche*, *coccolucie*, and it is thus frequently indistinguishable, as is occasionally the disease itself, from whooping cough, the first intelligible account of which was given by Ballonius in 1578, though Sprengel refers to Mezeray as mentioning the occurrence of whooping cough in 1414, when, as we have seen others speak of an epidemic of influenza, Sprengel (III, 85) says this French name for whooping cough arose from the hood or "cucullio" with which the sufferers covered their heads in France in the epidemic of 1510, or perhaps from *coquelicot*, the name of an herb, which was at first employed in the treatment of it. I have been thus prolix in the account of the confusion as to this French term, and the evident confusion of the diseases, for which it stood, in order that the lack of differentiation of two distinct maladies may be seen, a little prior to the time when the separate study of the affections began. As a matter of fact, we may plainly perceive that in this instance we have now no means of knowing, with surety, what epidemics were whooping cough and what were influenza, in and before the sixteenth century. We may venture to apply the lesson thus learned to the apparent origin of other epidemic diseases, and we recognize that new knowledge was coming in to the world to bless mankind, and not new diseases to afflict it. Ballonius' description unmistakably identified whooping cough.¹ He himself declared he had never read an author who had given a description of it. Notwithstanding the assertion of Sprengel (V, 595) that Hoffmann first described influenza in 1709, under the name of catarrhal fever, it is evident from the following citation that he was preceded by many years by Willis, who, describing the *catarrhus febrilis* of 1658, says:² "About the end of April an affection suddenly blazed forth which, as though blown from the stars by some sudden gust, all at once fell upon many, so that in some towns in the space of one week, more than a thousand men were prostrated. The pathognomonic symptom of this disease, and that which first attacked the patients, was a troublesome cough with profuse expectoration and catarrhal discharge from the palate, throat, and nares. There was febrile disturbance, which was accompanied by heat, thirst, prostration, unaccountable lassitude, and severe pain in the back and limbs."

¹ *Epidemiorum et Ephemeridum Libri II.* Parisiis, 1640, p. 237.

² Willis: *Opera Omnia*, Amst., 1682. De Febribus, Cap. XVII, p. 143.

"Many of those of weaker constitution succumbed, but the strong recovered." He himself died of it in a later epidemic (1675).

Hoffmann¹ speaks of it as a quotidian remittent fever epidemic in 1709. Juch² describes the catarrhal fever raging as an epidemic in 1741 in many provinces of Germany, and Huxham³ says that the catarrhal fever which spread through all Europe under the name of the influenza in 1743 frequently became pleuritic or peripneumonic. John Fothergill⁴ speaks of an epidemic which appeared in London in 1775, and many physicians replied to his circular letter inquiring into it, since it prevailed generally throughout the British Isles, where it was at that time known as the influenza.

These accounts do not by any means include all the records of epidemics of influenza occurring before the nineteenth century, but are sufficient to prove its frequency and its antiquity. It is hardly worth while to pursue the history of it further, except to say, that it was to some degree pandemic in Europe in 1849 and then for forty years little was heard of it until it suddenly became recrudescent in 1889-90. Since then repeated epidemics have occurred in all civilized countries, each milder than the precedent. It may now be considered as mildly endemic and on the verge of becoming sporadic again.

Diphtheria.—Again it is in the sixteenth century that the description of an epidemic of diphtheria is first to be noted. It is to be found in the works of Forestus,⁵ "*Anno 1557, a Christo Salvatore nostro nato, mense octobris, gutturi morbus epidemicus adeo Alcmariæ grassabatur, ut integras familias subite invaderet; ita ut inter duos tresve septimanas ex hoc malo in eadem urbe ultra ducenti homines extincti sint.*"⁶ Forestus seemed to think the disease arose from a certain wind, which, with a dense, bad-smelling fog, had preceded it. Wierus, a German physician, described an epidemic occurring in 1563, and Sanné refers to a passage in Ballonius, which, by the way, I cannot find, where a membrane is described as having been found in the trachea on

¹ Opera Omnia, Edit. 1740, II, p. 47-48. (Sprengel.)

² Juch: In Haller's Disputationes ad Morborum Historiam, Lausanne, 1758, Tomus V, p. 297.

³ An Essay on Fevers, etc., 2d ed., London, 1750, p. 20.

⁴ The Works of John Fothergill, Edited by Lettsom, 1784, Vol. III, p. 251.

⁵ L. C. Liber VI, p. 1—De Febribus publice grassantibus. According to Chauveau (Annales des Maladies de l'Orielle, etc., 1901, XXVII, pt. 2, p. 458) Paracelsus described diphtheria under the name of "prunella" before either Forestus or Baillou.

⁶ This little city of Alkmar in the Netherlands, where Peter Forest saw and described an epidemic of diphtheria, and where he himself contracted the disease, was sixteen years later threatened with another calamity. "If I take Alkmar," writes the Duke of Alva to King Philip, "I am resolved not to leave a single creature alive; the knife shall be put to every throat." Motley's Dutch Republic, Vol. II, p. 464. The bravery of the inhabitants saved them from this merciless fate.

autopsy in 1576. Ludovicus Mercatus,¹ who died in 1599, gives a long account of the epidemics in Spain in 1583 and subsequent years. It was called Garrotillo, after an instrument the Inquisition had made them familiar with, which was used to strangle people. He described the membranous condition of the throat as "pustules of various colors, especially verging toward the black, surrounded by fetid mucosities, with putrefaction and softening of these parts." A child bit the father's finger, while he was attempting to extract membrane from his child's throat, and he died two days later of the disease, which phenomenon excited the wonder of the author, who had referred the causes to changes in the patient's temperaments, or to atmospheric conditions. Thomas Bartholinus,² writing in 1646, says that the "Suffocative angina of children is like an epidemic disease, which from the year 1618 like a pest attacked children, and infected and killed others at Naples." "From the effects of the comet of the year 1618, Elisaeus, learned physician of this city, deduced the virulence of this disease." Gurlt (l. c.) gives the following extract from the brochure by Andrea Sgambato, "De pestilente Faucium," relative to an epidemic of diphtheria in Italy in 1617, after the appearance of three comets in the sky: "The torches of the comets were not yet extinguished, when a pest began to rage among the children which at first, especially in winter, spared no one. With such celerity did the infection pass from one to the other, that in a few days a father had to mourn the loss of all his children. It spared neither rich nor poor, and ravaged places apparently salubrious in the country before the city."³ In the form of a commentary on Aretaeus' work on the subject, Marcus Aurelius Severinus describes his experience with the pestilential sore throat at Naples in 1618.⁴ Bretonneau in the additions to his work (l. c.) transcribes an extract from a letter of Chisi (1748?), concerning the disease, which is clearly identified in the description he gives of an attack in his own son followed by diphtheritic paralysis. Huxham, whose notice of the disease in 1775 is included in his essay on fevers (l. c.), ascribes to Fothergill, in 1748, the first accurate account of malignant ulcerous sore throat in England. Dr. Francis Home, of Edinburgh, in 1765, published his famous work on the disease in the larynx, to which he was the first to give in medical literature the Scotch word of croup.⁵ It was a work which for a long time was widely

¹ Ludovici Mercati Opera., Francof., 1620, V, p. 134.

² Epist. Med., XLIX, Centur. I, Hague, 1740, p. 205.

³ Bretonneau; Des Inflammations Spéciales du Tissu Muqueux et en Particulier—de la Diphthérie, 1826, translates Carnevale's description of the epidemic in Naples in 1618, following the comet (De Epidemico Affectu). He also gives extracts from several ancient authors I have not had the opportunity, or have not taken the space to mention.

⁴ De Recondita Abscessum Natura, Frankfort, 1643.

⁵ An Inquiry into the Nature, Cause and Cure of Croup, Edin., 1765.

quoted, but apparently it included many cases of spasmodic laryngitis in children, as, indeed, continued to be the case in the diagnosis of diphtheritic croup, until the advent of bacterial classification.

Confusion with Scarlet Fever.—If the differential diagnosis is here at fault in comparison with modern knowledge, it is still more so in many other reports, in which it is impossible to be sure that scarlet fever was not included in the category of malignant sore throats. In very many of the reports this is self-evident. Scarlet fever, which becomes first clearly recognizable in the works of Ingrassias (1510–1580) as *rossalia*, and in that of Ballonius (l. c.) as *rubeola*, was first called “*febris scarlatina*” by Sydenham. It has often appeared as an epidemic when diphtheria has also been prevalent. This confusion is noted in the early work of Fothergill,¹ who first noted these throat disorders in England in 1739, and the same criticism may be applied to the work of Huxham. This is still more apparent in the early American accounts of throat epidemics. Dr. William Douglas communicated to a medical society in Boston his observations, which had a title, “*The Practical History of a New Epidemical Miliary Fever with an Angina Ulcusculosa*,”² which raged in Boston, but first broke out in Kingston township, fifty miles eastward of Boston, on the 20th of May, 1735. Dr. Douglas, however, as may be judged from the title, did not recognize it as the disease described by Forestus. Dr. Cadwallader Colden, in 1735, is said also to have published a treatise on “*The Sore Throat Distemper*,” and it is to him that Samuel Bard, M.D., in 1771, dedicated his essay, “*An Enquiry into the Nature, Cause, and Cure of the Angina Suffocativa or Sore Throat Distemper*,”³ a work so highly esteemed by Bretonneau that he translated it into French. Dr. Jonathan Dickinson, the first president of Princeton College, also described the epidemic of 1734–1735 in a letter from Elizabethtown, N. J., to a friend, which was afterward printed as a tractate in 1740, “*Observations on That Terrible Disease, Vulgarly Called the ‘Throat Distemper.’*” Angina was epidemic many times in New England from 1733 to 1787, and, without a doubt, this was probably both scarlatinal and diphtheritic according to our present nosology.

Beginning Differentiation of Throat Affections.—Perhaps no better example of this undifferentiated state of acute throat inflammation can be found, after the decline of the Hippocratic pathology and the classification of Aretaeus, than in the works of Christian Gottlieb Ludwig,⁴ whose namesake, eighty years later, gave the

¹ The Works of John Fothergill. . . . By J. C. Lettsom, London, 1783, I, p. 365.

² Vid.: An Essay on Scarlet Fever. By Caspar Morris, Phil., 1853. Appendix.

³ A very rare book, I believe, but to be found in the library of the New York Academy of Medicine.

⁴ *Institutiones Medicinae Clinicae*, Lipsiae, 1758, p. 134.

patronymic to a well-marked septic condition of the pharynx. In the eighteenth century Ludwig drew a sort of composite picture, which in a few years was to begin to undergo a process of resolution into its component parts. Nevertheless modern differentiation of throat affections may be said to have begun at this time. Rush¹ and Chalmers² evidently confounded spasmodic and diphtheritic laryngitis, but Rush later, in his works, recognized them as two different diseases. John Miller, to whom Rush addressed a letter on the subject, described "pseudocroup" and wrote on the asthma and whooping cough in 1768-69. Wichmann,³ in 1794, still further developed the differential diagnosis, Michaelis having, in Germany, exhaustively described true croup in 1778.

Tracheotomy.—An account of the history of tracheotomy naturally follows that of diphtheria. Since the days of Paulus Aegineta, who himself simply quoted from an earlier author, the opening of the air tube was described by the majority of systematic medical writers, but apparently practised by none whose records have reached us until the time of Brasavola. Numerous Arabian and pre-Renaissance writers mention it. Lisfranc, Nicholas Florentinus, William of Salicet, Petrus d'Abano, all make reference to it. Some have ascribed to Beniveni, who died in 1502, the first actual operation, but a reference to the 1507 edition of his book⁴ discloses the fact that his operation was an external pharyngeal incision into a peripharyngeal or perilaryngeal abscess, and by no means a tracheotomy, though it was successfully done for the purpose of relieving dyspnœa. It is doubtful whether Guido-Guidi ever performed the operation, though he recommends and describes that of Antyllus as a desperate resort, and he describes and figures silver and gold tracheotomy tubes.⁵ He was a friend of Cellini, and died in 1569. Casserius ascribes to Brasavola, who died in 1555, several operations for tracheotomy, the first operation being, according to Sanné, in 1546. Brasavola is quoted as saying: "When there is no other possibility, in angina, of admitting air to the heart, we must incise the larynx below the abscess," etc. (Holmes.)

Casserius practised the operation which his master, Fabricius, described and defended. Casserius' work⁶ is a very fine dissertation on the anatomy of the larynx and the ear, but his description of the operation of tracheotomy which he himself performed is not equal to that of Fabricius, who never did the operation.

¹ Medical Inquiries and Observations. London, 1789, p. 118.

² An Account of the Weather and Diseases of South Carolina, London, 1776.

³ Ideen zur Diagnostik. Hannover, 1794-1802.

⁴ De Abditis Nonnullis ac Mirandis Morborum et Sanationum Causis, Flor., 1507, Obs. XXXVIII.

⁵ De Curatione Membratim Vidi Vidii Junioris. Liber VIII, Cap. 5, Flor., 1594, p. 324.

⁶ De Vocis, Auditusque Organo, Historia Anatomica, 1600.

Gurlt¹ seems to understand that Casserius incised the tracheal rings, but I do not understand that the "*divisis annulis*" is to be so construed, but rather that they were separated, as in the operation of Antyllus. This is borne out by the description of Fabricius and by the subsequent history of the operation. It is probable that the difficulty in differential diagnosis, as to the site of the obstruction in respiration, at a period before they knew anything either of laryngoscopy or of the physical diagnosis of pulmonary conditions, and perhaps the lingering criticism of Aretaeus, that it was the "*pneuma*" itself or the vital principle which was affected in these cases, caused physicians to falter in what, to us, seems the most pressing of indications for operative interference. The dangers of the operation were also grossly exaggerated. So well did Casserius appreciate these fallacies that he declared that those who rejected bronchotomy are "*inhuman, awkward, timorous, and are even, as it were, to be held as homicides.*" Casserius' work was published 1600 and that of his master, in which I have found the reference to tracheotomy, in 1617. Apparently, therefore, he preceded him in the boldness with which he advocated the operation. Certainly he surpassed him in having himself performed the operation. Since, in Fabricius' long dissertation on the subject, he does not allude to Casserius, who was his favorite pupil and his successor, we may conjecture that the former's chapter on the subject must have been written, at least before Casserius published his book.

The Operation of Fabricius.—It is thus that Fabricius ab Acquapendente, in florid Latin, eloquently praises the operation of opening the *aspera arteria*:² "Of all the surgical operations, which are performed on man for the preservation of his life by the physician, I have always judged to be the foremost that by which man is recalled from a quick death to a sudden repossession of life, a feat which raises the surgeon nearest to the level of Aesculapius; that operation is the opening of the *aspera arteria*, by which patients, from a condition of almost suffocating obstruction to respiration, suddenly regain consciousness, and draw again into their heart and lungs that vital ether, the air, so necessary to life, and again resume an existence which had been all but annihilated." Fabricius reviews the disputes of former authors as to its utility, and says that it is useless when the lungs are affected and the whole trachea is full of material. "It is justifiable, in short, when the obstructing matter is only in the larynx above the place of incision. When below, it is to be refrained from." He assures us, contradicting himself somewhat, that even when there are some signs that the trachea is full, we should still operate. To escape the criticism

¹ *Geschichte der Chirurgie*, II, 487.

² *Opera Chirurgica*, De Chirurgicis operationibus, Cap. 44, Ludg. Batav., 1723, p. 475

of perhaps hastening death, "and because from the operation no small emolument may be derived," he advises that the patient's friends should be told of the desperate nature of the case. The operator should be a good anatomist. The fauces should be first explored with the finger, alone or armed with a short knife, bound to it in order to rupture any abscess which may be present, but if the trouble is in the larynx this is of little use. He is the first (unless it is Casserius) to criticise the transverse skin incision of the ancients, and counselled that it should be made vertically over the third and fourth tracheal cartilage. He defends the operation against the criticism of Aretaeus with quite modern arguments. As for the cartilage not healing by primary intention, would it not heal by secondary?¹ But even if it should not heal, the soft parts would sufficiently cover it. A longitudinal mark with ink was to be made down the middle line of the neck and a cross mark at the point of tracheal incision—scarcely the breadth of a thumb below the lower border of the larynx. Fabricius describes the cannula more explicitly than Guido. Straight and curved cannulas were in use, but Fabricius preferred the former. He declares that the surgeons of his own time, frightened by the warnings of the ancients, *have not* performed the operation, nor has he himself done so. Notwithstanding this work of Fabricius, which seems first to have been published in 1617, though presumably written several years earlier, it cannot be doubted that the operation was more common than we should infer from his remark, for Ballonius² in 1574, in considering the advisability of the operation, said: "Of course it is dangerous, but if it is done by a skilful hand, which knows how to avoid the recurrent nerves, it is free from danger. It promises certain safety. At any rate it is better to try a doubtful remedy than none, and it may be that it is omitted to the great detriment of patients." It is probable, therefore, that Fabricius' work on the subject had been written before that of Casserius, and it is evident that the operation had been growing in favor in the fifty years which had elapsed since the time of Brasavola, and had probably been often performed in that time. Marcellus Donatus in his curious book,³ first published in 1586, strongly urged tracheotomy when indicated, and in spite of the little esteem which his work has met with at the hands of the historians, he was one of the first to urge the pressing importance of postmortem examinations. Habicot,⁴ who was something of a charlatan, published a tractate entitled: "Question chirurgicale, dans laquelle il est démontré que le chirur-

¹ The cartilage is always spoken of, but of course it is the tissue between the rings which is referred to.

² Opera Omnia, Venetiis, 1734, Tom. I, p. 163. Epidemorum et Ephemeridum, Lib. II.

³ De Historia Medica Mirab., Lib. III, Cap. I, Francof., 1613, p. 230.

⁴ See extract from his work cited in Dict. Hist. de la Médecine, (Dezeimeris) II, Paris, 1834, p. 682.

geon doit absolument pratiquer l'operation de la bronchotomie, autrement la perforation de la flute ou tuyau du poulmon" (1620).

His experience consisted principally in two operations on persons not affected with angina, one a wound of the larynx and another a case of foreign bodies—gold pieces—in the pharynx. He describes the size and forms of tracheal cannulæ. Louis, who has given a most excellent history of the operation,¹ quotes from Fonseca, a Portuguese author who died in 1632, the curious history of a young surgeon of London who was bribed to attempt to save the life of a robber who was to be hung. He made an incision into the trachea and inserted a tube. The noose failed thus to shut off the malefactor's breath, but, being a heavy man, although life was not extinct when the body was delivered to his friends, he died, very shortly after regaining consciousness, from the effect of his great weight producing other fatal damage.

Sennert,² a voluminous writer in the early part of the seventeenth century, who, on a careful inquiry into the efficacy of birds' nests in angina, came to the conclusion it was due to birds' dung mixed with the dirt, approved of tracheotomy in desperate cases, if performed by skilful hands. In 1646 the question of tracheotomy was discussed in the letters of Thomas Bartholinus and Moreau.³ The latter says, writing from Paris: "As for me, I have seen innumerable people, suffering with angina, saved by venesection alone from the arms, so often praised, fewer carried off by the neglect of the administration of remedies at the proper time, and a very few in whom bronchotomy might have been judiciously and seasonably used." He describes the operation he performed on a soldier, in which he made use of the transverse incision, and used a curved leaden tube with strings to attach it around the neck. He had performed it also in children, and one should not wait until they are nearly suffocated, he says. In them a shorter tube is to be used.

Laryngocentesis.—In another work of Bartholinus⁴ he mentions that John Van Horne, in dissecting the body of a man dead of phthisis, pointed out, among other operations, the place for a laryngotomy. Although Sprengel asserts (VII, 144) that Frederic Dekkers was the first to recommend paracentesis of the trachea, in a work published in 1694, on bronchotomy, Sanné states that, according to Malavicini, Sanctorius (died 1636) first made use of a trocar, the cannula of which he left in the wound for three days. This procedure, laryngocentesis, was also described in 1748 by

¹ Sur la Bronchotomie. Mémoires de l'Académie Royale de Chirurgie, Paris, 1784. T. IV, p. 455.

² Opera Omnia, Tom. II, Lib. II, Part I, Cap. 24, Parisiis, 1641, p. 400.

³ Thomae Bartholini Epistolae Med. Centur., 1740, I Epist., LXXX and LXXXI, p. 331.

⁴ Acta Medica and Phil. Hafn., Hafniae, 1673, I.

Garengeot.¹ For the reasons suggested, or perhaps for others less apparent, tracheotomy found its way into favor very slowly. The singular mistake of Detharding,² in the early part of the eighteenth century, although it doubtless caused many useless operations, must have done much to familiarize the profession and the laity with the operation. His advocacy of tracheotomy in cases of drowning, advanced in 1714, arose from the observation that the lungs and the stomach of a drowned person did not contain the water, which had formerly been supposed to be the cause of their death. As one of his arguments he cites Wepfer, from whom we have had occasion to quote, as having incised the trachea of a beaver after having been held under the water until drowned, and as having been unable to press any water out of the lungs. He supposed that the structure and action of the glottis and epiglottis prevented, not only the entrance of the water, but frustrated the subsequent efforts at artificial respiration. He counselled, therefore, doing a tracheotomy and blowing air into the lungs. While this idea was frequently put into practice by many eminent surgeons for more than a hundred years, it never was universally accepted as a proper procedure, and it finally fell into disuse.

The Modern Operation.—We now note the first great advance in the technique, since the first mention of the operation. Although others, as Casserius and Fabricius, had declared that cut cartilages healed kindly and easily, division of them was always avoided. Juncker,³ in 1721, said of bronchotomy, that some advised the ring to be cut, which allowed more convenient placing of the tube, but he thought this renders the healing more difficult, and he advised that it should only be done for foreign bodies, in which case many rings may be cut. A little before this time, Heister⁴ apparently first advised the division of the rings as a routine practice. He speaks of tracheotomy in the "Bräune," and for resuscitation of the drowned. Platner,⁵ in 1758, approved of bronchotomy, when necessary, in angina, and says it is safe to cut the cartilaginous rings. He did not approve of paracentesis. Vic d'Azyr,⁶ in 1776, communicated to the Royal Society of Medicine of Paris his reflections on the possibility of laryngotomy between the thyroid and cricoid cartilages.

Laryngotomy.—According to Sprengel, Desault was the first who practised laryngotomy, splitting up the thyroid cartilage in

¹ *Traité des Operations*, etc., 2d Edit., Paris, 1731. Perhaps also in the 1st Edit., 1720.

² *Epistola ad Luc. Schrockium*. Haller's *Disputationes Chirurgicae*, Lausanne, 1755, T. II, p. 428.

³ *Conspectus Chirurgiae*, Halae, 1721, p. 665.

⁴ *Chirurgie*, Nürnberg, 1719, p. 555.

⁵ *Institutiones Chirurgiae*, Lipsiae, 1758, p. 65.

⁶ *Hist. de la Soc. Royale de Méd.*, 1776, p. 311.

an individual in the larynx of whom a foreign body had lodged. While Desault urged the propriety of such a procedure in cases of this kind, I find no record of the fact that he performed it, in any of the many editions the great Bichat issued of his works. We have noted a similar suggestion in Juncker, in regard to the tracheal rings. Pelletan¹ records a case, operated on in 1788, in which he did a laryngotomy, dividing the thyroid cartilage in order to push down into the œsophagus a foreign body arrested at that point. The man recovered but remained hoarse, and according to Pelletan such will always be the case when the incision includes the larynx. In another case (Obs. IV), in 1805, he divided the cricoid cartilage alone. Holmes attributes the origin of the modern tracheotomy tube to A. G. Richter, who published his *Obs. Chirurg.* in 1776.²

Tracheotomy in Diphtheria.—From what has preceded it is evident, I think, that many of the cases in which tracheotomy had been done, were suffering from diphtheria; but when Bretonneau wrote his great treatise³ he cited from Borsieri the report of an operation, as the first instance in which it was clearly evident that the obstruction to breathing, for which it was done, was due to croupous laryngitis. It was performed by Andrée, a skilful London surgeon, in 1782, upon a five-year-old boy, who recovered in fifteen days.⁴

INTRANASAL SURGERY AND PATHOLOGY OF THE SEVENTEENTH AND EIGHTEENTH CENTURIES

Operations for Nasal Polypi.—We will now turn our attention to that part of intranasal surgery which has always occupied, to some extent, the activities of medical men—the removal of nasal polypi. We have seen the skilful procedures of Hippocrates. We have seen the barbarous modifications of them by Paulus and the Arabians with their knotted strings and little saws. Velpeau,⁵ who gives a very much fuller account of the ancient history of this subject than I can find room for here, refers to a procedure I have not elsewhere met with in my reading. He says that William of Salicet proposed the gradual dilatation of the anterior openings of the nostrils with a sponge, or some other device, to render avulsion of nasal polypi easier of execution. The knotted strings of horse-hair and of silk were soon abandoned after the Renaissance, and in 1571 Aranzi or Arantius, in giving an account of his method of dealing with nasal polypi, describes not only a forceps with

¹ *Clinique Chirurgicale*, Paris, 1810, I, p. 1, Obs. 7.

² *Observationum chirurgicarum fasciculus secundus*. Gottingae, 1776.

³ *Des Inflammations spéciales . . . et . . . de la diphthérie*, Paris, 1826, p. 327.

⁴ The reader is referred to the treatise of Sanné on Diphtheria, to Gurlt's *History of Surgery*, and to Louis *Sur la Bronchotomie* (l. c.) for a fuller account of the operation.

⁵ *Nouveaux Eléments de Médecine Opérat.*, Paris, 1839, III, p. 595.

long jaws he had invented for the purpose, but he gives still more interesting details of his way of illuminating the anterior nares.¹ He speaks of the difficulty of blood obstructing the view in the use of the knife, and to obviate this he constructed his long forceps. He obtained illumination by placing the patient in a darkened room and making a hole through a wooden shutter to admit the ray of light, which was to fall directly into the nasal cavity, which he rendered more patent by raising the end of the nose. On cloudy days he used artificial light, magnified by a water bottle.

Remembering that in the sixteenth century not only were the Greek medical works more faithfully translated into Latin, but that they were more widely read in the original, we may easily conjecture that Fallopius² drew his idea of the wire snare for nasal polypi from the works of Hippocrates, but it differed very much from the devices the latter employed, and it is in very fact the modern nasal snare of Jarvis, without the wheel, of which all others at present in use are modifications. By Fallopius' reference to nasal hemorrhoids we also perceive he was familiar with the Arabian pathology, but he makes a distinction between them and ordinary polypi, practically much as we now do more exactly. The hemorrhoids were our vascular hypertrophies, and the polypi were our œdematous growths, the former being noted far back in the nose (posterior parts of the inferior turbinated bones?), and the latter being situated in more accessible regions, as a rule. For the cure of the anterior growths he used the ligature, leaving it around the growth for two or three days, when it would fall off with the constricted mass. This method he did not apply to hemorrhoids or "carunculæ" in the back part of the nose. He says: "But when the polypus is well within the nose it is difficult to use the ligature, which should encircle the roots of the polyp." He mentions the forceps operation of Paulus and continues: "But I take a silver tube which is neither too broad nor too narrow, and then a brass or steel wire, sufficiently thick, preferably the iron wire from which *harpsichords* are made. This doubled, I place in the tube so that from this wire a loop is made at one end of the tube, by which, used in the nares, I remove the polyp. When the polyp is engaged in the loop, I push the tube to the root of the polyp, and then pull on the metal threads sticking out at the lower part of the tube, and thus I constrict the roots of the polyp and extract it, since by this wire loop the root of the polyp is cut because it is a soft substance." Harder growths he pulled down so that he could cut off the roots with a knife.

¹ Julii Caesaris Arantii: De Tumoribus Secundum Locos Affectos, p. 172.

² Institutiones Anatomicae: De Tumoribus Narium, in Opera Omnia., Francofurt, 1600, II, p. 298.

Fallopius' tractate, De Tumoribus præter Naturam, was first published 1573, and the publication of his snare dates back to that, but he died in 1562.

Fallopian praised his instrument as very efficacious, and he used it also for polypi of the rectum. He condemns strongly the use of a cautery through a speculum, regarding the practice as dangerous. He also speaks of the string-sawing method, which he had never used. His is the first improvement on the method of Hippocrates in removing nasal polypi. Fallopian died in 1562, two

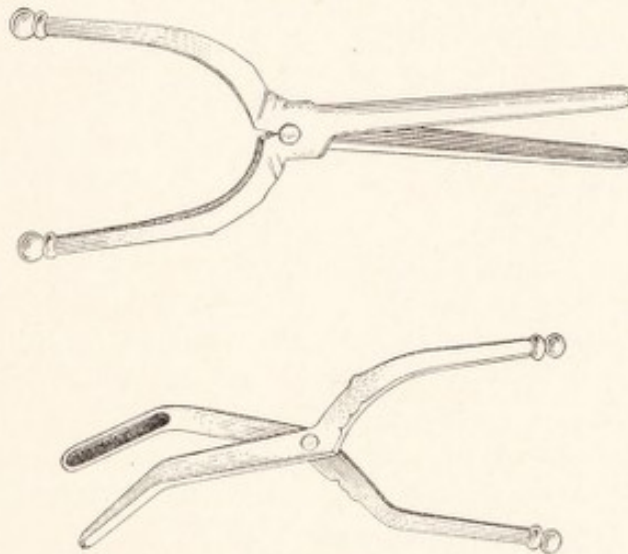
FIG. 12



Fallopian's nasal snare.

years before his much-admired preceptor, Vesalius. The description of his snare was not published for many years after his death. Rhinologists cannot fail to be struck with the appearance, at such an early date, of what is practically a modern instrument. For some reason the advantages of the steel wire were not appreciated, and the instrument was not destined to come into use until it had been reinvented after the development of other adjuvants of intranasal surgery. Kubo¹ in an interesting article on the ancient

FIG. 13



Fabricius' forceps for nasal polypi.

history of rhinology in Japan refers to a snare, similar to if not identical with that of Fallopian, which he supposes, probably with reason, to have been invented independently. Many snares and devices for tying ligatures around polypi were subsequently invented, but without the elastic steel wire they were little, if any, superior to the intranasal forceps. These latter, though used by Aranzi and

¹ Archiv für Laryngologie und Rhinologie, XIX, p. 145, 1907.

even by earlier operators, came into favor principally through the advocacy of Fabricius ab Acquapendente. Gurlt speaks of Dalechamps, a French surgeon of about the same period, using an instrument similar to Aranzi's, but Paré knew no better treatment for polypi than local applications and the cautery. The forceps invented by Fabricius were really scissors curved at the end. There were many modifications of them. Thus, John Van Horne (1621-1770) added teeth to their points with which to seize the polyp.

Thomas Bartholinus relates a fatal case of hemorrhage from their use, although Fabricius had boasted they were entirely safe (*tutissimum*).

Riolan¹ (1577-1657), in his works, illustrates the general practice in regard to intranasal surgery of this kind, which we may see was inferior to either the procedure of Fallopius or to that of Fabricius for the removal of polypi. He mentions five methods: (1) Astringent and other local applications of drugs. (2) The operation of Celsus and Galen—cutting with a flat-pointed probe and burning the roots with a cautery. (3) When coming down behind the palate, pull it down with the forceps and cut it off. (4) It may be burned; or (5) cut off with horse-hair in the manner recommended by Mesua.

Glandorp, in whose tractate² published in 1628 full references will be found to previous literature, apparently was ignorant of Fallopius' instrument, for his own device was greatly inferior to it, though it, unlike the earlier and better snare, was adopted and modified by many subsequent operators. It was a sort of a hook, a shank with a curved end and an eye at the point, through which a waxed-silk thread was to be passed. A knot being firmly tied and the thread twisted, the polyp was thus ligated until upon the ninth day it would fall away. Fabricius Hildanus used a seton in the nose, and tried to get rid of the polyp by suppuration. More than 200 years after Fallopius' death, Levret published, in 1771,³ a most elaborate and exhaustive treatise, containing accounts of the most ingenious and complicated instruments for the ligation and extraction of polypi. Notwithstanding their ingenuity, they seem utterly worthless viewed from a modern standpoint.

Much more practical and efficient, it would seem to us, were the instruments of Benjamin Bell.⁴ Although Heymann asserts that the first mention of Belloc's sound is to be noted in the work of Deschamps in 1805, a similar instrument is to be found described in Bell's work in 1791. He figures different forms of snares and forceps for removing nasal polypi. The best of the former is

¹ *Opera Omnia*, Parisiis, 1610, *Morbi Narium*, p. 448 et seq.

² *Tractatus de polypo narium*, etc.

³ *Observation sur la cure radicale de plusieurs polypes de la Matrice, de la Gorge, et du Nez.*, 3 éd., Paris, 1771.

⁴ *System of Surgery* (first edit., 1784), Am. edit., Worcester and Boston, 1791, vol. III, p. 42 et seq.

perhaps a double cannula, in each tube of which the end of a pliable wire was to be inserted and drawn through, leaving a loop at the end. The double cannula was then, after adjustment to the polyp, revolved in the nose, which, twisting the wire, constricted the polyp. The apparatus was then left in the nose, tightened at intervals, until after a few days the growth came away. Some of the operations performed with forceps were of the most atrocious nature. For the details of a revolting operation for polypus nasi I commend the reader to descriptions in Le Drans' works.¹ After failure of evulsive methods, he used a seton saturated with some medicament of a styptic nature.

Percival Pott,² who mentions the wire snare, declares he has seen the septum and pieces of the palate pulled away by the forceps and other evulsive methods. He believed there were many polypi, which, though not malignant, should be left alone on account of the impossibility of a successful operation. He denied with scorn the efficacy of escharotics and setons. Mann, according to Cloquet³ and Petit, according to Garengot,⁴ first split the soft palate for the extirpation of a postnasal polyp.

The Pathogenesis of Nasal Polypi.—Some account may now be given as to the ideas in regard to the etiology and pathology of the nasal polyp. A singular conception of the etiology and pathogenesis of the polyp, in pre-Schneiderian days, may be found in Forestus. In spite of the monstrous error of conception, we may perhaps recognize the germ of the idea which subsequently became the accepted one until the rise of the myxoma mistake in the last half of the nineteenth century. Forestus, writing in the last years of the sixteenth century, mentions (l. c.) the remarkable case of a woman in whose nostrils a huge polyp had grown "due to her carrying heavy weights on her head; it forced the mucus down into the membranes of the nose." She was cured by ligation of the polyp and the application to its stump of vitriol; but when she resumed her occupation, it again returned and was again cured in the same way.

Previous to the eighteenth century nasal polypus was still a very comprehensive term, and Van Meckren⁵ even gave that name to a piece of wood, covered by granulations, which was expelled from the nose of a patient he was treating by local applications.⁶

Passing over a hundred years from Forestus, and beyond the advent of the Schneiderian anatomy, we find the idea modified by

¹ *Traité des Opérations de Chirurgie*, Paris, 1742, p. 455; *Observations de Chirurgie*, 1731.

² *Chirurgical Observations*, London, 1775, p. 43.

³ *Osphrésilogie*, p. 668.

⁴ *Traité des Opérations*, Paris, 1731, T. 3, p. 52, obs. V. Garengot does not state which of several French writers before him of this name he refers to.

⁵ *Observationes Medicae Chirurgicae in Latinum translatae ab Blasio*, 1682.

⁶ The earliest account of a rhinolith I have noted is by Thos. Bartholinus. It is referred to by Cloquet: *Osphrésilogie*, p. 627.

Saint Hilaire.¹ "*The polypus*. When this excrescence is hard and is not pendent they call it sarcoma, which is a great, round tumor, which has not a root like the polypus; moreover, sarcoma always commences at the lower part of the nostrils, and the polyp takes its origin in the osseous lamellæ at the root of the nose. In order to well understand the cause of this excrescence, it is necessary to observe that the internal membrane of the nose is very thick and spongy, and is bathed in a sticky, viscid humor, and its porosities are so arranged that it only gives passage to those parts of the blood which are the thickest and most likely to produce excrescences. All these causes joined together contribute greatly to the generation of polypi. Whenever a little heat and disturbance get into the blood, its movement increases, its viscid parts are extruded, the heat fixes them and condenses them, and their abundance in a part as spongy as the nose, furnishes the substance of the polyp, because these humors becoming arrested in the tissue of this membrane, they swell its vessels and dilate its glands; the matters congeal, and are changed into a fungous and carcinomatous mass and, by the addition of new matter, the polyp enlarges and grows. The polyp indeed may also be engendered by an acrid lymph, which erodes the glands and the channels of the internal membrane of the nose in such a manner that the nutrient juice, becoming infiltrated by the ulceration of this membrane into the interstices of its fibers, coagulates there and forms, little by little, those excrescences which they call polypi. One may again attribute the cause of these excrescences to the little glands of the membrane, which, in dilating, become joined together and form that which we call polypus. The acidity of the humors may, indeed, contribute to the generation of these excrescences, because it can coagulate the nutrient juice, which become lodged in the glands, remains there, having lost its fluidity, and new juice flowing there and coagulating, it forms a tumor in the nose, which they call a polyp."

I am sure I may be pardoned for giving room to this verbose and confused extract, because it illustrates very well, indeed, the new light, as yet but little appreciated, which had been shed over medicine by the discovery of the circulation of the blood and the lymph, and by the demonstration of the glands as well as by the anatomical researches of Schneider. Through it all there runs the influence of both the iatrochemical and the iatrophysical school.

Although he practically adopts the classification of Hippocrates, mentioning five kinds of polypi, Dionis,² the first edition of whose surgical work was published in 1707, makes this distinction between two varieties: "One is an excrescence formed by the engorgement

¹ L'Anatomie du Corps Humain. Par le Sieur de Saint Hilaire, 1698. Tome I, p. 43. Des maladies du nez.

² Cours d'Opérations de Chirurgie. Bruxelles, 1708, p. 392.

of the glands which line the walls of the pituitary membrane, and the other is the extension of this membrane gradually elongated." One has only to read Boerhaave and Morgagni to perceive that they also had the idea of a membrane clogged with humors. Boerhaave in his *Institutiones*¹ could only account for the formation of a polypus, by supposing that the nasal passages and the sinuses becoming clogged with inspissated mucus, the mucous membrane was unable to discharge its humors. Popular belief in the reality of lunar influences, a lingering of primeval superstition, is reflected in the works of Juncker² in his references to this subject. He says, that according as the moon fills or wanes, the polypi of the nose increase or decrease in size. "Hence it may be concluded it is best to attack the polyp in the waning of the moon." After this it is necessary to add that he was a respected and distinguished medical writer in his day.

Gorter³ speaks of nasal polypus thus: "It seems sufficiently evident that the pituitary membrane is separated from the bone, often carious, in the cavity of the nostrils, so that it makes a pendulous sac, either single or multiple, according as this membrane is separated from one or more depressions of the small bones, which sacs swell with secretions collected in the cellular lamellæ of the membrane."

Heister,⁴ the great German surgeon of the eighteenth century, adopts this pathology, and, referring to the earlier work of Palfin, who had made the same observation,⁵ he speaks of polypi springing from the accessory sinuses and the cavities of the ethmoid.

Morgagni,⁶ while accepting this view, differentiates much more intelligibly than previous writers the various phases of intranasal disease. Referring to cases of polypi of the maxillary antrum reported by Meckren and Palfin, he says that they are much more frequently seen, at postmortem, outside than inside the sinuses. He describes hypertrophies at the lower border of the inferior turbinated bones, which he regarded as glandular, doubtless more on account of their nodular surface than on account of histological findings, of which nothing was yet known in these cases.

The Anatomy of the Accessory Nasal Sinuses.—We will now turn to the accessory sinuses which have, of late years, assumed a position of such striking interest in rhinology that they deserve a special

¹ Boerhaave's *Academica*, Lectures on the Theory of Physic, being a genuine translation of his *Institutes*, London, 1751-57, vol. IV, footnote, p. 28.

² *Conspectus Chirurgiae*, Halae, 1721, p. 236.

³ *Chirurgia Repurgata*, Lugd. Batav., 1742, § 882, p. 201.

⁴ *Chirurgie*, 1743.

⁵ A surgeon of Paris once told me he had seen a polyp which had its attachment within the cavity of the os maxillare and had grown through the hole of communication into the nose; this he had observed after death. Palfin, *Anatomie du Corps Humain*, II me partie, Cap. 15, edit. 1726, p. 92.

⁶ *De Sedibus et Causis Morborum*. Lib. I, Epist. XIV, Venetiis, 1761, I, p. 108 et seq.

notice of their anatomy, physiology, and pathology. Notwithstanding that Galen refers in several places¹ to the porosity of the bones of the head making them of little weight, there is no direct reference, so far as I can discover, to the sinuses. As we have noted, Berengar described them, and he is credited with being the first definitely to indicate their existence. Vesalius² described the maxillary, frontal, and sphenoidal sinuses, and asserted that they contain nothing but air. Both he and Fallopius (Institut. Anatom.), in quoting Galen, leave the impression that the latter had definitely noted the accessory sinuses. They agree with him in explaining the porosity of the bones of the head as having been created to render them less heavy. Massa, who wrote before Vesalius' work saw the light, also entertained³ this view. We have noted that Colombo suggested the name *Ampullosum* for the *os maxillare* on account of its sinus. After Berengarius, Fallopius⁴ first added materially to our knowledge of the accessory sinuses. Describing the sphenoidal sinus, he says: "There is no cavity in children until they arrive at maturity. In adults, however, it is found double and sufficiently large. It begins to form after the first year. . . . Those cavities, contained in the frontal and cheek bones, are not to be found in the skulls of the newly born." After criticising some erroneous opinions which certain anatomists have entertained in regard to the sphenoidal sinus, he says: "The third opinion is that they serve for holding the air before it enters the brain. This, while a more respectable opinion, becomes ridiculous in view of their absence in infancy," and he adds the sage remark: "*Ex his colligo licere cuicunque philosophari, at non semper sine errore.*" In another trite Latin sentence he accepts the idea of Galen: "*Nam natura, cum vult extendere et non addere materiam, inflat et faciat ut illae partes sint leviores.*" Notwithstanding the fact that this ancient view is still the accepted one, so far as we at present indulge in any teleological speculations at all, there have always been numerous divergences of opinion as to the uses of these cavities. Thus Veslingius⁵ says: "There is much doubt as to their use. Each one forms his own conjectures. Some, as Placentinus, claim they contain mucous humor which is distilled into the nares; others that they serve to make the voice more resonant, because in those who speak badly they are not found. Some think the air is elaborated in them for the generation of the animal spirits. Spigelius thinks they are for drawing in the odors. Others think they contain the humor by which the eyes are moistened and lubricated." He himself accepted the view of Galen.

¹ As for instance *De Usu Partium* IX, 2 et seq., (Kühn) III, p. 691.

² *De Humani Corporis Fabrica*, Lib. I, Cap. VI-IX.

³ *Epist. Med. et Philosoph.*, 1542. *Epist. V.*, Venetiis, 1550, p. 55.

⁴ *Gabrielis Fallopii: Obs. Anatom.*, Francofurti, 1600, p. 367.

⁵ *Syntagma Anatomicum*, Appendix, Pars XIX, 1637.

A reference to Spigelius¹ will show that he doubted their adding any quality to the voice, a function ascribed to them, however, by Bartholinus, who asserted² they were not present in those of a faulty voice. Both Fallopius and Veslingius, as well as Jessen (1601), supposed they were also instrumental in the generation of the animal spirit. Jessen and Bartholinus believed the frontal sinus contained a viscid liquid, which lubricated the eyeball. Paaw³ speaks of the frontal sinus as containing a viscid matter, not dissimilar to the substance of the brain, but, "far more likely in my opinion is the use of this cavity that of receiving the air drawn through the nostrils into it, so that it may be better assimilated and prepared for the brain. Unless it is thus properly prepared by this and other sinuses, the ingress of this crude and unprepared air causes catarrhal troubles of the brain." These opinions of more original observers are reflected in a curious book⁴ on anatomy published in English, evidently for popular use, by a Dr. Alexander Read, in 1642. He speaks of the frontal sinuses as double in childhood, but one in those of ripe age. "These cavities contain a clammy substance, kept in by a green membrane. They are for the retention of the odor, before it is carried into the brain." As for the sphenoidal sinus, he says, "there is a cavity like to those above the eyebrow," but he speaks of the ethmoidal as furnishing a way for the excretions of the brain. Schneider's works finally revolutionized all this. He declared that the sinuses had nothing to do with the animal spirit and were empty. The latter opinion, however, made its way very slowly. Almost a hundred years after Schneider, the great Boerhaave declared, in his lectures, not only that acuteness of smell largely depended on the size of the frontal sinus, their presence allowing a greater extent to the pituitary membrane, but he also was of the opinion that they acted as reservoirs for the nasal secretions. He remarks that the reason why children's noses are always running, is that the accessory sinuses are not sufficiently developed to contain the mucus. Much of Boerhaave's nasal pathology was based on this conception. The fluid, which the earlier anatomists supposed they contained, was thought to have come from the brain. After the publication of Schneider's works, Diemerbroek still believed, as has been stated, that it came from the brain, but through the mucosa which lines the nose and its cavities, thus keeping the latter full. Vieussens (born 1641) supposed they contained a thick fluid, filtered out of the blood on its way to the brain. Much later the great Haller⁵

¹ De Human. Corp. Fabr., Opera Omnia, 1645, p. 35.

² Anatomia . . . Reformata. Hagae Com., 1660, p. 488.

³ De Human. Corp. Ossibus., Amst., 1633, p. 37-38.

⁴ The Manual of Anatomy, or Dissection of the Body of Man, London, 1642, p. 397.

⁵ Elementa Physiologiæ Corporis Humani. Liber XIV, § 5, Lausanne, 1763, V, p. 180

in the eighteenth century accepted this view, intimating they were reservoirs for lubricating the nasal mucosa. Verheyen (1648-1710) had, however, previously asserted they were empty. Reininger partook of the view of Haller, saying the sinuses were so arranged as to the nasal cavity that whatever position we are in, their contents will drain out of one or more of them, collecting in the others, until they in their turn are emptied by a change of position. Morgagni¹ declared the maxillary sinus was occasionally absent. Weinhold (1783-1829) thought the sinuses were cavities, which suck the impurities out of the blood and hold them, and that they are to be regarded as the equalizing apparatus, the "equatorial bearers" of the arterial system throughout the animal kingdom.² The frequency with which the accessory sinuses have lately been found, postmortem, to contain sero- or mucopurulent fluid, satisfactorily accounts for this divergence of views. A more palpable error was committed by Spigelius, Bauhinus, Laurentius, Paaw, and many others in supposing that the sinuses are lined by a green membrane. It was pointed out by Schneider that this condition was entirely due to postmortem changes.

Wounds of the Accessory Nasal Sinuses.—Early surgeons were familiar with the wounds, but not with the diseases of the frontal sinus. Hence we find at first no reference to the intentional opening of it, but evidently it was occasionally inadvertently included in the field of operation in trephining for cranial fractures. Ambroise Paré,³ speaking of the wounds of the head, warned against trephining the frontal sinuses, as they are "filled with white, sticky fluid as well as with air." Elsewhere⁴ he says that he had seen a surgeon trephine the sinus, in wounds of it, under the impression the brain was injured. "Wherefore it is necessary for the surgeon to become acquainted with this cavity, which he can do by breaking open several heads of the dead."

Fabricius Hildanus (l. c.) speaks of wounds of the frontal sinuses "not healing easily and often degenerating into fistulæ and malignant ulcers." "The wounds of these cavities have such a large communication with the eyes, that I have seen acrid and corrupted pus, which flows from these cavities, fall upon the conjunctiva and push the eye out of place." Verheyen⁵ says that he was once present at an operation on a sheep, for the removal of worms from the frontal sinus, but the animal died because the operation was too extensive. Palfin had seen the same mistake as Paré, and his differential points to distinguish the frontal sinus from the cerebral cavity in wounds of the head were: (1) "When one sees

¹ *Adversaria Anatom.*, Lugd. Batav., 1723, I, p. 38, VI, p. 116.

² The incompleteness in the references, to be here noted, may be supplied by referring to the much more exhaustive history given by Zuckerkandl, *Normale und pathologische Anatomie der Nasenhöhle*. Wien., 1893, I, p. 1.

³ *Chirurgie*, Livre X, Chap. 21, Edit. 1564.

⁴ Livre V, Chap. 4.

⁵ Quoted by Palfin: *Anatomie*, Paris, 1726, part II, p. 93.

mucus coming out of the wound. (2) When air is blown from the wound by expiratory effort with closed mouth and nose. (3) The penetration of injected bitter water from the wound to the throat, or (4) its discharge from the nose." He relates several interesting cases where this mistake was made.

Worms in the Accessory Nasal Sinuses.—The remark of Verheyen, in regard to worms in the frontal sinus of a sheep, finds a precedent in human pathology in the observation of Beniveni, published as early as 1507.¹ He relates the case of a friend of his by the name of Phillip, who suffered atrociously with such pain in the head that his eyes grew dim, his mind wandered, vomiting occurred, the voice was lost, the body was cold, and even life itself seemed lacking; but when death really seemed imminent and there seemed no help, he suddenly passed from his right nostril a worm as long as a palm's breadth, and of a most robust nature, and all his anguish was relieved.

Morgagni,² referring to Littré as having, in 1704, conceived the idea of trephining the frontal sinuses, says that Mangetus, according to Vallisnieri, had performed the operation for the removal of a worm whose presence he had diagnosticated as giving the patient great pain. According to Cloquet,³ Vallisnieri was the first who spoke of worms in sheep's noses from the true stand-point, but Morgagni, speaking of worms being frequently found in sheep's noses and rarely in man's, credits Fernelius⁴ with having first declared that the brain was not the origin of worms in the nose. This subject of worms in the nose was exhaustively discussed in the first part of the eighteenth century by Salzmann and Honold.⁵

The following is from Boerhaave's *Institutiones* No. 792:⁶

"There was a distressing example of a girl at Rotterdam, whose six pituitary sinuses were all full of worms, which kept on growing and appeared from hour to hour; and this girl I cured by a slight fumigation with cinnabar and a decoction of tobacco in water which, being snuffed up the nose, obliged the worms to move their quarters."

Perhaps the earliest reference to what may have been sinus suppuration is to be found again in Fernelius: "There forms sometimes abscesses around these places without fever or very

¹ Antonii Benivenii, *De Abditis Nunnallis ac Mirandis Morborum et Sanationum Causis*. Flor., 1507.

² *De Sedibus et Causis Morborum. De Morbis Capitis*, Epist. Anatom. Med., XIV, sec. 20 et seq. 1761, I, p. 115.

³ *Osphrésiologie*, p. 617, note.

⁴ Fernelius, born in 1497, died 1538, was the physician who cured the beautiful but frail Diana, of Poitiers, and is said to have been the first, since the time of Al-Mamun, the Arab (876-833), to calculate the circumference of the globe.

⁵ *De Verme Naribus Excusso*. In Haller's *Disputat. ad Morb. Hist.*, 1721, I, 385.

⁶ *Acad. lect.*, V, p. 487.

much pain, and after their rupture I have seen true pus run in abundance from the nostrils, as it comes out of purulent ears, and this without any prejudice to the general health." Morgagni (l. c.), from whom I have quoted this extract, comments on it, saying that doubtless Fernellius was referring to the accessory sinuses, "for how could a man like him suppose the pus came from the anterior cavities of the brain?" One might answer, that without the anatomical knowledge supplied by Schneider 100 years later, it would have been strange if Fernellius thought of the pus or the worms either, as having come from any place but the brain. One is therefore not surprised on turning to the passage,¹ evidently referred to by Morgagni, to find no warrant for supposing that Fernellius suspected the true origin of the pus or the worms. His work appeared first in 1567.

Surgery of the Maxillary Sinus.—Nathaniel Highmore, in 1651, described² the sinus, which bears his name, and gave some poor representations of it. He, however, mentions a case of suppurative disease of the cavity in a woman who had some bad teeth in the upper jaw. This was before the publication of Schneider's work, though, as we have seen, the sinuses had long been well known.

Velpeau³ quotes Molinetti, who wrote in 1675: "In a patient suffering from terrible pain, they made a (external) crucial incision on the jaw, and with the crown of the trephine penetrated into the antrum of Highmore, which was the seat of the abscess."

Morgagni intimates that Jean Henry Meibomius, who died in 1655, invented what we now know as Cowper's operation for opening the maxillary antrum, and his son practised it. Velpeau says that Zwingler, before Meibomius, pulled out teeth and, dilating the alveoli with a sponge, made exit for pus from the antrum. There were three medical authors by the name of Meibomius, apparently different generations, but their works, as well as that of Zwingler, are inaccessible to me. William Cowper contributed the chapter on the diseases of the nose to Dr. Drake's "*Anthropologia Nova*," which was published first in 1717, and there⁴ is to be found the description of the operation as we know it.⁵ ". . . By all which, it appears with what difficulty any peccant humor, lodged in either of these cavities, can be discharged by the foramina narium, since these cavities must be either filled up to the top ready to run over first, or the head must be held down to procure the discharge. This induced me to put into practise an operation, in the cure of

¹ *Johanni Fernellii Ambiani, De Morbis Universalibus et Particularibus*, Edit. 1656, Lib. V, Cap. VII.

² *Corporis Humani Disquisitio Anat.*, Hagæ Com., 1651.

³ *Nouveaux Eléments de Médecine Opératoire*, Paris, 1839, III, p. 608.

⁴ Drake, J., *Anthopologia Nova*. Book III, Cap. 10, London, 1717, II, p. 305.

⁵ From the spelling which is usually employed (Cooper) doubtless many have attributed this operation to Sir Astley Cooper, who lived a hundred years later.

ozæna, which appeared reasonable to me by the structure of the part, I being convinced it might be done without hazard to the patient. After the foremost Dens Molaris was taken out, not finding an aperture from its alveolus into the antrum, which in other instances I have seen happen, with a convenient instrument I bored the hole of the alveolus into the Antrum Genæ, whereby the pus, which before lay in the antrum, ran out, and the medicines that were daily injected by this aperture passed into the nostrils, whereby the patient was cured, though this disease had continued, with a vast flux of stinking matter daily from the nose, for more than four years before the operation." Besides another case operated on in the same way, he relates the history of an old man in whom the maxillary antrum was opened. Carious bone came away with the teeth, when extracted, and the man soon died from convulsive disorders, when, on post mortem, a fistulous tract was found through the Foramen Lacerum; the opposite side of the os sphenoides was also perforated and the dura mater laid bare but not perforated; but on the contrary it was inflamed, and very much thickened on that side of the head: "I found an aposthemation in the cortical substance of the forepart of the hinder lobe of the brain, though covered with pia mater, in which was about an ounce of fetid matter." He also first suggested the perforation of the antrum on its anterior surface. According to Portal,¹ Lamorier, a surgeon of Montpellier, born in 1717, proposed, as the result of his own investigations, to open the sinus more posteriorly, between the malar tuberosity and the third molar tooth. Jourdain, a Paris dentist, in 1765 reported to the Royal Academy of Surgery of Paris a method of washing out the Antrum of Highmore through the natural opening.² He also is credited with the observation, which of late has again been brought into prominence, that fetid matter is often found in the maxillary sinus of those who had succumbed to adynamic or ataxic fevers. For opening the sinus Desault used a sharp triangular perforator, Runge used a knife, and Chas. Bell a trephine. I further translate from Velpeau the following: "In a patient, who had no longer any molar teeth, the idea occurred to Gooch³ to perforate the Antrum of Highmore from its nasal surface. This method was also proposed by John Hunter in his treatise on the human teeth in 1778. Ol. Acrel⁴ had already followed an almost similar procedure, that is to say, after operating in the manner of Cowper he placed a second canula through the nose into the sinus. . . . A buccal fistula of the maxillary sinus suggested to Ruffel⁵ the idea of penetrating there

¹ See Velpeau, l. c., who gives a very exhaustive account of the earlier literature, but unfortunately without exact references.

² Journ. de Méd. Chir. Pharm., etc., Paris, 1767, XXVII, 52, 157.

³ An English surgeon who died in 1780.

⁴ A Swedish surgeon born in 1707 and died at 90 years of age.

⁵ I can find no other reference to a physician of his name.

with a perforator, making it come out above the gum in order to establish a counter opening. A seton was then passed and kept in the opening for six weeks, working so well that success crowned the efforts of the surgeon. Callisen (1740-1824) followed this plan. . . . Bausch and Henkel succeeded by passing a seton through a fistula in the floor of the orbit and bringing it into the mouth through an alveolus. Bertrandi resorted to a like plan, not, however, using the seton. Weinhold (1810?) went through from the upper part of the canine fossa into the antrum and thence through into the palatine vault. Jussi operated in much the same way."

On reference to Callisen's work¹ I find that he refers to abscesses of the frontal and maxillary sinuses. He advised operation by trephine on the former, and perforation through the canine fossa in the latter. He advises that the opening should be kept pervious by a linen tent, or a sponge, or a tube made of elastic resin, (*resinæ elasticæ*—rubber?) or of gold, so arranged that it will not slip into the cavity. He declared that penetration through the hiatus semilunaris, as recommended by Jourdain, is often impossible. He was also familiar with polypi in the Antrum of Highmore. I am sure anyone, reading these accounts of operations on the Antrum of Highmore for suppurative disease, will perceive that all the recent procedures, which have been of late so exhaustively and frequently described, have been long anticipated in surgery. Tumors of the maxillary sinus we have noted as having been reported by Palfin and others. Van Ruysch reported finding two at post mortem.² In the *Journal de Desault* in 1791 is an account of an operation of considerable gravity by Plaignaud, in 1784, on a tumor of the maxillary antrum which was successful.³ Another case is reported,⁴ in which the disease was allowed to pursue its course unmolested, and the patient died three years after its inception.

Diseases and Surgery of the Tonsils.—It remains to say something in regard to diseases of the tonsils during the period with which we have been dealing. Very little advance is here to be noted. Besides the hypertrophy, disease of the tonsillar structure is rarely alluded to independently of acute throat inflammations. Sydenham incidentally made the singular remark, but doubtless well founded, that red-haired people were more liable to tonsillar inflammation than others. Ettmüller,⁵ in his remarks on inflammation of the tonsil, draws attention to the gaping of the foramina. "On account of this," says he, "when these tonsils are swollen and more or less inflamed these foramina gape and are more conspicuous, so that they are taken for ulcers by the inexperienced surgeons." Fallopius

¹ *Systema Chirurgiæ Hodiernæ*, Hafniæ, 1798, Vol. I. p. 343, et seq.

² *Frederici Ruyschii Opera Omnia*, Obs. LXXVII, Amst., 1737, Vol. I, p. 71.

³ *Jour. de Chir.*, par M. Desault, Paris, 1791, I, p. 111.

⁴ *Ibid.* T. II, p. 278.

⁵ *Opera Omnia*, Amst., 1697, II, p. 602.

had also drawn attention to this point, still frequently the source of error.

As to operations on the tonsils, coming down as late as the middle of the eighteenth century, we find surgeons still, as ever, with a wholesome respect for tonsillar hemorrhage. Heister's category (l. c.) of operations on the tonsils is: (1) Corrosive applications. (2) Abscission according to the methods of the Ancients. (3) Ligation, using the apparatus of Hildanus for the uvula. Cheselden, he says, applied such a ligature by means of a sound. Benjamin Bell (l. c.) employed his double canula snare for ligation of the tonsils, in the same manner as for nasal polypi. A method, which he also ascribes to Cheselden, was to pierce the tonsil with a double-threaded needle, and tie off each half of the tonsil in a ligature. Even such a radical operator as Desault,¹ although he performed tonsillotomy with an instrument he called Kiotom (Uvulotome), yet in pusillanimous patients he used a ligature put on with a forceps, and tightened for a day or two until the tonsil fell off.

Anatomy of the Nose and Throat in the Eighteenth Century.—In the eighteenth century but few advances are to be noted in the gross anatomy of the nose and throat when compared to the much greater strides made in the sixteenth. Still there were some. We have already noted the description of the pharyngeal tonsil by Santorini. He first described the cartilages in the larynx which have taken his name, declaring they are found in man but not in animals. He drew attention to the great mobility of the crico-arytenoid joint, and gave the first intelligent account of intralaryngeal movements.²

Pathological Anatomy.—Bertin described the sphenoidal turbinated bones.³ Meckel and Ackerman and Daniel wrote learned and valuable treatises on the nervous system of the nose and throat.⁴ Valsalva had written his great work on the ears⁵ which was first published in 1705, and described more accurately the palatal muscles, but not his least claim to fame in the annals of medicine is the fact that he was the preceptor of Morgagni, and started him upon that series of observations at the post mortem table, which has resulted in the firm basis modern medicine now has in pathological anatomy. The predecessors of Morgagni were too much occupied with rare cases and fabulous histories, the curiosities of Medicine, to make much advance in this direction. Post mortem examinations were not infrequently made in the seventeenth century and even in the sixteenth century. Thus we find Tulpus, who

¹ *Œuvres Chirurgicales*, Pub. par X. Bichat, Paris, 1798, II, p. 202.

² *Observationes Anatomicæ*. 1724, De Larynge.

³ *Déscription de deux os inconnus*, par M. Bertin, *Mém. de L'Académie des Sciences*, 1744, p. 298.

⁴ Ref; Sprengel, VI, 162.

⁵ *Valsalvæ Opera*., Cap. II, XIX, *Auris Descriptio*, Ludg. Batav., 1742, p. 34.

rivalled Bontekoe in his devotion to tea and tobacco as panaceas, describing¹ a malignant tumor of the pharynx and œsophagus observed during life and examined postmortem. Incidentally in many epistles of Thomas Bartholinus and of many others there are scattered accounts of the study of lesions found postmortem. Bonet is the first who systematically recorded² the history of cases and the results of observations on opening the body after death, but his work is a most verbose, unclassified, and entirely unreadable record of much which might in other hands have been valuable. In it we find the confirmation of Schneider's observations, but in his zeal to prove that the bloodvessels carry the nasal discharges, he exaggerates and distorts the significance of anatomical facts. He taught that the mucus was derived from the blood and lymph vessels of the glandular mucosa, and that in the brain they absorbed and carried away its secretions. Nevertheless, he opened the way for the observations of Valsalva and his great pupil, Morgagni. It may be remarked that the latter refers to Bonet as having reported some cases of laryngeal tumor observed postmortem, but I have been unable to find the reference.

Morgagni.—Although the immortal "*De Sedibus et Causis Morborum*" was not published in its entirety until 1762, when Morgagni was nearly eighty years old, his "*Adversaria Anatomica*" was published when he was a young man (1706-1723). A few points of interest to us may be found in it. He was somewhat influenced by Van Ruysch³ in his description of the nasal glands. The tracheal glands first mentioned by Laurentius he describes more fully.⁴ He speaks also of the laryngeal glands⁵ and made the singular mistake, on noting the cuneiform cartilages, of describing them as glands. This mistake many years later was corrected by Wrisberg,⁶ whose name they now bear. Morgagni passes in review the anatomical facts brought to light by early anatomists as to the cartilaginous frame-work of the larynx.⁷ Galen first noted and described the ventricles of the larynx, giving them that designation, but Morgagni's name has been attached to them on account of his more elaborate description.⁸ He also described the *Appendices Laryngis Ventriculorum*.⁹ He supposed that the ventricles are instrumental in modifying the voice, but he warned against the reasoning from animals like the frog to man, various authors having explained their function in this way. Nevertheless, he thinks this more probable than that they form reservoirs for mucus to lubricate the cords. He ascribes this opinion to Verheyen. He points out

¹ *Observationes Medicæ*, 1641, Lib. I, Cap. 44.

² *Sepulcretum* first edit., 1679, another and enlarged edition by Mangetus in 1700.

³ *Advers. Anatom.* VI, *Animad.*, 89. ⁴ l. c. I., 25. ⁵ l. c. V., 42.

⁶ In the notes to Haller's *Primæ Linæ Physiologicæ* edited by Wrisberg, this error was pointed out in 1780.

⁷ *Adver. Anat.*, I, 23.

⁸ l. c. I., 16. ⁹ l. c. V., 42, V., 43.

that the surrounding mucosa is quite as well supplied with glands as are the ventricles.

Deviations and Spurs of the Nasal Septum.—When we turn to his more celebrated work we find that the first subject which engages our attention in the chapter which he devotes to the nose and ear is that of deviation of the septum.¹ Quelmalz² had in 1750 written a treatise on this subject, the first, so far as I know, of its kind. It is still a readable thesis, in which much which is discussed in modern rhinological literature may be found intelligently set forth. Among the causes of the conditions he mentions, are pressure on the nose in difficult labor, falls in infancy, the continual thrusting of the finger into the nose in childhood, inflammatory conditions, and others, which we do not now regard as efficient. He speaks intelligibly of the symptoms and the sequelæ, but says nothing of the treatment. Morgagni, criticising him for not mentioning exuberant growth of the cartilage, speaks of often finding this condition on postmortem dissection. Deviation of the septum, he declares, is often natural, and he warns observers against being deceived by those who write in an absolute manner that the nose is divided into large equal cavities by an intermediate septum. On the other hand: "To this error another is opposed by those who say the septum is always inclined to one side or the other, except in children." He had seen in adults many straight septa. Then follows the explanation of the cause of deviated septa which still holds good after 150 years: "The too rapid growth of the septum relative to the other bones of the upper jaw, from which reason there necessarily results a curvature." He also described very carefully a septal spur without deviation in an old woman. I have already had occasion to refer to Morgagni's views on nasal polypi and his notice of hypertrophies of the inferior turbinated bone, which he regarded as glandular.

The Cerebrospinal Fluid.—Bidloo³ had described a case in which cerebrospinal fluid had escaped from the nose as a result of injury. St. Clair Thomson⁴ has quoted another case, reported previous to this by Willis,⁵ whose nervous fluid theory Bidloo earnestly combated. Morgagni⁶ had also seen such a case. He was also aware of the existence of what was afterward known as Jacobson's organ, which had been noted by Steno and Van Ruysch.

¹ The *De Sedibus et Causis Morborum* has been carefully translated into French, *Recherches Anatomiques*. . . . par Desormeaux et Desnouet, and some readers will find it more convenient to consult this ten-volume edition than the original Latin work. The same references apply to that. See *Des Maladies des Oreilles et du Nez*, No. 16, Paris, 1820, II, p. 343 et seq.

² *Programma de Narium earumque Septi Incurvatione*. Haller's *Disputat. ad Morborum Historiam*, 1757, T. I., p. 377.

³ *Exercitat. Anat. Chirurg.*, Decas, 2, 7, Lugd. Batav., 1708, p. 180.

⁴ *The Cerebrospinal Fluid*, London, 1899, p. 67.

⁵ *Cerebri Anatome*, p. 152.

⁶ *De Sed. et Causis Mor.*, Lib. I., Ep. XIV, p. 21. He apparently did not recognize it as of cerebral origin.

I will reserve Morgagni's important observations on laryngeal ulceration until I have occasion to trace the history of laryngeal phthisis, introducing here, however, his notice of slight irritation in the auditory canal as a cause for persistent cough.¹

Lieutaud was the follower of Morgagni, and recorded many interesting observations made at the postmortem table, but his work is really nothing more than a note-book, unclassified for the most part, and without any deductive instruction.

Diphtheria.—Besides laryngeal and tracheal polypi and ulceration of the larynx, we find² this remark on the pathological conditions in the air passages of a girl evidently dead of diphtheria: "Glottidi hærebat materia quædem mucosa. Interior trachææ facies crusta viscida purulenta investiebatur," etc. There are records of other cases of a like nature. He observed pus in the frontal and occipital (sic) sinuses.³

THE NINETEENTH CENTURY—THE PRE-LARYNGOSCOPIC ERA.

I do not know how I can better usher in our story of a new epoch than by going back into the eighteenth century to pick up the thread of the ideas which have dominated the latter part of the nineteenth. This I shall frequently have to do in matters more immediately cognate with our subject.

The Intermaxillary Bone in Man.—In 1779 Vicq D'Azir⁴ announced, before the Academy of Science in Paris, that he had been able to trace the intermaxillary bone in the human fœtus, and he had Darwinism in his mind when he made the reflection that Nature seems always to model her works after a primitive ideal. In 1784 Goethe wrote to his friend Herder: "I have found neither gold nor silver, but that which gives me an inexpressible delight, the os intermaxillare in man." This had been, apparently by an accidental blunder, as we have seen, described by Galen and depicted by many of the anatomists of the Renaissance. This had been, if we may be allowed the expression, a bone of contention for many centuries. The fact that man was supposed to have no intermaxillary bone was one of the arguments by which he was distinguished from the brutes, but Goethe believed in the unity of nature, and six years later he wrote his "Metamorphose der Pflanzen," in which is contained the philosophy of Spencer and the biology of Darwin.

And now we must plunge at once into the medical history of the nineteenth century, returning, as I have said, many times to pick up the threads of our story amidst the records of past ages.

¹ Lib. II, Ep. XIX, p. 54.

² Hist. Anatom. Med., Parisiis, 1767, I, p. 435.

³ Ibid. II, p. 292.

⁴ Oeuvres de Vicq D'Azir, Paris, 1805, IV, p. 159.

It is still impossible to comprehend the historical significance of the phenomena of the nineteenth century just passed. We are just leaving it behind, and its proximity in the historical landscape gives us no opportunity for philosophical perspective, while the lifeless chronicle of events is a dreary work which is to be avoided if possible.

Bichat.—The French Revolution, the great cataclysm which finally and irrevocably burst asunder the bands of ecclesiastical and political tyranny, horrible and frightful as was the catastrophe and its immediate results, was the denouement of that series of events to which the Renaissance was the prelude in the history of civilization. In the Sciences, and especially in Medicine, the beginning of the fruition of this enfranchisement of thought, of speech, and action did not become apparent until near the middle of the century just passed. Coincident with the social and political upheaval in France appeared the genius which shaped the beginning of the new life in Medicine as radically as did Napoleon those events, the chronicling of which is called History.

Bichat was the first to turn the torrent of eager study and investigation of biological secrets toward the elucidation of the physiology and pathology of the separate tissues, as distinguished from the anatomical localities and organs of the animal body. Before Bichat, since the time of the Arabs, diseases were divided according to their situation, the head, the chest, the stomach. Morgagni first classified disease according to the lesions of the different organs of the body. Bichat, continuing the differentiation, described the different tissues of which the various organs were made up.

Since the revolt of Cullen and his predecessors from the old humoral pathology, we have been practically upon a basis of the Solidism which he had carried to such extremes. It is only within the last few decades that we have begun to perceive that all such divisions are impossible, all regions, all organs, all tissues, all of the body fluids are too intimately associated, one with the other, to allow us to single out, in disease, any single unit as the entity exclusively deranged; but we may note a tendency in the recent trend of research in the problems of immunity for the pendulum to swing back again, after nearly two hundred years, to the domains of humoral physiology and pathology.

Bichat sketched the outlines of the study of physiology and pathology which were later filled out by the labors of the Germans, the schools of Johann Müller, and of Virchow.

In his "*Anatomie Pathologique*" he considered the functions and the morbid states of the serous and of the pituitary membranes, but he insisted¹ that not only should pathology be studied from the

¹ *Anatomie Pathologique. Dernier Cours de Xavier Bichat d'après un Manuscrit Autographe de P. A. Bécclard—1825.*

standpoint of the system of tissues affected, but from that of the character of the lesion as well. It is true, here as always, that this thought had existed in the minds of many before Bichat, but it was left to him to inaugurate its practical application. He, himself, had little opportunity in his short life to even begin the Herculean task of filling out this comprehensive schedule. He died when just turned thirty.

Special Treatises.—Before reviewing the comparatively few steps in advance taken in the knowledge of our subject during the pre-laryngoscopic era of the nineteenth century, some reference must be made to special treatises.

Olfaction.—In the early part of the century considerable attention was devoted to the nose as the organ of olfaction. Indeed, since the decline of the Galenic physiology and the establishment of the doctrines of Schneider, the fact has often been lost sight of altogether that the nostrils were an essential part of the respiratory tract. When it became evident that the air did not ascend to the brain, and the secretions of the latter did not drip downward in catarrh, the warming, dust freeing, moistening functions of the nose in respiration, upon which Galen laid the proper stress, sank from view and have only again been brought into prominence within in the last three decades.

Jacobson's Organ.—We have seen that the mistaken idea of some of the early anatomists, as to the olfactory function of the accessory sinuses, long lingered after the error had been pointed out that they prepared the air for the brain. This idea of the nose solely as the organ of smell probably led to the prompt acceptance of the organ of Jacobson as an occasional diverticulum in the mucosa serving for olfaction. The great Cuvier laid the Danish anatomists' communication¹ before the Institute of Paris in 1811. Ruysch,² in 1703, pictured the orifice in the nose of an infant he had dissected. Morgagni³ refers to Steno as having noted this organ in a sheep. He seemed to connect it in some way with cases which Thomson (l. c.) rightly regards as instances of the escape of the cerebrospinal fluid from the nose. Sommering also noted it before Jacobson's paper.⁴

Deschamps.—Deschamps,⁵ in 1804, published the first separate "Treatise on the Diseases of the Nasal Fossæ and Their Sinuses." Naturally prominence was given to the physiology and pathology of olfaction, and Deschamps declared that the filaments of the

¹ Descriptive Anat. d'un organ observe 'dans les Mammifères. Ann. de l'Inst. d'Hist. Nat., XVIII, 1811, p. 412-24.

² Ruysch: Thesaur. Anat., Amst., 1744, III., Tab. IV, fig. 5, A.

³ Morgagni: De sedibus et Causis Morborum, Lib. I, De Morbis Capitis, 21.

⁴ For further information as to the history of the organ see Mihalkovics. Nasenhöhle und Jacobsonsches Organ, Wiesbaden, 1898.

⁵ Traité des Maladies des Fosses Nasaes, Paris, 1804.

olfactory nerve may easily be traced to the middle of the nasal fossæ, but he denied absolutely, as a result of experimentation, that the sinuses contribute anything toward the function of olfaction. This had been previously less emphatically asserted by Richeraud.¹ Notwithstanding these positive statements, such eminent authority as Magendie in 1817 inclined to the opposite opinion. He says: "The larger size of the sinuses seems to coincide with a greater power of olfaction; this at least is one of the most positive results of comparative anatomy." He, however, admitted that the olfactory filaments had never been followed into the sinuses nor found in the mucosa of the inferior turbinated bone, nor on the inner surface of the middle.

Deschamps' work of more than 300 pages is one of considerable interest, not only because it was the first separate book on Rhinology, but because it may be supposed to represent fairly well the state of knowledge at the beginning of the century as to intranasal disease. He says nothing whatever of anterior rhinoscopy, nor of a nasal speculum, though, as we have seen, traces of both had from time to time appeared in medical annals. Notwithstanding this most important and other scarcely less noticeable omissions, he professed to include all the matter of interest known to medicine in regard to the nasal fossæ and their annexa in his book. He distinguished the ordinary tumefaction of the mucosa from the nasal polyp, and for the former he recommended the use of oiled bougies in dilating the obstructed channels of the nose. He divided nasal polypi into (1) fungous and vascular. (2) Mucous and lymphatic. (3) Scirrhus. (6) Sarcomatous. His methods of treatment were: (1) The local application of astringents. (2) Excision with a guarded bistouri. (3) Avulsion with the forceps, to which he devotes considerable space. (4) The knotted thread he speaks of with ridicule. (5) Chemical caustics, nitrate of silver—"mercurial water" (acid nitrate?)—butter of liquid antimony, and the actual cautery. (6) Ligature with a waxed thread and with wire of pure silver.

These methods of operating he adapted to his different varieties of polypi, giving preference to the ligature. The wire loop adjusted with forceps and finger was, when *in situ*, tightened by pulling it through the eye of a probe or sound. The polyp was removed more by avulsion than by abscission. For ozæna, he recommended the application of the cautery when "the site of the ozæna permits;" otherwise he abandoned the treatment of this disease to palliative measures. He confused essential ozæna with the syphilitic. Considerable space in this book is devoted to the consideration of sinus disease, principally of the maxillary antrum, but he recognized the painful symptoms of acute catarrhal inflammation of the frontal sinus. He speaks of simple inflammation of the maxillary sinus,

¹ Nouveaux Eléments de Physiologie, 2 éd., Paris, 1802, Vol. II, p. 57.

also of polypous tumors, and of dropsy of that cavity. He counsels opening the maxillary sinus, in suppurative disease, through an alveolus of a bad tooth if it exists; otherwise to make an opening above the alveolar border, in either case, large enough to introduce the finger. He advised an even larger opening where there were antral polypi. He has nothing to say of ecchondroses or deviations of the nasal septum.

Cloquet.—A very much more comprehensive work, especially in historical matters, was the work of Cloquet,¹ which was first published in 1821. It professes to be a work on olfaction, but as a matter of fact it is much more than that. Its 750 pages exhibit the enormous erudition of the author, who deals with his subject in the most exhaustive manner and from every point of view. It is an inexhaustible source, from which one may draw accounts of all sorts of phenomena related to the sense of smell. Not only is this its prominent characteristic, but it deals incidentally, much more fully than Deschamps' book, with the nose and its diseases. Membranous occlusions of the nostrils, fractures of the nose, deviations of the septum which he considered to be usually irremediable, rhinoplasty, are all more or less thoroughly discussed. Coryza, vasomotor rhinitis, rhinorrhœa, and syphilitic rhinitis, with other affections, are treated together, and not sufficiently differentiated to satisfy the modern reader. The same may be said of other chapters in the book. Thickenings of the nasal mucosa are considered in a page and a half.

Watt.—These works of Deschamps and Cloquet were not illustrated, but we may note in England the appearance in 1809 of the "Anatomico-Chirurgical Views of the Nose, Mouth, Larynx, and Fauces," by John James Watt. It contains some colored charts of the parts with an anatomical description of them. They compare not unfavorably as to accuracy, but are perhaps not so artistic as the later color plates which have been issued so frequently lately. They are the first colored plates with which I am familiar showing the anatomy of the nose and throat.

Porter.—A few separate treatises appeared in the pre-laryngoscopic period on the larynx. In 1826 William Henry Porter published a small brochure in which he discussed croup, diphtheritis, œdematous laryngitis, phthisis laryngea, which he, like others, confused with syphilis of the air tubes, speaking at some length of the "mortification of the laryngeal cartilages." Traumatic laryngitis, foreign bodies, and wounds are also discussed.² It is not

¹ *Osphrésiologie*.

² *Observations on the Surgical Pathology of the Larynx and Trachea*, 2 ed., London, 1837. I am only familiar with the second edition. Holmes speaks of the first edition as too limited in scope to be compared with the treatise of Albers, which appeared in 1829. However that may be, it is the first separate treatise on the larynx since the little work of Codronicus, two and a half centuries earlier.

accurate, therefore, to regard Albers' work as the first special work on the larynx.

Albers.—It appeared in 1829.¹ As Heyman has pointed out, it is a work of considerable value in that it collected what was known on the subject, but it is by no means exhaustive in that respect, and there is very little original matter in it. Of more value are the chapters he devotes to the subject in his later publication.² In his Atlas there are some striking drawings of laryngeal tumors. In other respects the works of Albers are noteworthy as almost the beginning of those publications on pathological subjects which were soon to make the medical schools of Germany famous.

Ryland and Colombat.—In 1838 appeared the works of Ryland³ and of Colombat.⁴ Ryland speaks of croup as affecting children and of the Diphtheria of Bretonneau as affecting adults. He refers also to spasmodic croup and hysterical spasm of the glottis, cases having been reported by Albers, Sir Charles Bell, and Porter. Tumors of the larynx and tracheotomy occupy considerable space in his book. Colombat invented a clumsy instrument for opening the mouth and depressing the tongue, which he called a stomatoscope, also some devices of inferior interest for cutting the tonsils and the uvula.

Piorry.—A very much more interesting work, and one evincing more original though frequently erroneous ideas, is the one by Piorry published in 1844.⁵ He opens his work with the remark that the diseases of the nose are unfortunately usually not considered in treatises on diseases of the respiratory system, and he insists on the doctrine, which received no help even from the advent of laryngoscopy, that not only many diseases of the larynx but also of the lungs depend upon morbid conditions of the nasal passages, nasal obstruction, called by him *rhinostenoma*, one of the forms of which we recognize in a deviated septum, the other being alternating vasomotor stenosis. He proposed percussion, then a young science, for investigating the accessory sinuses. He described with considerable accuracy many of the sequelæ of nasal obstruction and mouth breathing, including aural symptoms from closure of the Eustachian tube, and pulmonary changes, such as chronic dyspnoea and asthmatic attacks. He referred the cause of nasal disease to systemic affections. Crusts in the nose are to be removed after soaking in oil.

¹ Die Pathologie und Therapie der Kehlkopfkrankheiten. Leipzig, 1829.

² Beobachtungen a. d. Gebiet. der Path., Bonn, 1836. Atlas der path. Anat., 2te Abth., Bonn, 1842.

³ A treatise on the Diseases and Injuries of the Larynx and Trachea, by Frederick Ryland. London, 1837.

⁴ Traité des Maladies et de la Hygiène de la Voix. Paris, 1838.

⁵ Ueber die Krankheiten der Luftwege, von A. Piorry. Leipzig, 1844. It seems to have been written but never published in French, the German edition being the only one I have found noted.

Nasal Bougies.—Piorry advised the introduction of bougies even in acute attacks. He described the dilatation of the *alæ nasi* with a forceps to allow the light to fall in, but admitted that it was impossible to see very far by this means. Stethoscopy was also recommended by him in the diagnosis of intranasal conditions. He described rhinitis attending cases of the grip, which was prevalent in the first half of the century. On the whole this book exhibits a surprising amount of information in regard to intranasal conditions at an epoch when anterior rhinoscopy was feebly developed, and posterior rhinoscopy was unknown. Some of his ideas have not received the sanction of modern rhinology, but may not on that account be the less true. He declared that one of the causes of rhinitis was the cutting of the vibrissæ in the vestibule of the nose which should filter the dust particles from the air.

Evil Effects of Water on the Nasal Mucosa.—Piorry asserted that water was injurious to the whole upper respiratory tract with the exception of the nasopharynx, and syringing either the ear or the nose, especially with cold water, resulted in inflammation. Rhinitis thus frequently arose from bathing and diving. As treatment he urged the injection of oily or fatty substances in the nose. To such extremes did he go in this direction that he advised the anointing of the nostrils with oil while shaving or washing the face. The intranasal syringing of water he condemned very strongly except for the purpose of removing foul, stinking secretions. Nitrate of silver and various powders he recommended as medicaments for internal applications. His other therapeutic measures were of a general nature, in accordance with his views of etiology. Blisters, bleeding, purging, sweating, were the vigorous measures which were recommended for rhinitis, in keeping with the heroic treatment of his times. He confused ozæna with purulent disease of the accessory cavities. For intranasal operative procedures he refers the reader to the general works on surgery. His remarks upon affections of the larynx, trachea, and bronchi, as one must expect in pre-laryngoscopic times, are confusing and of little value.

Systems.—In the first half of the nineteenth century began again the custom of including in one work, or in a continuous series, all the medical lore known to mankind, but instead of such a work being attempted by one author it was divided among several. In these early Systems and Handbuchs and Traités the chapters on the nose and throat are lacking, or treated in the most cursory and incomplete manner. As an example of this sort of literature one may be cited wherein the following was published, just three years before Garcia announced the event, which at once shed a new light on diseases of the larynx.

Friedreich¹ says: "Unfortunately the methods of physical

¹ Die Krankheiten des Larynx und der Trachea, Virchow's Handbuch der spec. Path. und Therapie, 1858, Vol I, p. 417.

diagnosis do not allow, in diseases of the larynx and trachea, that extended application they do in diseases of the deeper parts of the respiratory organ."

Laennec's "*Traité de l'Auscultation Mediate*" in 1819, his invention of the stethoscope, and the rapid development of the other methods of the physical diagnosis of the diseases of the chest, doubtless did their part in stimulating interest and curiosity, which finally culminated in the application of inspection to the diagnosis of intralaryngeal lesions.

Auscultation and Percussion of the Nose and Throat.—We have noted Piorry attempting to apply Laennec's methods to diseases of the nose, and we find Friedreich attempting to explore laryngeal phenomena by means of palpation, auscultation, and inspection of the epiglottis through the mouth. In Friedreich's chapters we find intelligent attempts at differentiating tubercular from syphilitic diseases of the larynx, but œdema of the glottis and perichondritis laryngea are for him, as for many later writers, still pathological entities. He speaks of paralysis of the glottis with aphonia as paraplegias, but of course he had no means of establishing a diagnosis except from rational symptoms.

To return now to the individual topics of interest in the development of our laryngological and rhinological knowledge, we may begin again with Bichat.

In the few notes which remain to us from the works of Bichat upon the histology of the diseases of the pituitary membranes, he cast but little light upon the subject. We may note, however, that he questioned whether ozæna was really an ulceration, but leaned to the idea that it was a diffuse inflammation. He speaks¹ of the liability of the mucous membrane of the larynx to become gorged with serum during inflammation. He succeeded by traumatism in producing this condition in dogs, but we look in vain for those details of the study of the respiratory mucous membranes, which later followed, from Bichat's initiative, in the works of Bretonneau and others.

In 1791 Fourcroy and Vauquelin had² examined nasal secretions, both in healthy subjects and in those suffering from coryza, and had noted the salts of lime and soda. According to him, the mucus was the same from all the mucous membranes, but Berzelius later, on the contrary, believed it to vary according to the locality from which it was taken. Magendie thought that the mucous glands are not necessary for its formation, but that it is found where there are none, and also after death.

Bretonneau and Diphtheria.—These were some of the preliminary studies which, together with the direction given to medical study by Bichat, lead to Bretonneau's "*Treatise on Diphtheria.*" In the

¹ *Traité d'Anatomie Descriptive*, Paris, 1802, II, p. 399.

² *Annales de Chimie*, Août, 1791, Vol. X, p. 13.

works of Matthew Baillie, which, though not collected until 1825, were of a considerably earlier date, may be found several accurate accounts of the postmortem appearances in those dead of Croup.¹

Anglada says: "It is known that Napoleon, in 1807, on account of a sorrowful event, put the question of Croup to the Assembly; numerous and important works followed." He offered a prize for the best essay on the disease, owing, it is said, to the death of a son² from it. Not only in France, but elsewhere, as we have seen, the disease was being more carefully studied. John Cheyne, in 1809, wrote on "The Pathology of the Membrane of the Larynx and Bronchi," a treatise which is chiefly upon the lesions of Croup, under which title he also published a work.

It was not, however, until Bretonneau's publication, in 1826,³ that any very great advance is to be noted in the nineteenth century in the study of diphtheria. He recognized its specific character and thus gave it its name (p. 41-43): "From the impossibility of applying to a special inflammation, so well defined, a single one of the names which have been given to its variations, allow me to designate this phlegmasia by the name Diphtheritis, derived from *διφθέρω*, which means a skin, an exuvium."

His work gives by far the best description of the disease which had yet appeared, but even in its clinical manifestations the differentiation was much at fault. In addition to his own remarks on the disease, he transcribed the works of many previous writers, among them that of Samuel Bard. He had performed tracheotomy for the laryngeal disease, and was of the opinion that his was the first case in which it was successfully done, though he refers to the case in London reported by Borsieri, which I have cited. Bretonneau's work produced a great impression upon his contemporaries, and it is one of the landmarks in the history of diseases of the throat. Shortly after its publication, we may note the report of a fatal case of nasal diphtheria by Billard,⁴ but he does not give it that name.

The Epiglottis.—Bichat,⁵ from experimentation, had come to the conclusion that the epiglottis was in no way essential to the produc-

¹ See also *The Morbid Anatomy of Some of the Most Important Parts of the Human Body*, London, 1793, and *A Series of Engravings, etc.*, London, 1800, III. Plate II, Fig. 1.

The word Croup, first used by Home, is of Scottish origin, designating a membranous inflammation of the air passages, and is said to have primarily signified strangulation, but it is from a Gothic root, meaning to cry out, the term being applied to the disease probably on account of the altered tone of the voice.

² If this is so, it must have been an illegitimate son. Constant in his *Memoirs of the Private Life of Napoleon*, mentions no such event as the death of an illegitimate child at this time.

³ *Des Inflammations . . . et . . . de la Diphthérie*, 1826.

⁴ *Traité des Maladies des Enfants*, 1828. I have seen only the second edition, 1833.

⁵ *Traité de l'Anatomie Descriptive*, Paris, 1802.

tion of the voice, which, however, was altered when he cut off the tops of the arytenoid cartilages, and was lost when he severed them from one another in the middle line. We have seen how gross an error had entered into the conception of the ancients in supposing the epiglottis served to keep solids from the larynx, but permitted fluids to enter it. It gradually was accepted as an efficient valve to keep the latter out also. Magendie refused to accept this on authority. He said¹ he himself was of the former opinion, except for the doubt that should always exist in the mind of the physiologist. On extirpating the epiglottis in dogs he found they swallowed fluids as well as solids quite as easily without it. Elsewhere² he asserts he had observed the same phenomenon in two individuals deprived of the epiglottis by disease. He, therefore, concluded that it was not indispensable in deglutition. From various experiments on animals he did much not only to elucidate the mechanism of swallowing, but the action of the intralaryngeal muscles as well, though his conclusions have not been all of them confirmed by later investigations. One notes the significance of the new order of things in France at this time in the field of medicine as well as in all other subdivisions of science.

Innervation of the Larynx.—Le Gallois,³ in 1812, inaugurated a series of investigations as to the innervation of the larynx, to which later writers have not since added so large a number of well-ascertained facts as we might expect from advances in other fields of physiological research.

Dupuytren and Bichat had both observed the effect of cutting the pneumogastric, and many, since Galen's account, had noted the results of section of the recurrent laryngeal nerves; but it remained for Le Gallois to demonstrate that death, which so often supervenes, especially in young dogs, when the pneumogastrics are cut, was due to section of the recurrent fibers in it, and that this also happened when both recurrences were simultaneously cut. He noted this happened less suddenly the older the dogs were. He found that the glottic aperture was more narrowed by the operation in young than in old dogs. He also drew attention to the varying effects from ligation of the recurrences, due to the degrees of pressure exerted. Le Gallois did not take so much pains to record the color and sex of the dogs in his experiments, but on the perusal of his work it may easily be seen how much of the work of more recent, more voluminous, and less readable experimenters was anticipated by him.

Sir Charles Bell,⁴ in 1821, asserted that because the vagus nerve does not arise by a double root and has no ganglia it is not a nerve

¹ *Mémoire sur l'Épiglotte*, Paris, 1813.

² *Précis Élémentaire de Physiologie*, Paris, 1817, Vol. II, p. 63.

³ *Le Gallois: Expériences sur le Principe de la Vie*, Paris, 1812.

⁴ *On the Nerves*. *Phil. Trans.*, London, 1821, p. 398.

of sensation, he having shown, simultaneously with Magendie, that the posterior roots of the spinal nerves are sensory and the anterior roots are motor filaments. Another theory of Magendie was contradicted by Robert Willis in 1829, and later by Claude Bernard. They showed that it was erroneous to regard the superior laryngeal nerves as supplying filaments to the closers of the glottis, and the inferior laryngeal nerves as sending branches exclusively to the openers of the glottis. Willis, according to Holmes, did much to elucidate the actions of the various intralaryngeal muscles, a matter still involved in much uncertainty.¹ Marshall Hall, in 1836,² and Dr. John Reid, as well as Magendie, contributed largely to the development of our knowledge of this intricate subject. Hall was apparently the first to point out the reflex nature of Spasmodic Croup. His idea that it is due to the irritation of teething, indigestion, and constipation has been much invalidated, but only in very recent years.

Sir Astley Cooper, in drawing attention to his discovery of the ganglion of the superior laryngeal nerve in the vagus, opened the way for Cock³ and Hilton⁴ to declare the internal branch was exclusively a nerve of sensation, the inferior or recurrent nerve being the exclusively motor nerve of the larynx and the external branch of the superior laryngeal supplying the cricothyroid muscle. Dr. John Reid⁵ confirmed these conclusions and added many new facts by his investigations upon the glossopharyngeal and vagus nerves.

Magendie was of the opinion that section of the superior laryngeal nerve prevented the emission of almost all acute sounds, but Longet,⁶ who prefaces his account with an exhaustive bibliography of the work of previous observers, declared, as had Bischoff before him, that the section of this nerve produces no effect upon the voice in dogs. They also asserted that the Spinal Accessory is the motor root of the pneumogastric nerve, Galen having considered the former a branch of the latter. They cut the Accessory filaments within the skull and obtained aphonia and hoarseness in animals. Notwithstanding this, Claude Bernard,⁷ that materialistic philosopher, who in many ways exercised such a pernicious influence on French thought in the decades which followed him, insisted that the Spinal Accessory is a motor nerve and the Vagus is a mixed one at their origin, and that they do not bear the relation

¹ Some of the statements ascribed to Willis by Holmes had been long previously made by other observers.

² Lectures on the Nervous System, and especially later in 1841 in his book, *Diseases and Derangements of the Nervous System*.

³ Edward Cock: *Guy's Hospital Reports*, London, 1837, II, p. 311.

⁴ John Hilton: *Ibid.*, p. 514.

⁵ *Edinburgh Medical and Surgical Journal*, 1838, Vol. 49, p. 109.

⁶ *Anatomie et Physiologie du Système Nerveux*, Paris, 1842, II, p. 271.

⁷ *Archives Générales de Médecine*, Paris, 1844, April, 4, sér., IV, p. 397 May, V, p. 51.

to one another of the anterior and posterior roots of a spinal nerve, but that the Spinal Accessory is a motor nerve which regulates the movements of the larynx and the thorax every time these organs are to produce phonation, and that the Pneumogastric regulates them in respiration. Therefore the Spinal Accessory should be regarded rather as the antagonist than as the coefficient of the Vagus, as phonation for the moment suspends the act of respiration. He confirmed the observation by Magendie as to the lack of effect on the voice of the section of the superior laryngeal nerve, which lesion induces anæsthesia

Bischoff¹ declares, in the Latin which as used in the early part of the last century was almost as grotesque as that of the thirteenth, that Tiedemann had assured them that investigations on this nerve would probably result in his discovery of its function. This encouraging admonition to industry has not been entirely realized yet, but at least the thesis Bischoff upheld has been proved to be, with some modifications, true, *i. e.*, that the vagus nerve is more or less the analogue of a posterior nerve root in that it is chiefly made up of sensitive fibers while the accessorius furnishes motor fibers to it, among them those of the recurrent laryngeal. This followed as a postulate from Bell's discovery of the function of the anterior and posterior roots of the spinal nerves and has been firmly fixed in modern conception by the development of phylogenetic science on its embryological side. It is a direct offspring of the idea of Goethe and Oken and of Bischoff's predecessors that the skull bones of vertebrates are nothing but modified vertebræ.² While this idea no longer has credit either with embryologists or evolutionists, it was in the air in the pre-Darwinian era and drew its inspiration from the mass of thought out of which sprang the conception of the instability of species.

Longet³ and Claude Bernard,⁴ the former by galvanization, the latter by tearing it out, demonstrated that the accessorius root contains motor nerve filaments governing the laryngeal muscles.

In the work of Onodi⁵ one may find fairly well expressed the modern view: "In mammals a separation of the spinal and the bulbar parts and the calling of the spinal part 'accessorius' is useful from a practical standpoint," but whether we are otherwise justified in eliminating the word, 'accessory' is not entirely clear. They are still described in our text books as separate nerves, but the

¹ Bischoff: *Nervi Accessorii, Willisii Anatomia et Physiologia*, Darmstadt, 1832.

² A résumé of the discussion which followed may be found in Schech: *Experimentelle Untersuchungen über die Funktionen der Nerven und Muskeln des Kehlkopfs*; *Zeitschrift für Biologie*, 1873, IX, p. 258.

³ Longet: *Recherches expérimentelles sur les fonctions des nerfs, des muscles du larynx, etc.*, Paris, 1841.

⁴ Claude Bernard: *Leçons sur la physiologie, et la pathologie du système Nerveux*, Paris, 1858, T. II.

⁵ Onodi: *Anatomie und Physiologie der Kehlkopfnerve*, Berlin, 1902.

consensus of opinion seems to be that they belong in the same complex group, and indeed the tendency still exists to place the glossopharyngeal and the hypoglossal nerves in the same phylogenetic group.

Voice Production.—The history of the advance in the knowledge of the innervation, and of the kinetic phenomena of the larynx, is intimately associated with that of voice production. It therefore seems best that some account of it should be given here, though this must be done in the most cursory way. Full accounts of the progress of such knowledge may be readily found in the separate treatises of Gordon Holmes,¹ of Fournié,² and of others. We must retrace our steps considerably. We have seen the very crude ideas of Democritus, Hippocrates, and Aristotle, and we have to regret the lost treatise of Galen on the voice, which perhaps would have revealed to succeeding generations clearer ideas on the subject. We find in all the pre-Renaissance and Arabian works constant reference to Galen's conception of the larynx—in mediæval Latin, the "*principalissimum organum vocis*." The first reference, which I have noted after Galen, to a more extended and exact conception of laryngeal physiology is to be found in the remark of Paré on the anatomy of the larynx: "When the cartilages are open the voice is large like the Basse-Contre. On the contrary, when they are compressed, the voice is shrill." It was long after the time of Paré before the matter was taken up as a separate study. Casserius indeed, in his work on the larynx, discusses voice formation to a considerable length, as did many other anatomists incidentally, but it was Claude Perrault (1613-1688) who first explained the voice by mechanical laws and especially endeavored to demonstrate that it is produced only by the larynx without the trachea taking any immediate part in it.³ He compared the larynx in birds and animals with the human organ.⁴ "As regards the tone of the voice, it is low and grave when the glottis makes a long slit, because this makes the lips relaxed and their vibrations slower." He insisted that the upper parts of the air passages take part in the formation of the voice. He likened it to a flute, the muscles of the larynx working the variations.

Shortly after this Dodart⁵ took the matter up. He insisted that the trachea only furnishes the material of the voice, *i. e.*, the expired air. The glottis is the only organ of the voice. All the effects of the glottis for tones depend on the tension of its lips, and of its various internal structures. The concavity of the mouth has no

¹ Holmes: *Treatise on Vocal Physiology and Hygiene*, London, 1879.

² Fournié: *Physiologie de la Voix et de la Parole*, Paris, 1866.

³ Sprengel: *l. c.*, V, 150.

⁴ *Oeuvres Diverses de Physique et de Méchanique*, Edit. 1721, Vol. 2, p. 392; also *Ibid.*, Vol. I, p. 220, II partie, Du Bruit.

⁵ *Mémoire sur les causes de la Voix de l'Homme*, par M. Dodart, *Hist. de l'Académie des Sciences*, 1700, p. 308.

part in the production of the voice, but it is a modifier of it, and still more is this true of the nose. He showed that Galen's comparison to a flute could not be accepted, if one went into details. He spoke of the vibrations of the ligaments, and of the dilatations and contractions of the glottis. He asserted the trachea is elongated in high notes, and shortened in low ones. He likened the vocal organ rather to a horn or trumpet. According to him, the glottis is the place which corresponds to the lips of the musician; the body of the instrument extends from the glottis to the external orifice of the vocal canal, that is to say, to the mouth.

In 1742 Ferrein modified the conception of Dodart somewhat by comparing the larynx to a stringed instrument such as the violin.¹ He was the first in accordance with this idea to apply the name "vocal cords" to the lips of the glottis. Dodart, as we have seen, had taken note of the oscillations of these ligaments, but Ferrein more particularly saw in them the principal instruments of the modulation of the voice, and he reported a number of observations which tended to prove that the air in striking the glottis produced different tones according to the vibrations which these parts performed. Bertin, in 1745, inclined to the simile of Dodart, asserting that the vibration of the glottis was not sufficiently free to allow comparison with the oscillation of cords. Ferrein's view was adopted by Montagnat (1746), who called attention to the second larynx in birds, which is supplied with a taut membrane which is able to produce the same notes as the ligaments of the glottis. Haller in his great work² wrote a long dissertation upon the voice and the parts played in its formation by the various structures of the nose and throat, referring to the accessory sinuses as having the function of making the voice more sonorous. He seems, however, to have added very little that was original to our actual knowledge, and the same may be said of Walther,³ but the latter has much to say of the intralaryngeal movements.

We should not pass on to the nineteenth century in this matter without taking note of the noble labors of Johann Conrad Amman.⁴ Although Hartmann says that the Spanish Benedictine monk, Pedro de Ponce, in the sixteenth century, proved that deaf mutes can be taught to speak, Amman's is the first treatise upon a method of teaching the mute to talk. He followed practically the same method of teaching as is now used in the various institutions for that purpose, *i. e.*, lip reading.

Under the impetus of the new life in France, Magendie took up the study of voice production where it had halted for the best part

¹ Vid. Sprengel, l. c., and Colombat: *Traité des Maladies et de l'Hygiène des Organes de la Voix*, 1838, p. 50.

² *Elementa Physiologica*, Lib. IX, Lausanne, 1761, III, p. 366.

³ *De Hominis Larynge et Voce*. Haller's *Disp. Anatom.*, 1749, Vol. IV, p. 691.

⁴ *Surdus Loquens sive Dissertatio de Loquela*, 1740.

of a hundred years. He was the first who actually saw by experimentation on animals the vibration of the vocal cords *in vivo*. He¹ again more confidently compared their actions to the vibrating bands of wind instruments, this in animals depending on the contraction of the laryngeal muscles rendering the vocal cords taut, the intensity and volume of the voice depending on the extent of the vibrations, and this depending on the length of the cords, the size of the larynx and the amount of the expulsive force of the air current. In contradistinction to Ferrein, he taught that the tones of the voice depended not so much on the tension of the cords as upon the length of their vibrating surfaces, deep tones being due to the vibration of the whole length of the cord, and the high notes to the vibrations only of the posterior portions, varying with the height of the note. The larynx rises in high notes and descends in the low notes, thus lengthening and shortening the vocal tube. He regarded the ventricles of the larynx as anatomical devices to allow of the separation of the true from the false cords. He differed from Bichat in supposing the epiglottis to have something to do with the formation of the voice. He also noted the modifications of the voice by the cavities of the mouth and nose. Holmes (l. c.) refers to Liscovius as having dwelt upon the importance of the width of the vocal slit in voice production, a matter appreciated, as we have seen, by Dodart and exaggerated by Paré before him. Sehfeldt, in 1835, was the first to state that the falsetto voice is produced by the action alone of the edges of the vocal cords. Holmes says that Biot in 1816 originated, and Cagniard de la Tour by his invention of the siren² in 1825 demonstrated the accepted theory of sound produced by the vibration of tongued instruments.

Mayer³ and the great Johann Müller⁴ wrote at great length on the subject, but in a manner most discouraging to the modern reader. In this respect, however, they were surpassed by Harless.⁵ He wrote a two-hundred-page article on the voice, in which the most exhaustive examination of the anatomy of the parts was made. Histological, chemical, dynamic investigations are detailed with unwearied industry and indefatigable zeal. Its very ponderosity has buried it in oblivion. It is highly probable that a careful study of it might reveal matters of interest to the modern student, brave enough to undertake the task.

This brings us up to Garcia's invention, which revolutionized

¹ Magendie: *Précis Elementaire de Physiologie*, Paris, 1816, I, p. 210.

² The siren consists of a revolving plate pierced by holes at its circumference, through which on passing in its revolutions over an aperture air is forced, the rapidity of the revolutions regulating the pitch of the musical note produced.

³ Mayer: *Archiv für Anatomie und Physiologie*, Berlin, 1826, p. 188.

⁴ Müller: *Handbuch der Physiologie des Menschen*, Coblenz, 1840-2, p. 179.

⁵ Emil Harless: *Wagner's Handwörterbuch der Physiologie*, Braunschweig, 1853, IV, p. 505.

the study of voice production. Many works rapidly appeared, among which may be mentioned Merkel's "*Funktionen des Menschlichen Schlund und Kehlkopfes*" (1862). He had previously, before the importance of the advent of the laryngoscope was appreciated, written his "*Anthropophonik*." In 1861 Bataille in a memoir¹ presented to the Academy of Sciences, following up the suggestion of Garcia, advanced very decidedly the knowledge of the finer intralaryngeal movements in phonation and in singing, though his results were stated somewhat dogmatically. Notwithstanding the invention of the laryngoscope and the numerous exhaustive monographs on the subject of voice formation, among which may be noted Grüntzner's,² little was established beyond what had been discussed in pre-laryngoscopic days.

Photography.—The photography of the larynx by French,³ a triumph of ingenuity, skill, and persistence, resulted in upsetting many of the ideas, conceived not only by the early investigators, but much also which had been advanced since the introduction of the laryngoscope.

Modern Theories.—Willis, in 1830, advanced the idea that the vibration of the air in the cavity of the mouth was independent of the vibration of the laryngeal air, and thus the formation of the voice was a complex process. This idea was superseded by the somewhat similar but modified overtone theory advanced by Helmholtz,⁴ who derived the idea from Wheatstone.⁵ This has since been the prevailing theory of voice production, which, with modern apparatus of precision, has been so scientifically investigated by Professor Edward W. Scripture.⁶

Laryngeal Phthisis.—Littré⁷ seems to think a passage in "*Disease II*" is a proof that Hippocrates, or rather the author of this Hippocratic treatise, had observed phthisis laryngea, because he alludes to ulcers in the tube of the lungs. If we are to suppose that this book had its origin in the School of Alexandria, where they were familiar with the dissection of the human body, this may be a valid conjecture.

Before the advent of laryngoscopy there was considerable progress made not only toward the correct understanding of tubercular disease, but toward the recognition of its manifestation in the larynx. Virchow has pointed out⁸ how a mistaken interpretation of Sylvius de la Boe led him to confound small tubercular cavities in the lungs with suppurating conglomerate glands. Clinical

¹ *Nouvelles Recherches sur la Phonation*, 1861. Ref.; *Gaz. Hebd. de Méd. et Chirurg.*, 17 Mai, VIII, p. 308.

² Hermann's *Handbuch der Physiologie*, Leipzig, 1879, Band I, 2^{te} th.

³ *Trans. Am. Lar. Assoc.*, 1883, p. 59.

⁴ *Lehre von den Tonempfindungen*, Braunschweig, 1863.

⁵ *London and Westminster Review*, 1837.

⁶ *Experimental Phonetics*.

⁷ Littré: *Œuvres Complètes d'Hippocrate*, Tome VII, p. 77.

⁸ *Die Krankhaften Geschwülste*, Berlin, 1864-5, III, p. 621 et seq.

observation had frequently noted the enlargement of the so-called conglobate glands associated with evidences of pulmonary phthisis. From this, and subsequently through the works of Morgagni, Cullen and many others, the conception gradually arose that there was a pathological connection between vomicæ in the lungs and the enlarged lymph glands. This is a singular instance of how out of error much that is true in pathogenesis arose. We have seen Sylvius de la Boe interested in separating the conglobate from the conglomerate glands, and we need not, therefore, be surprised at finding him mistaken as to the cavity of the dilated conglomerate glands being identical with foci of suppuration in the lungs.

Morgagni.—The history of the growth of our knowledge of laryngeal phthisis is usually traced back to Morgagni. Again we note that growth means differentiation. Tuberculosis and syphilis are inextricably confused in the early accounts of phthisis laryngea. According to Morgagni in his discourse on the lesions of respiration,¹ Fantoni had noted in the cadaver of a man the mucosa of the arytenoid cartilages so ulcerated and thickened that there only remained a very small laryngeal opening through which the patient, who had lived in this condition a long time, had breathed with great difficulty. Morgagni then described the case of a woman of forty who had been asthmatic for some time, and she having died, nothing was found in the lungs or brain to account for her symptoms. At Morgagni's suggestion, the larynx was brought to him. He opened it from behind and pus of a grayish color flowed out, and from such a situation that the swelling it caused must have projected into the larynx and produced dyspnœa. Notwithstanding this memorable case has been frequently cited as one of tubercular laryngitis, I am very much of the opinion that it was a case of syphilis. However that may have been, evidently it, with some other similar observations reported by Bonet, Santorini, and others, impressed Morgagni with the necessity of directing attention to the larynx in cases of dyspnœa, not only at postmortem examinations but clinically. He did not fail to lay emphasis on this point, and his remarks soon aroused interest in the study of such lesions.

Lieutaud, who, in a very inferior manner, continued the work of Morgagni, reported² several cases, which at postmortem presented lesions in the larynx which may have been tubercular.

Petit (1790), Portal (1792), Sauv   (1802), Saignelet (1806), wrote theses on laryngeal phthisis in which it is difficult to separate the syphilitic from the tubercular cases, but in which the various

¹ De Sedibus et Causis Morborum. Lib. II, De Morbis Thoracis. Epist. Anat. Med., XV, Art. 12.

² Historia Anatomica Medica, Lib. IV, Parisiis, 1767, II, p. 297 et seq. Obs. 65, 67, 67a, 68. The last observation presents more satisfactory evidence of the lesions having been tubercular than the others.

symptoms and lesions common to both are set forth at length. Matthew Baillie,¹ in 1793, noted frequent appearances in the lungs at postmortem to which he gave the name of tubercle, but he declared they did not occur in the branches of the trachea "where there are follicles. They are solid or they may break down." Nevertheless, it would appear, in the edition published in 1825, after his death, that he had observed the walls of the trachea thickened and the mucosa covered by little hard tubercles accompanied by a scirrhus affection of the glands. He also referred to inflammation of the tracheal mucosa and its ulceration "where there are serofulous abscesses of the lungs. The same appearances are observable in the mucous membranes of the larynx."²

Laryngeal Tubercle.—Whatever may have been the real conditions referred to by Baillie, Broussais,³ in 1806, noted white miliary tubercles in the larynx of a man dead of pulmonary phthisis. There was also an ulceration in the ventricles of the larynx. His observation seems to have been first published in 1816. Previous to this Bayle⁴ had published his varieties of phthisis pulmonalis, the first of which was tubercular. He described its three stages: the state of tubercle, its softening, its cavernous or cystic stage. He is also said to have been the first to make use of the term "tubercular diathesis."⁵

While, therefore, tubercle had been recognized, not only in the lungs but in the larynx, before Laennec's publications, he more clearly and definitely than others pointed out the characteristic lesion, to which he himself fell a victim, dying, in 1826, at the age of forty-five. In his treatise on the Diseases of the Chest,⁶ he thus defines phthisis pulmonalis at the beginning of his book: "The existence in the lungs of those peculiar productions, to which the name tubercle has been restricted by modern anatomists, is the cause and constitutes the true anatomical character of consumption." He described their formation, regarding them as adventitious matter forming in the pulmonary tissue.

A very full and satisfactory account of the condition of the knowledge of laryngeal phthisis prior to Louis' celebrated work may be found in the thesis of Pravaz.⁷ Unfortunately we are still in a position to thoroughly understand the vivid impression made upon the author by the death of his mother from this formidable affection, and we also understand his bitter quotation of the expression of Asclepiades in regard to Hippocratic medicine where

¹ *Morbid Anatomy of Some of the Most Important Parts of the Human Body*, London, 1793.

² *The Works of Matthew Baillie*, London, 1825, Vol. II, p. 84 et seq.

³ *Histoire des Phlegmasies*, Paris, 1816, I, p. 372.

⁴ *Recherches sur la Phthisie Pulmonaire*, Paris, 1810.

⁵ *Jour. de Méd. Chirurg. and Pharm.*, etc., Paris, An. XI, T. VI, p. 3.

⁶ Translated by John Forbes, 1823.

⁷ *Recherches pour servir à l'Histoire de la Phthisie Laryngée*. Thèse de l'Ecole de Médecine de Paris, No. 56, 1824.

he says it was the contemplation of death. He says, "No one can doubt today that laryngeal phthisis may exist primarily." This to the modern reader is explained by the citation of such cases, cured by the administration of mercury.

There is a notice in a publication¹ in 1818 that creosote was used in the form of a fumigation of tar, and it was suggested that this might be useful in laryngeal phthisis, but as a rule treatment was regarded as of no avail.

Louis on Phthisis and Catarrhal Ulcers of the Larynx.—The advent of the more exact methods of diagnosing pulmonary disease by physical examination, corresponding to the more general study of its anatomical lesions, resulted in a considerable increase of attention given to tubercular lesions of the upper air tubes. The work of Louis² forms an integral part of the history of Phthisis, but in a work of more than 500 pages hardly fifty are devoted to the manifestations of the disease in the "tracheal artery," the larynx and the epiglottis. To the lesions of the latter he devoted especial attention. In 102 cases at autopsy the upper air tubes were examined and lesions were found—of the epiglottis 18, of the larynx 22, of the trachea 31. While he did not recognize, as did Broussais, tubercle in the larynx, he supplemented the work of Laennec by its careful description in the lungs. The work of Louis is more frequently quoted in laryngology as having given origin to the idea that the ulcers of the larynx in phthisis are due to the mechanical raspings of secretions, cast off from the tubercular lesions of the pulmonary tissue. This mistaken conception has hardly yet entirely disappeared from our nosology of disease, in spite of the early work of Rokitansky and Virchow. This was asserted not only in the first edition of his work, but repeated in the second edition in 1843. He seems to have been the first to use the term and to draw attention to the existence of latent phthisis, a matter with which advancing science has made us more familiar.

While far less exhaustive and valuable we may note in the work of Andral in 1834³ more accurate views than those of Louis as to some matters pertaining to laryngeal phthisis. He gave a long description of it, noting the occurrence of tubercle in the larynx.

Trousseau and Belloc.—Barth, writing in 1839, referred to fifteen or sixteen authors who had by that time written on the subject of laryngeal phthisis. By far the most exhaustive and the most valuable was the work of Trousseau and Belloc,⁴ which still remains a classical authority on the subject. Their differentiation of the lesions was still far from perfect, but they were aware of this con-

¹ Dictionnaire des Sciences Médicales, Paris, 1818, Vol. XXVII, p. 264.

² Recherches Anatomico-Pathologiques sur la Phthisis, A. Louis, Paris, 1825.

³ Clinique Médicale, 3 éd., Paris, 1834, 5 vols.

⁴ Traité Pratique de la Phthisie Laryngée, de la Laryngite Chronique, et des Maladies de la Voix, Paris, 1837.

fusion in the works of previous writers. Thus they quote Borsieri as saying in 1826: "There are those who think ulcers of the larynx and the aspera arteria, because they are not situated in the lungs, should be excluded from phthisis. However, from these lesions also the body often wastes away, and is consumed by a slow fever just as in the parent disease." Their assertion that he was the first to recognize laryngeal phthisis as in itself an essential disease is, as we have seen, hardly accurate. They included in their category of laryngeal phthisis:

1. Simple laryngeal phthisis produced by the common causes of inflammation in general, without pulmonary phthisis.

2. Syphilitic laryngeal phthisis.

3. Cancerous laryngeal phthisis.

4. Tubercular laryngeal phthisis.

Notwithstanding their recognition of tubercle in their last division, we see in their first the influence of the catarrhal theory of Louis, and the evidence of insufficient differentiation and faulty diagnosis, while their other two classes give evidence of a considerable advance in differential diagnosis over the works of their predecessors. Practically, however, when we come to study the reports of many of the cases classified thus, we will find considerable confusion. In this respect the slightly later memoir of Barth¹ gives evidence of a more correct understanding, as he separated more intelligently the syphilitic from the tubercular cases. We may now note the beginning of a more careful limitation and definition of the word tubercle. Hodgkin² notes a distinction, first that the term is applied to the shape or contour of a formation, and second to adventitious deposits as first used by Laennec.

Rokitansky.—We have now arrived at the time of Rokitansky, who inaugurated a system of study of morbid lesions, which was far in advance of anything which had yet appeared in Medicine. Many of his ideas are now rejected, but many more contained the germs of doctrines which still rule in the field of pathological medicine. In accuracy they were far in advance of contemporaneous research, and rapidly gained almost universal acceptance, especially his errors. He also looked on tubercle as an exudate of coagulated protein stuff, and in this era, when the knowledge of the cell was still in its infancy, he asserted that this exudate was embryonic tissue, or Blastema which had not yet undergone organization.³ He nevertheless recognized that the ulcers occurred from the breaking down of this tubercular exudate. He regarded primary tuberculosis of the larynx as an exceedingly rare affection. The lesion

¹ Mémoire sur les ulcérations des voies aériennes. Archives Générales de Médecine, Paris, 1839, 3me. série, Vol. V, p. 137.

² Lectures on the Morbid Anatomy of the Serous and Mucous Membranes, by Thomas Hodgkin, 1840, Vol. II, p. 132.

³ Handbuch der Path. Anat., Wien, 1846, Band I, p. 391.

of tubercle was more carefully described than ever before, and at last we note there is here¹ no indication of his confounding it with syphilis. In continuing the history of the old conception of tubercle, I need only refer to the paper of Rheiner, ten years later,² in which again appeared the idea of Louis, that the ulcerations of laryngeal phthisis are mechanical and catarrhal in their origin.

We may here take note of matters of further interest in the works of Rokitansky. In spite of his careful observations he spoke of the existence of dilatation of the larynx, corresponding to the condition of bronchiectasis in the lungs. He dealt in a systematic way with the hyperæmia and anæmia, the acute and chronic inflammations of the mucosæ of the upper air passages, their hypertrophy and atrophy, noticing the changes in the glands and describing polypi as a result of inflammatory action. It is a little difficult to understand the nature of the condition he refers to as blennorrhœal catarrh and stenosis of the larynx. Besides his mistaken conception of tuberculosis, he more accurately described the exudative processes of croupous inflammation, dividing them into several varieties, including the "true croup" of children. He spoke of the lesions in the air passages of variola and typhus fever as submucous processes involving ulceration of the mucosa and perichondritis. He described benign epithelial growths, mucous polypi, and the laryngeal excrescences of syphilis and tuberculosis. Fibrous tumors are also noted as well as malignant growths. In short, in the pathology of the larynx as well as in that of other regions we cannot fail to remark the great services rendered by Rokitansky. Unfortunately lesions in the air passages above the larynx did not receive the same careful study at his hands.

Œdematous Laryngitis.—As a contrast to the importance which the word tubercle has assumed in our terminology, the reader of the medical literature of this period will find much said of another phenomenon of disease in the larynx described by Bayle. Among the conditions which later studies in pathology have banished from the nosology of disease as an entity in itself, we frequently recognize the term Œdematous Laryngitis. The early treatise of Bayle,³ in 1817, however, cannot be justly blamed for having failed to give the term its proper place, for the author declared that it was a stage of many local and general diseases. Nevertheless many subsequent writers accepted the designation as creating a proper basis of classification for many cases. Sestier,⁴ especially, in a voluminous work in 1852, attempted to bring many fundamentally different pathological conditions into one category on this basis.

¹ l. c., Vol. III, p. 36.

² Virchow's Archiv, Berlin, 1853, V, 534.

³ Œdème de la Glotte ou Angine Laryngée Œdémateuse. Dict. des Sciences Médicales. Paris, 1817, T. 18, p. 505.

⁴ Traité de l'Angine Laryngée Œdémateuse, Paris, 1852.

"Ludwig's Angina."—Some years before this D. Ludwig¹ described a clinical condition arising from infection of perilaryngeal tissues which is still described under his name. "Ludwig's Angina," on any basis of etiological classification, in spite of its peculiar condition of board-like hardness, deserves, as little as Bayle's "Edematous Angina," a place in modern nosology.

The Cell.—We cannot proceed further in an intelligible account of any part of the history of medicine without a few words as to the history of the discovery of the cell. It would be difficult to understand how the early microscopists failed to note more frequently and to study more carefully this unit of all living matter in the animal and vegetable world, were we to forget the small range of their magnifying glasses, the imperfection of the correction of the aberration of light, and more especially the imperfect technique in preparing solid tissues for microscopic examination. An English physician, Robert Hooker, in 1665, examining with a glass a little section of cork, saw cavities in it which he called cells and likened to a honey-comb. Subsequently, in 1671, Grew and Malpighi comprehended something of the significance of this discovery of the structure of the vegetable kingdom. It was another Englishman, Robert Brown, who first noted, in 1831, that in many families of plants a circular spot which he named areola or nucleus was present in each cell; and in 1838 M. J. Schleiden asserted that a similar spot or nucleus was a universal elementary organ in vegetables. The same phenomena had begun to be observed in animal structures, and in 1839 Schwann, a pupil of that man of genius, Johannes Müller, announced the important generalization that there is one universal principle of development for living organisms and that is the formation of cells.² The fruits of the labors of these men and others, their predecessors and contemporaries, were spread broadcast over all fields of medicine, and Virchow's apothegm "*Omnis cellula e cellula*" became the shibboleth of pathology after the middle of the century.

Epithelium of the Mucous Membranes.—Henle,³ as early as 1838, declared that the mucous membranes of the body are lined with epithelium, and in regard to the nasal mucosa he said: "From the openings of the nares the pavement epithelium extends internally for some distance upon the nasal septum as well as upon the *alæ nasi*, on a line which, upon the septum and upon the lateral walls of the nose, one may imagine as being drawn from the free border of the nasal bone to the anterior spine, occurs the change

¹ Medicinisches Correspondenz-Blatt des Württem. Aerztl. Vereins, Stuttgart, 1836, VI, No. 4, Feb. 5, p. 21.

² Vid. Sir William Turner's Presidential Address, The Popular Science Monthly, October and November, N. Y., 1900, LVII, p. 561; LVIII, p. 34; also Henneguy, *Leçons sur la Cellule*, Paris, 1896.

³ Archiv für Anatomie, Physiologie, etc., 1838, p. 103.

from a pavement epithelium to a ciliated epithelium." Later, in 1843,¹ he more exhaustively treated the whole subject.

The Tonsils.—William Bowman,² in 1845, described the sweat glands of the skin as tubular diverticula. He subsequently³ described similar structures in the nasal mucosa, which in the meanwhile Kölliker⁴ had also noted in the mucosa of the upper part of the nose, and to which he had given the name of Bowman's glands. The racemose glands of the mucosa, as we have seen, had long since been known. Henle (l. c.) had regarded the tonsils as of a similar nature, and even as late as 1866⁵ he is somewhat obscure as to their character, retaining the old name suggested by Sylvius de la Boe of the conglobate glands of the pharynx. It was Kölliker⁶ who first properly described these structures at the base of the tongue and in the fauces. He studied them in their simple forms in animals, but while he described the folds and depressions of the mucosæ and the follicles in their walls and the epithelium, the finer structure of the lymphatic net-work escaped the comparatively feeble powers of his microscope. He described the normal tonsils as "*Balg-Drüsen*," *i. e.*, closed, ductless glands developed in the walls around the depressions in the mucosa.⁷ Much contention arose as to their nature. Henle (l. c.), Sappey,⁸ Sachs,⁹ and others regarded them as true acinous glands, the lymph nodes being the acini and the invagination of the epithelium we call *lacunæ* being regarded as ducts. One may see in the plates of Sachs the errors into which this school fell. Sappey, in a later edition of his great work, failed to repeat this explanation of the tonsils. Brücke had also declared the tonsils were simply lymph glands, and Billroth¹⁰ called them follicular glands. Although the latter thus agreed with Kölliker and Gerlach in properly regarding them as part of the lymphatic system and related to the Malpighian corpuscles of the spleen, their conception of them was that the follicles, or, as we call them, the nodes, were really closed sacs holding grumous material, the round cells being apparently held in solution. The

¹ *Histoire des Tissus*, in the *Encyclopédie Anatomique*, Vol. VI, Paris, 1843.

² *The Physiological Anatomy and Physiology of Man*, Todd and Bowman, Vol. I, Chap. XIV, pp. 406-426, London, 1845. Also to be found in *The Collected Papers of Sir W. Bowman*, London, 1892.

³ l. c. II. The second volume was not published until 1856.

⁴ *Handbuch der Gewebelehre*, 1852.

⁵ *Handbuch der Eingeweidelehre des Menschen*. Braunschweig, 1866.

⁶ *Mikroskopische Anatomie, oder Gewebelehre des Menschen*, Leipzig, II, 2, 1852.

⁷ Huxley: *Quarterly Journal of Microscopic Science*, London, 1854, II, p. 82, who translated Kölliker's work into English, declared in his luminous language: "So far as its structure is concerned in fact, the tonsil exactly represents a lymphatic gland, developed around a diverticulum of the pharyngeal mucous membrane."

⁸ *Traité d'Anatomie*, Paris, 1857, III, p. 43.

⁹ *Müller's Archiv f. Anat.*, Leipzig, 1859, p. 196.

¹⁰ *Beiträge, zur path. Histologie*, Berlin, 1858.

finer intercellular structure was yet to be elucidated by the investigations of His in 1862, and the curious arrangement of lymphoid tissue around the juncture of the food and air passages was pointed out by Waldeyer in 1884,¹ and "Waldeyer's Ring" is now a well-known but as yet little understood apparatus.

Tonsillotomies.—The structure of the faucial tonsils, therefore, had been largely elucidated before the development of the specialty of laryngology, and the same may be said of their abscission, which indeed we have seen fully described in the very earliest of medical annals. Middeldorpf already described² his method of ablation by means of the galvanocautery snare. Before this the original forms of the tonsillotome now in use had been devised. The inception of the Mackenzie tonsillotome may be seen on referring to Bell's "System of Surgery," published in 1791 (Vol. III, p. 87). This was modified in 1828 by Philip Syng Physick,³ who first used it for amputating the uvula, adapting it subsequently⁴ to the tonsils, and using a forceps to drag them through the loop of his instrument.

Out of this grew another device for the same purpose. Fahnstock⁵ four years later described the instrument which was adopted and modified somewhat in France, and is now known under his name or that of Matthieu.

Horace Green.—One of the striking incidents in the history of laryngology was the storm aroused in America, in the decade preceding the announcement of Garcia, by the persistent claims of Horace Green. The question as to whether it was possible to introduce, *per vias naturales*, a probe into the box of the larynx seems, on the eve of the discovery of the laryngoscope, to have been the most inconsequential of contentions, yet it excited in New York, and to some extent in London and Paris, the bitterest feelings of resentment, anger, and opposition. The only explanation of the importance which was at the time attached to this contention would seem to have been the latent idea, that if they once succeeded in performing this feat of legerdemain, all the ills of the larynx would be cured. But if one may conjecture that this was the idea which lent importance to the controversy fifty years ago, it is impossible to fathom the reason which has occasionally led writers since then to regard this episode, in the history of laryngology, as anything more than a lamentable example of how coteries of medical men will insult one another, and transgress the bounds of decency in their discussion of a trivial matter. We have seen how Hippocrates referred to passing tubes into the air passages,

¹ Deutsche med. Woch., May 15, 1884, X, p. 313.

² Die Galvanocaustic, Breslau, 1854.

³ American Journal of the Medical Sciences, 1828, Vol. I, p. 262.

⁴ I. c., Vol. II, p. 116.

⁵ American Jour. Med. Sc., 1832, Vol. XI, p. 249.

and how it is mentioned in all pre-Renaissance medical writers. We shall see later in the history of intubation how Desault, Loiseau, Bouchut, fully demonstrated the possibility of introducing instruments into the larynx from above. Horace Green was persecuted and reviled for claiming he could perform this operation, but this is only a part of the story. He laid himself open to criticism by claiming that by this procedure he could apply medicaments which would cause the cure of various pulmonary and laryngeal lesions, which the same vastly more accurate manœuvres, guided by the laryngoscope, are today unable to accomplish. His pathology, resting on the half comprehended ideas of Louis, was so erroneous and crude as to secure no support from his more scientific colleagues.

Very frequently a new triumph of dexterity or invention in any department of surgery leads to the erroneous assumption that because a difficulty of technique has been overcome, a new era in surgical therapy has been inaugurated.

As early as 1818 Bretonneau¹ had carried a probang over the aryteno-epiglottic ligaments and expressed fluids from the sponge at this point, but Trousseau denied that the interior of the larynx was reached by him.

Trousseau and Belloc in their great work, published in French first in 1837 and translated into English in 1841, described a method of making applications to the larynx which leaves us also in considerable doubt if they ever really succeeded in placing any medicament in the larynx itself. Their own doubts as to this are emphasized in the skepticism which Trousseau later evinced toward the assertions of Green, who, however, was finally acknowledged by him to have succeeded in entering the larynx. Horace Green, in 1846, published his "Treatise on Diseases of the Air Passages, Comprising an Inquiry into the History, Pathology, Causes, and Treatment of Those Affections of the Throat Called Bronchitis, Chronic Laryngitis, Clergyman's Sore Throat, Etc." In 1840 he had reported a number of cases of laryngeal and bronchial disease to the New York Medical and Surgical Society as cured by intralaryngeal applications. His statements, while finding some support, were received with incredulity by a large number of his hearers. It was thought and persistently argued that it was impossible in practice to introduce instruments into the larynx. He had made his first successful attempt in 1838, a year after the publication of Trousseau and Belloc's work in France. He was subsequently charged with having derived his ideas from this book and having failed to acknowledge it. His favorite, almost his sole, local application was a 40-80 grains to the ounce solution of nitrate of silver. His laryngeal applicators had practically the same curves as those now in use. A number of prominent medical men testified

¹ *Traité de la Diphtérie*

to the accuracy of his statements as to the practicability of intralaryngeal applications. Immediately the book met with the bitterest reception on the part of the medical press.¹

It would be profitless to follow the history of all the bitter controversy of the time. He was attacked with savage malignity, but vulnerable as were many of his other ideas, he nevertheless succeeded finally in proving that he could enter the larynx with his applicator. In this claim he was firmly supported, in the end, by the leaders of the profession in New York, and although even as late as 1855 Erichsen,² in London, while admitting that the probang might be carried to the vocal cords, decided that it could not be introduced further.³ Nevertheless in the course of the bitter contest Dr. Green was compelled to resign from one of the medical societies in New York and was even threatened with expulsion from the Academy of Medicine. The matter was fully discussed there in 1855, and an unfavorable report was made by a committee appointed to investigate his assertions. This was, however, laid on the table. He finally fully established his claims to be able to enter the larynx, but he did not succeed in proving the further claim of his ability to inject medication into the bronchial tubes and tubercular cavities of the lungs. Green eventually somewhat receded from this position, saying that he could inject it below the trachea. He grossly exaggerated the efficacy of these topical applications, saying that he had produced thereby astonishingly ameliorating effects with his nitrate of silver.

Doubtless in many cases he was self-deceived by a faulty diagnosis and by his superficial knowledge of pathological anatomy. There is, however, no doubt that he greatly benefited many cases of simple chronic catarrhal inflammations of the pharynx and larynx, and his success in obtaining a large clientèle doubtless had something to do with the jealousy of his confrères.⁴

THE LARYNGOSCOPE.

We have now passed in review events of interest to us in the first half of the wonderful century just completed. Before we proceed further and enter directly upon that era in which laryngoscopy created a new field for scientific endeavor and observation, let us not forget the advance in that intellectual evolution, that

¹ Something of this may be found in the Boston Medical and Surgical Journal, Dec. 16, 1846, XXXV, p. 392, et seq.

² Lancet, Nov. 24 Dec. 1, 1855, II, pp. 489, 518.

³ Bull. de l'Acad. Impér. de Médecine, 1858, Vol. 24, p. 101. Trousseau admitted that to Horace Green belongs the honor of having methodically and systematically treated diphtheria when it occupies the larynx, by caustics introduced by means of a little sponge. A little later Loiseau carried solutions of tannin, etc., into the larynx.

⁴ For a list of the works of Horace Green, see his obituary notice in the New York Medical Journal, Jan., 1867, IV, p. 316.

most important and all-pervading element in the history of civilization, which the Germans, after their wont, have rolled together in one word and called the "Zeit-Geist." After the French Revolution there was hardly an obstacle in the world to the advance of science—none except the bigoted but almost impotent sentiment of the Church. The fagot, the rack, and the boot, prison and exile, had long since passed away from the horizon of possibilities in the personal prospect of the man of Science. From the burning of Bruno and the degradation of Galileo to Wilberforce's undignified and maladroit taunt against the Darwinians at Oxford, a period of scarcely two hundred and fifty years had elapsed. It needed not Huxley's cutting rejoinder to remind the world that ecclesiasticism was no longer an efficient engine of intellectual tyranny.

The Laryngoscope of Bozzini.—The century had hardly opened when we find the idea existent that it might be possible, by means of a mirror, to see into the larynx.¹ Bozzini seems to have drawn on himself an undeserved amount of criticism by the publication, in 1807, of a brochure,² describing a double cannula with a mirror placed at an angle at the end, which was supposed to transmit light through one compartment, and reflect it from the mirror on to the parts examined, whose image, received on the mirror, was reflected back to the eye through the other compartment. It was supposed, singular to say, that the light passing in would interfere with the perception of the reflected image if one tube was used. A wax candle with a reflector behind it supplied the illumination. This instrument was used successfully. With it and others, Bozzini claimed to be able to inspect the various canals of the body, among them, the larynx. Of course this contrivance was too imperfect to attract any attention to the idea, but the invention of Babington, and that of Cagniard de la Tour, were practically the present instrument. Exhibited before scientific bodies it is singular, but instructive, that these should not have attracted the notice which thirty years later was given to Garcia's invention.

Babington.—In 1829 Benjamin Babington presented to the Hunterian Society³ "an oblong piece of looking glass, set in silver

¹ In Mackenzie's early account of the history of the laryngoscope he committed the error of referring to Celsus as having been familiar with the use of dentists' mirrors. He evidently mistook the word *specillum*, meaning a probe, in *De Medicina*, VII, c. XII, for *speculum*, meaning a mirror. He was also wrong in supposing that Levret, in the eighteenth century, had any glimmer of the possibilities of the idea of laryngoscopy in recommending a polished steel tongue depressor in examining the pharynx.

Vid. Levret; *Observations sur la Cure Radicale de Plusieurs Polypes de la Matrice, de la Gorge, et du Nez.*, Paris, 1749.

² *Der Lichtleiter oder Beschreibung einer einfachen Vorrichtung und ihrer Anwendung zur Erleuchtung innerer Höhlen und Zwischenräume des lebenden animalischen Körpers*, von Philip Bozzini, der Medizin und Chirurgie Doctor, Weimar, 1807.

I am indebted to other sources, chiefly Morell Mackenzie's works, for an account of this brochure.

³ *London Medical Gazette*, 1829, III, p. 555.

wire, with a long shank. The reflecting portion was to be held against the palate, whilst the tongue was held down by a spatula." The doctor proposed to call this contrivance a Glottoscope.¹

Cagniard de la Tour.—Fournié says² that in 1825 M. Cagniard de la Tour introduced into the back part of his own throat a little mirror, hoping that by the aid of the solar rays and of a second mirror he could see the epiglottis and even the glottis, but he was only partly successful.

Senn.—There is still another record of this date, which is interesting in connection with the foregoing as illustrating how the idea was hovering in the air long before Garcia. Senn,³ in 1827, tried to use a small mirror in the pharynx to see the parts below. He used no illumination and supposed his failure was due to the small size of the mirror. Again we find a great London surgeon, who appreciated some of the possibilities of such an instrument in 1837.

Liston.—Liston⁴ declared: "The existence of this swelling (of the laryngeal mucosa) can often be ascertained . . . by means of a speculum; by such a glass as is used by dentists, on a long stalk, previously dipped in hot water, introduced with its reflecting surface downward and carried well back into the fauces, a view may often be had of the parts."

Baumès.—Baumès, in 1838,⁵ exhibited at the Medical Society of Lyons a mirror the size of a two-franc piece, which he described as being very useful for examining the posterior nares and larynx.

Much more earnest but scarcely so successful were the efforts of Trousseau and Belloc to see the parts *intra vitam*, with which their work on laryngeal phthisis in 1837 was concerned. I may quote, directly from them, their own experience and that of others I have not thus far mentioned.

Selligue.—"For several years we have been occupied with the construction of a speculum laryngis. The one of M. Selligue is known. He is a very ingenious mechanic, who, affected himself with laryngeal phthisis from which he had entirely recovered, made for his physician a speculum with two tubes, of which one served to carry the light to the glottis, and the other served to carry back to the eye the image of the glottis reflected in a mirror placed at the guttural extremity of the instrument. . . . The

¹ According to Mackenzie, Babington's patient sat with his back to the sun, the rays of which were reflected into his throat by an ordinary hand mirror. In Mackenzie's book, *The Use of the Laryngoscope*, London, 1865, p. 14, the laryngeal mirror of Babington is illustrated, but in the original notice here cited, there is no reference to the method of illumination, except that a strong light is necessary.

² *Physiologie de la Voix*, Paris, 1866, p. 352—quoting from the *Journal de l'Institut*, 1825, No. 225.

³ *Jour. des Progrès*, 1829, p. 231. Note (quoted by Mackenzie l. c.).

⁴ *Practical Surgery*, by Robert Liston, London, 1837, p. 350.

⁵ *Compte Rendu des Travaux de la Société de Médecine de Lyons*, 1836-1838, p. 62.

use of this is very difficult, and there is only about one patient in ten who can bear its introduction. Indeed, it is of a volume which occupies the space comprised between the free border of the velum palatum and the superior surface of the tongue." A similar instrument, the description of which we may note corresponds with that of Bozzini, was made for them, but so unsuccessful were they with it they denied it was possible for Bennati¹ to see the glottis with the instrument of Selligue. "He might have seen the epiglottis or the superior opening of the larynx, but as for the glottis, it is situated at such a depth and in such a manner that it is impossible to see it with the speculum even in the cadaver, while the irritation of the pharynx in the live subject renders it still more inaccessible, even in those who are most accustomed to it." This emphatic expression of a negative opinion as to the performances of others, was characteristic of the man who later in life, at first obstinately refused credence to the practicability of Green's topical applications, and Bouchut's intubation of the larynx.

Warden.—Adam Warden² suggested the use of refracting prisms to carry the light and the line of vision to parts within the larynx, the ear and the vagina, through variously devised cannulæ. He claimed that in one case he was able to see the pathological condition of the larynx.³

This idea later also occurred to Ephraim Cutter in America,⁴ about the time laryngoscopy became elsewhere an accomplished fact.

Avery.—Mackenzie (l. c., p. 22) gives a full description and an illustration of the laryngoscope of Avery invented in London in 1844. A small lamp attached to a head-piece was worn on the forehead with a reflector behind it. A speculum similar to Bozzini's, except with a single tube, was used to hold the reflecting mirror.

The collection of these notes seems to make a respectable pre-laryngoscopic history of the laryngoscope. How completely the idea, dwelling in the minds of men, had failed to take root, is to be noted in the remark of Friedreich (1854), I have quoted, regarding the impracticability of extending to the larynx any method of physical examination.

Manuel Garcia.—These are the brief words with which Manuel Garcia, in 1855, explained his device for examining the larynx: "The pages which follow are intended to describe some observations made on the interior of the larynx, during the act of singing. The method which I have adopted is very simple. It consists in placing a little mirror, fixed on a long handle suitably bent, in the throat

¹ Bennati, in a footnote to the 3d edition of his *Recherches sur la Voix Humaine*, describes the instrument here referred to.

² *London Medical Gazette*, n. s., Vol. II, 1844, p. 256.

³ *Monthly Journal of Medical Sciences*, London, 1845, V, p. 552.

⁴ A contribution to the History of Laryngoscopy, by Louis Elsberg, M.D. *Archives of Laryngology*, 1883, Vol. IV, p. 122.

of the person experimented on, against the soft palate and uvula. The party ought to turn himself toward the sun, so that the luminous rays, falling on the little mirror, may be reflected on the larynx. If the observer experiment on himself he ought, by means of a second mirror, to receive the rays of the sun and direct them on the mirror which is placed against the uvula."¹

Garcia was entirely unaware of the previous attempts to accomplish his purpose with devices, some of which were identical with his own. His invention, great in utility as it was in the hands of medical men, was merely an incidental contrivance in those of the earnest teacher of singing, who desired to see the apparatus which produced the sounds he was endeavoring to train into harmony and the remainder of his communication is largely devoted to the conclusions he drew from what he saw in his own throat of the various laryngeal movements during the act of musical phonation. The announcement, therefore, was chiefly a demonstration of autolaryngoscopy.

Garcia was called the Father of Laryngoscopy and in the sense that his independent discovery of the laryngoscope resulted in its utilization in founding the specialty of laryngology the title is deserved. Yet we have seen how long before him the conception of laryngoscopy and the actual invention of the laryngoscope had preceded his own. He had the rare fortune to live long enough to see the enormous consequences of the attention which his studies attracted. He lived to be more than a hundred years old, dying in 1906 in his 102d year.² In 1905 delegations of laryngologists from all parts of the civilized world gathered in London on the occasion of his centenary³ to do him honor.

Difficulties of Technique.—The crux of the difficulties which had hitherto prevented the utilization of this device which had, as we have seen, been so many times proposed, is evidenced in the notice of Garcia's communication which appeared in Paris.⁴ "M. Garcia has the faculty of supporting in the pharynx and at the isthmus of the fauces the prolonged contact of foreign bodies without provoking in him efforts at vomiting." Commenting on this the editor said: "As for the ingenious procedure by which he was able to see the glottis in function, I hope indeed soon to be in a position to repeat it myself." This latter remark is an early hint as to the interest aroused by the announcement that it was possible to see a puzzling, interesting, familiar, but hitherto invisible physiological phenomenon, but it bore no trace of any thought

¹ Observations on the Human Voice, by Manuel Garcia, Esq. Received March 22, 1855; Proceedings of the Royal Society of London, 1855, VII, p. 399.

² Internat. Centralblatt für Laryngologie, etc., 1906, XXII, p. 281.

³ Ibid., 1905, XXI, p. 91.

⁴ M. Segond: Gazette Hébdomadaire de Médecine et de Chirurgie, Paris Nov. 16, 1855, II, No. 46, p. 816.

as to the vast possibilities in the way of studying pathological phenomena.

Ludwig Türck.—It is thus that Ludwig Türck relates¹ how his attention was directed in Vienna to the matter in 1857: "Half through accident, without knowing of my predecessors, I came to the idea of using a small mirror for the investigation of laryngeal disease. First, as I was showing Professor Ludwig the internal laryngeal structures of a patient in my hospital division, I learned of Garcia's investigations." From that it would appear that Türck had himself invented an instrument before he knew of Garcia's. Others declare that Garcia's communication was on his hands before he came upon the idea. However this may have been, certain it is that Türck had worked at the problem before Czermak took it up. The latter, however, preceded him in the public announcement of his studies.

Johann Czermak.—In March, 1858, there appeared a publication² upon the laryngeal mirror in one of the Vienna medical papers. It was by Professor Czermak, who said that Türck some time previously had been attempting to use some of Garcia's instruments. Czermak borrowed some mirrors of Türck for the same purpose, and his paper consisted only of some remarks on his experience, but he urged all physicians to make a trial of them. He said that Türck and Garcia used sunlight, but he made use of lamplight and advised the employment of a "large perforated concave mirror for reflecting either the sun or artificial light." Subsequently he very correctly asserted³ that but for this invention of the reflecting mirror, laryngoscopy would have been "a dead-born child." He urged in his first communication that by persistent practice difficulties in the technique may be overcome. Czermak's first device for fixing the head mirror seems to have been to hold the frame of the mirror between the teeth, Semeleder adapting it to a spectacle frame in 1858. Whatever may have preceded this, it is evident on a perusal of the literature of the subject at this period what an impulse Czermak's brief notice gave the whole matter. It aroused the languid interest of others, and soon excited the active resentment of Türck. Less than two weeks after this first communication in a medical journal, Czermak gave a public demonstration of the use of the laryngoscope.⁴ At this meeting Türck was present and claimed priority as the first to employ it for diagnostic purposes.⁵ This Czermak admitted.

¹ Klinik der Krankheiten des Kehlkopfes, Wien, 1866.

² Ueber den Kehlkopfspiegel, von Prof. Joh. Czermak; Wiener med. Wochenschrift, March 27, 1858, VIII, No. 13, p. 196.

³ Der Kehlkopfspiegel, 2 Aufl., Leipzig, 1863.

⁴ Zeitschrift der Gesellschaft der Aerzte, Sitzungsbericht; Sect. f. Physiologie und Pathologie, No. 17, April 26, 1858, Jahrg., XIV, p. 271.

⁵ See also: A. o. Beilage zu No. 16, der Wiener medicin. Wochenschrift, April 17, 1858, VII, p. 265.

Soon followed Türck's own publications.¹ Jealousy and strife soon began between the two men, and the history of it is an undignified record, the relation of which would serve no good purpose but to exhibit the folly of it and the harm such incidents do to the posthumous fame of otherwise distinguished men.²

Rhinopharyngoscopy.—Czermak soon opened up another region in the throat to examination. He turned his mirrors upward and demonstrated the pharyngonasal cavity, in Buda-Pesth, July 29, 1859.³ Very shortly after this, Voltolini took the matter up⁴ and still further developed the technique, abandoning the palate retractor used by Czermak. The latter in his early attempts at post-rhinology had also attempted the use of double mirrors, one placed at an angle above the other to show the choanæ. Czermak also introduced a mirror through a tracheal opening and demonstrated the under surface of the vocal cords. The mirrors at first and for long afterward varied in shape and size, many having bent handles. There were many subsidiary devices which complicated, but did not improve the technique, and early in the history of laryngoscopy we may note the old idea of Aranzy by which sunlight was admitted through a hole in a shutter of a dark room and allowed to fall, either directly or through a water bottle, into the nostrils or mouth of a patient. This was rendered more efficient by the use of a deflecting or reflecting mirror.⁵

Voltolini⁶ invented an apparatus for the manufacturing and burning of oxygen gas to be used in an incandescent light for examining the ear and larynx with Garcia's instrument.

Türck and Czermak in France.—By the profession in general, the new instrument at first was looked upon with some scorn as a physiological plaything, and the dispute as to the priority of its use may perhaps have had some beneficial effect in attracting an attention which its merits could not have effected. Türck and Czermak carried their ideas and their warfare into France. Having both published separate brochures in German on the use of the laryngoscope, Czermak in 1859, and Türck in 1860, they republished these immediately in French, and both went to Paris, where they gave public exhibitions and lessons in the new art. A commission of the Academy of Sciences of the Imperial Institute of France was appointed to investigate their rival claims. This did not choose to go into the question of priority, but accorded them both honor-

¹ Zeitschrift der K. K. Gesell. der Aerzte zu Wien, No. 26, June 28, 1858, Jahrg., XIV, p. 401.

² Lists of the numerous contributions of Türck and Czermak to the literature of the subject may be found appended to their later more voluminous works.

³ Der Kehlkopfspiegel, etc., 1860, von Joh. Czermak, also Deutsche Klinik, Berlin, No. 21, 1860, XII, p. 202. Die Besichtigung der Tuba Eustachii, etc.

⁴ Virchow's Archiv, Berlin, 1861, XXI, p. 45.

⁵ See among others Störk: Zeitsch. der K. K. Gesell. der Aerzte zu Wien, No. 46, p. 721, 1859.

⁶ Virchow's Archiv, 1859, XVII, p. 193.

able mention (March 21, 1861) for the services they had rendered science in the introduction of the laryngoscope. The committee suggested that 1200 francs for each be added to this honor.

Clinical Use of Laryngoscopy.—While Czermak had remarked upon some pathological conditions, he attributed the first studies in this field to his pupil, Semeleder, who in 1858, published¹ an account of some pathological conditions of the epiglottis and of the tongue. Störk, Türck, and Gerhardt, in the same year and the next began their numerous contributions to the literature of intralaryngeal pathology. In this Türck was especially prolific.² All these earlier works of Türck were in some form soon translated into French and English. Whatever may have been his merit as to the inception of the idea of laryngoscopy, he was foremost in the spread of the knowledge of disease revealed by it.

Intralaryngeal Applications.—For the most part his idea of pathology, especially pertaining to tuberculosis, conformed to the principles of Rokitansky. He described the appearances in lupus, diphtheria, syphilis, tumors, and œdema of the larynx. Störk, in 1859, in an article on the technique of laryngoscopy spoke of making laryngeal applications of nitrate of silver with the aid of the laryngoscope. Thus early was the question which agitated Horace Green and his adversaries conclusively settled without controversy. Czermak also claimed to have made applications of caustics and other drugs to the larynx under the guidance of the laryngoscope as early as 1859.

The Spread of Laryngoscopy.—The use of the laryngoscope quickly spread in the large cities of other lands. In London P. C. Price, apparently unacquainted with Garcia's communication to the Royal Society four years previously, published³ an account of a steel mirror which was to be used in examining the back part of the tongue and the epiglottis. In the *Medical Times and Gazette*, August 4, 1860, there is a short editorial note mentioning the investigations of Türck and Czermak, and stating inaccurately that the mirrors used were similar to those invented ten years before by Mr. Avery.

Morell Mackenzie had visited Czermak in 1859, and was in Vienna during the controversy between Czermak and Türck. On his return to London in 1860, in company with Gibbs, Prosser James, and others, he was foremost in the use of the laryngoscope and the study of the phenomena which it revealed, and in 1863 he

¹ Zeitsch. der K. K. Gesell. der Aerzte zu Wien., No. 28, July, 1858, Jahrg., XIV, p. 433.

² His contributions and those of others are to be found chiefly in the Zeitsch. der K. K. Gesell. der Aerzte zu Wien and the Allgemeine Medizin. Zeitung during 1859 and 1860. His brochure, *Praktische Anleitung zur Laryngoscopie*, Wien, 1860, is largely a reprint of these papers together with a historical and polemical dissertation on the subject of Laryngoscopy.

³ The Lancet, December 24, 1859, II, p. 643.

obtained the Jackson prize of the Royal College of Surgeons for his essay on "The Pathology and Treatment of Laryngeal Disease," his brochure on "The Use of the Laryngoscope in Diseases of the Throat with an Appendix on Rhinoscopy" appearing in 1865.

Windsor¹ gave an account of the history of the laryngoscope and pointed out the promise of its future. C. Rauchfuss² introduced into Russia the knowledge of laryngoscopy and intra-laryngeal operations.

Czermak and Türck, as we have seen, published their first books in France in 1859 and 1860. In 1861 Moura had advanced far enough in the new art to publish a treatise on laryngoscopy, a second edition appearing in 1865. Czermak besides his stay in Paris also visited London, as did Türck. The former also visited many cities in Germany, and Tobold, in Berlin, in 1863, published his "Anleitung zur Laryngoskopie," in which he adopted the principle of fixing the reflecting mirror to a stand which was eventually modified into the present so-called Tobold's apparatus. The original idea of this, however, is to be found in Türck's papers.

Voltolini³ contributed much, by the originality of his diction and the fertility of his inventive powers, to the spread and advance of the art in Germany especially as to nasopharyngoscopy and the employment of the galvanocautery. Post-rhinoscopy was at first eagerly pursued by Voltolini and Semeleder as an aid to the passage of the Eustachian catheter.

We have recited the attempt of Ephraim Cutter in America to utilize prisms in laryngoscopy. He and his predecessor in England, Worden, were alike unsuccessful in turning to account the principles of refraction, but his letters published by Elsberg are significant of how well extended was the idea of the practicability of laryngoscopy at the time Garcia demonstrated it.

Strangenwald,⁴ Church,⁵ Krackowitzer⁶ and John H. Douglas⁷ and Horace Green in 1861 reported the new art in America.

Louis Elsberg, to whose exhaustive work⁸ I am indebted for much of my information as to early laryngological literature in America, in 1862⁹ and 1863¹⁰ published papers on the laryngoscope and laryngoscopic technique. The latter more than anyone else was active in drawing attention in America to the value of the new art, and for some time previous to these publications he had

¹ British and Foreign Medico-Chirurgical Review, London, Jan., 1863, XXXI, p. 209.

² Zur Laryngoskopischen Technik, St. Petersburg. med. Zeitsch., 1861, I, p. 22.

³ Die Laryngoskopie und Pharyngoskopie, 1861.

⁴ American Med. Monthly and New York Review, July, 1860, Vol. XIV, p. 15.

⁵ Bulletin of the N. Y. Academy of Medicine, 1861, Vol. I, p. 156.

⁶ Ibid., p. 162.

⁷ Ibid.

⁸ Trans. Am. Lar. Ass'n, 1879, Vol. I, 33.

⁹ Am. Medical Monthly, N. Y., 1862, Vol. XVIII, p. 385.

¹⁰ Am. Medical Times, N. Y., May, 9, 1863, VI, p. 226; Dec. 26, 1863, VII, p. 297.

taught the technique in the University Medical College in New York City. His attention had been attracted and his ardor stimulated by Czermak, who had sent him his book. These studies and observations he brought, in 1863, before the New York Academy of Medicine and the American Medical Association. He also thus early urged the value of topical applications to the larynx. Horace Green lived to see an instrument of precision prove, before the Academy of Medicine, the claims which he had advanced there so courageously and so tenaciously many years before, but he himself took no active part in developing in his native country the art of laryngoscopy. He died in 1866.

It was several years after Elsberg became active in the propagation of laryngology in America that others joined him.

In 1866 J. Solis Cohen, of Philadelphia, began¹ that long series of communications which have done so much to establish the specialty of laryngology in America and to stimulate its steady advance for nearly forty years.

Laryngological Clinics and Instruction.—In the Medical Schools and Universities instruction was soon given in the art of Laryngoscopy. Türk and Semeleder are recorded as giving instruction in Vienna in 1861, the former being created professor in 1864. In other large cities, as well² as in Vienna, private and public instruction was soon to be easily obtained by the student. In 1861 Elsberg had begun teaching laryngoscopy in New York, and in 1868 in the catalogue of the University of the City of New York, Medical Department, his name appears as Professor of Diseases of the Throat, but not until 1875 was laryngology included in the curriculum of the Harvard Medical School, and that of the New York College of Physicians and Surgeons. After this it soon became a department of nearly all the teaching medical institutions. In the dispensaries and hospitals of New York City, special clinics were formed about the same time. The throat department of the New York Eye and Ear Infirmary was separated from the Aural Department in 1873. In 1875 a department for Diseases of the Throat was opened at the New York Dispensary.

Laryngological Literature.—The new specialty of laryngology found place for its publications at first exclusively in the general medical literature of the day, but especially in the otological journals, "The Archiv für Ohrenheilkunde," founded in 1864 in Vienna, and especially in the "Monatsschrift für Ohrenheilkunde," founded by Voltolini in 1866, in Berlin. The "Annales des Maladies

¹ Vid. Med. Record, N. Y., 1866, I, p. 178 et seq.; Am. Jour. Med. Sciences, April-Oct., 1867, n. s., LIII, p. 404.

² I regret very much that more exact and accurate information is not at my disposal of the beginnings of laryngological instruction in various capitals of the civilized world.

de l'oreille, du larynx, etc.," began its issue in 1874 in France. "The American Archives of Laryngology" began its short-lived career in 1880 (ten years later began the first issue of "The Laryngoscope"), the "Archivii Italiani," in 1881, the Spanish "Revista de Laryngologia," etc., in 1887, while the English "Journal of Laryngology" also did not issue its first number until 1887. In 1884 Semon began his comprehensive index of laryngological literature, the "Centralblatt für Laryngologie," while it was not until 1893 Fraenkel began his stately Archiv, which has done so much in the last few years to supply us with the best thought of the workers in our own special field.

This at present, of course, does not by any means exhaust the list. In fact the special literature dealing with the nose and throat has now become of such enormous bulk that it is impossible for any one man to peruse anything more than a small part of even the most important books, essays, and reviews.

Text-books as we have seen were rapidly issued and grew quickly from small brochures, their first editions, to the respectable volumes of Türck, Cohen, Fauvel, and Mackenzie. Of late years the exhaustive composite works, of which Heymann's Handbuch is the most striking example, are monuments of intellectual activity and restless endeavor. In every encyclopædic work on general medicine or surgery, laryngology, and rhinology occupy a relatively large number of pages. Since Friedreich's casual remark our knowledge of the diseases of the upper air passages has increased enormously, and the literature of the subject still more so.

Laryngological Societies.—America claims precedence in the formation of special laryngological societies. The New York Laryngological Society began its sessions in 1873, which, however, were gradually discontinued, and the organization of a throat section in the Academy of Medicine in 1885 practically took its place. The American Laryngological Association held its first meeting in 1879 under the presidency of Louis Elsberg. The International Medical Congress of 1881 established a section for laryngology and rhinology. Other special societies were formed throughout the world somewhat later. Since 1888 they have existed in abundance, but still have a tendency to multiply. Thus was the art of laryngoscopy and the science of laryngology spread throughout the principal countries of the civilized world.¹

We may now take notice of the great strides immediately taken in the knowledge of the various phenomena of disease of the upper air passages.

¹ For a fuller list of special journals and text-books and societies, see the Index Catalogue of the Library of the United States Surgeon-General's office under the heading of Laryngology, Rhinology, etc. The lists have grown to such dimensions that it is quite impracticable to include them even in an appendix to this work.

Laryngeal Tumors.—No subject so immediately engaged attention as that of laryngeal tumors. Forming striking pictures in the laryngeal mirror, causing marked and distressing symptoms, capable of immediate relief by means of instruments under the guidance of the laryngoscope, and last, but by no means least, affording the operator a chance to display in the most brilliant manner his newly acquired skill, the larynges of the civilized world were soon swept so clear of benign neoplastic excrescences, that one is today almost tempted to account for their present rarity by supposing the early laryngologists even removed the tendency to their formation. And yet even here we are able to go far back in the history of medicine, and note not only the observations of laryngeal tumors postmortem, but even their extraction *per vias naturales*.

Marcellus Donatus¹ in a vague way doubtless referred to laryngeal growths in the early part of the seventeenth century when he spoke of warts in the throat, fauces, and root of the tongue. He says they are rare, but occur at times. Edward Tyson,² in 1627, wrote of having diagnosticated a polypus of the bronchi and trachea from the expectoration of fleshy masses by a young man, but he was not able to obtain an autopsy to confirm his diagnosis, and it is not certain he did not observe fibrinous shreds.

Haller³ refers to a case of an ulcerous tumor of the epiglottis and "three scirrhous and round tubercles seated between the membranes" of the uterus. The epiglottic tumor was of such a size that wonder was expressed that the woman had not died. We may suppose it was an epithelioma.

Lieutaud in the middle of the eighteenth century recorded⁴ observations of two cases postmortem, in which laryngeal polypi has caused death.

The First Intralaryngeal Operation.—"A laryngeal polypus which Levret could not ligate with his instrument, G. Köderik, a surgeon in Brussels, ligated with much ease by means of an instrument which was constructed out of a row of hollow balls. This flexible instrument may perhaps be very useful in certain cases in which the stiff catheter renders no aid."⁵

John C. Cheeseman, in 1817, was doubtless the first in America to describe⁶ a laryngeal growth. His is the earliest illustration of

¹ De Historia Medica Mirabili, Lib. III, Cap. V, Francofurti a. M., 1613, p. 243.

² Acta Medica Thomæ Bartholini, Hafniæ, 1680, Lib. V, p. 94.

³ Pathological Observations, London, 1756, Obs. VIII, p. 14.

⁴ Historia Anatomica Medica, Parisiis, 1767, Vol. II, p. 297, Obs. 63 and 64.

⁵ This is as explicit a reference as I can find to the first authenticated case of intralaryngeal operation for a neoplasm. Herbinaux's report in the Jour. de Méd., Paris, 1770, not being at my disposal, I have it from Lewin's Deutsche Klinik, No. 13, March 29, 1862, XIV, p. 121, who himself quotes it from Richter's Chirurgische Bibliothek.

⁶ Transactions of the Physico-Medical Society of New York, 1817, Vol. I, p. 413. Case of a remarkable disease of the larynx and trachea, with a plate.

such a growth with which I am familiar. It was a case of papilloma of the vocal cords dying without relief. Albers remarked,¹ in 1834, that "tumors in the cavity of the larynx belong to a class remarkable alike for their rarity and their characteristic symptoms," and in 1837 Trousseau and Belloc could only report from literature and their own experience seven cases.

Cheeseman's case is omitted from Ehrmann's otherwise apparently complete list of the observations which had been noted up to the date of the appearance of his work in 1850,² including his own two cases, 31 in all. He also reported two cases of laryngeal polypi in horses and three in cows. Ehrmann said something of the structure of laryngeal polypi, dividing them histologically into fibrocellular and polypoid excrescences, these latter including what we call papilloma.

Shortly after Ehrmann's paper Horace Green³ published a work on the subject. He there speaks of having removed, by means of a knife and a bent tenaculum, a laryngeal polyp from a child of eleven, which he could see by forcible depression of the tongue. He boldly and quickly cut the tumor at its base, certainly a very skilful operation under the easily imagined circumstances. It must of course have been a pedunculated tumor, springing from the upper part of the larynx in a very tractable patient. In another case, that of a man, he used a sponge probang and cauterized the base of what was evidently a polyp. Still another growth, which was probably malignant, was partly removed by knife and tenaculum.

Middeldorpf⁴ succeeded, by means of an incandescent platinum wire loop, in removing in 1853 a polyp which he supposed sprang from the upper part of the larynx. The tongue was forcibly pulled out by a sharp hook, and the tumor was encircled with the wire by means of the fingers. He at this time was able to cite 64 cases of laryngeal polypi before his own. A few only of this number had obtained relief by operative interference, yet some of these as we have seen, were extracted *per vias naturales* before the days of the laryngoscope. Nevertheless, this was very exceptional, and when we realize that Ehrmann spoke the truth in saying, "Polypi of the larynx, left to nature, become sooner or later the cause of sudden death," we are able to appreciate what laryngoscopy did for these sufferers.

The First Intralaryngeal Operation by the Aid of Laryngoscopy.—Immediately laryngological literature abounded in reports of the diagnosis, *intra vitam*, of this morbid condition. Lewin, in 1861, declared⁵ that he had, thus far, seen fifty to sixty cases of laryngeal

¹ Jour. der Chirurgie und Augenheilkunde, Berlin, 1834, XXI, Heft 4, p. 517.

² C. H. Ehrmann: Histoire des Polypes du Larynx, 1850.

³ Polypi of the Larynx, N. Y., 1852.

⁴ Die Galvanocaustik, Breslau, 1854, p. 222.

⁵ Allgemeine medicinische Central-Zeitung, Oct. 12, 1861, XXX, 654.

neoplasms, and that they were present in 5 or 6 per cent. of all cases of laryngeal affections. He had operated on seven of these, three by cutting operations and four by caustics. Subsequently¹ in an exhaustive paper he pictured forceps and laryngeal cautery electrodes. He there states he operated on his first case July 20, 1860, and upon his second case in November, 1861. We must, therefore, conclude so far at least as certain publications indicate it, that Lewin was the first to attempt the extirpation of a laryngeal growth under the guidance of the laryngoscope. Von Bruns' title allotting to himself the credit of the first operation therefore is misleading,² though of course he probably knew nothing of Lewin's publication. It nevertheless gave rise to considerable controversy. After long training of his brother's throat, he succeeded in removing a growth from his larynx by means of a forceps. In another work³ in 1865 he was able to report sixteen cases operated on in various ways.

In 1866, Elsberg published⁴ a pamphlet on the subject. It was a work of considerable merit, with some very good plates of the microscopic appearances of papilloma, and less good colored plates of laryngeal growths *in situ*. In 1867, J. Solis Cohen reported⁵ the intralaryngeal removal of a polyp.

The laryngeal knife, which of late has been discarded as a very dangerous instrument, was the favorite weapon of these early operators,⁶ who, we may suspect, did not always report their mishaps with it. Von Bruns, however, invented a number of other devices for his work.

So rapidly did the observations of these growths multiply, that by 1871 one man was able to report from his own experience 100 cases. In this year, Morell Mackenzie published his essay on "Growths in the Larynx," which he differentiated into papillomata, benign epithelial growths, fibromata, fibrocellular or mucous polypi, myxomata, spindle-celled sarcomata, cystic tumors, adenomata, and angeiomata. He pictured various intralaryngeal instruments of his own invention, among them his laryngeal forceps, and the devices of others. His observations began in 1862, and in eight years he had seen 100 cases himself, and he was able to collect the reports of 189 cases by others, published since the introduction of the laryngoscope, ascribing the first case to Lewin, in 1860.

¹ Deutsche Klinik, No. 12, 1862, XIV, p. 114, ff.

² Die Erste Ausrottung eines Polypen in der Kehlkopfhöhle, von Victor v. Bruns, Tübingen, 1862, 2 Aufl.

³ Die Laryngoskopie und die Laryngoskopische Chirurgie, Tübingen, 1865.

⁴ Laryngoscopy, Illustrated in the Treatment of Morbid Growths within the Larynx, being the prize essay to which the American Medical Association awarded the gold medal for 1865.

⁵ Am. Jour. of the Medical Sciences, April, 1867, LIII, p. 404.

⁶ Vid. Ueber Kehlkopfneubildungen, von Dr. Otto Prinz, Archiv der Heilkunde, 1866, VII, p. 193.

Many observers treated them by applications of caustics, but this method soon found its proper field of therapy. It is interesting to note in the table of Fauvel,¹ that he had, up to 1876, seen 300 cases of laryngeal neoplasms, beginning in 1862, when he saw eight, and reaching the highest figure in 1873, when he saw 40 cases. To the modern observer, even in our largest hospital clinics, these now seem fabulous figures. The rapid differentiation of these growths is to be noted in both Mackenzie and Fauvel's works. Lefferts² was able, in 1876, to diagnosticate and operate on a case of eversion of the laryngeal ventricles, cases having been previously observed by Mackenzie (l. c.) and Moxon.³

Tonsils.—The modern history of the development of our knowledge of the tonsils does not present those striking advances which are evidenced for instance in that of accessory sinus disease, or even in that of the differentiation of atrophic rhinitis. Its history may be epitomized in the remark that such progress as has been made has been along lines entirely dependent upon the advance of general medical and surgical knowledge. Yet this meagreness of results has been due to no fault ascribable to lack of study and analysis. In no other domain of laryngology has there been a more prolific literature. Shortly before and shortly after the close of the nineteenth century the amount of literature dealing with the subject of tonsils and adenoids became enormous, especially in America. America indeed at that time was producing nearly half of the laryngological literature of the world and nearly three times the amount of any other nation, so far as the titles of abstracts indicate it for the year 1900 in the *Centralblatt für Laryngologie*. It is given as an even 1000. A very large proportion of this work was devoted to the subject of tonsils and adenoids⁴ and of it a not inconsiderable number of papers were chiefly concerned with the tonsils as a port of entry for infection, tuberculous and other. But this was the acme of activity, in spite of the fact that the attention of otologists had been more directly called to the importance of nasopharyngeal affections in the etiology of ear disease. Already by 1902 the number of references to be found to tonsils and adenoid papers had fallen off so that the largest number of reports referred to in any one number was scarcely more than 20 and the total number in the year was less than a quarter of what it had been two years previously.

We have seen that Schneider, Santorini, and Haller, under a different name, had fully described the pharyngeal tonsil. The gross anatomy of the faucial tonsils had been known and studied

¹ Fauvel: *Traité Pratique des Maladies du Larynx*, Paris, 1876.

² Lefferts: *Medical Record*, 1876, Vol. XI, p. 359.

³ Moxon: *Trans. Path. Soc.*, London, 1868, XIX, p. 65.

⁴ For instance in one number (2) there were 115 titles of papers, not counting diphtheria, on the subject of tonsils and adenoids out of a total of 221.

from the earliest times as we have also seen. The clinical symptoms of acutely inflamed tonsils and of chronic enlargement of the faucial tonsils had long been known. Methods for their removal had long been practised before the days of the laryngoscope. Many of the instruments used in the operation have been perfected. The use of the microscope, making possible the more minute study of the embryology and histology of the tonsils, made strides in the middle of the nineteenth century of such importance that the results were soon striking in all fields of medical activity. In 1839 Rapp¹ made a study of the comparative anatomy of the tonsils. He made no mention of their minute structure. We may infer that at the time of the discovery of the cell by Schleiden and Schwann it was practically unknown, at least in its modern sense. But soon after this the impetus their discovery had upon medical science is seen in the history of laryngology. Still the actual appreciation that the histology of the tonsils as of other of the tissues is a necessity in the study of their function and of their disease was of slow growth. The presence of the lymphoid tissue in the nasopharynx was long well known to anatomists before Meyer in 1868 drew attention to its importance as a pathological phenomenon.

The Pharyngeal Bursa.—F. J. C. Mayer² in 1842 described the tissue of the pharynx as constituting a bursa and Tortual³ referred to it as the superior sinus of the fauces. While Kölliker⁴ in 1852 had a fairly good knowledge of some of the finer anatomical features of the faucial and lingual tonsils and compared them to the Peyer's patches in the intestines, he gives no very satisfactory description of the like tissue in the nasopharynx, beyond recognizing it as exactly similar in finer structure to the tissue in the oropharynx. Henle⁵ in his classical work in 1866 referred indefinitely to depressions and blind dilatations to be found in the mucous membrane of the nasopharynx. He admitted the existence of Mayer's "bursa pharyngea" as a normal structure.

The Pharyngeal Tonsil.—Luschka⁶ fully described the median and lateral recesses of the pharyngeal tonsil, declaring he had always found it when he looked for it. His book on the subject is a masterpiece among the brochures of anatomy. He also was well acquainted with many of its embryological features. He declared there was an embryonic connection between it and the hypophysis. Against

¹ Rapp: Müller's Archiv für Anatomie, Physiologie, etc., Jahrg., 1839, p. 189.

² F. J. C. Mayer: Neue Untersuchungen aus dem Gebiete der Anatomie und Physiologie, Bonn, 1842.

³ Tortual: Neue Untersuchungen über den Bau des menschlichen Schlundes und Kehlkopfes, Leipzig, 1846.

⁴ Kölliker: Mikroskopische Anatomie, Leipzig, 1852, II, 2, 1, p. 41.

⁵ Henle: Handbuch der systematischen Anatomie des Menschen, 1866, Band II, p. 83.

⁶ Luschka: Der Schlundkopf des Menschen, 1868.

this idea in the following year Dursy¹ protested in a work on the comparative embryology of the head and its structures.

Tornwaldt's Disease.—The conception of the earlier anatomists of the regular existence of a normal pharyngeal bursa led Tornwaldt² in 1885 to speak of an affection of this cavity as the usual origin and cause of postnasal catarrh. It was spoken of and is still known as "Tornwaldt's Disease."

While it is possible that the cases observed by Løwenberg³ and more probably the cases observed by Voltolini⁴ were really adenoids, this does not detract in the slightest from the originality of Wilhelm Meyer's great clinical discovery. Wagner⁵ in 1865 had described the anatomical structure of what he called "Pharyngeal Granulations."

Wilhelm Meyer.—Wilhelm Meyer had reported his observations on this lymphoid hypertrophy, in Copenhagen, in 1868, and later published in London⁶ his paper "On Adenoid Vegetation in the Nasopharyngeal Cavity." It is difficult to find, in the annals of medicine, a first report of a morbid process which so thoroughly in one essay exhausts the subject from almost every point of view. So common that, after his attention had been drawn to the condition, he was able to detect it in 102 cases in eighteen months, with symptoms so characteristic that the veriest tyro in medicine now easily suspects their presence at a glance, with certainty of relief so quickly afforded by a simple surgical procedure, it certainly seems marvelous that the condition should have been so long undetected. The practice of postrhinoscopy had failed to reveal it. Notwithstanding that Czermak and his followers for ten years had been accustomed to explore by vision the cavity of the upper pharynx, it was left to an observer comparatively unfamiliar with postrhinoscopy to detect it with his finger. In seeking for the cause of a Eustachian catarrh in a patient, he pushed his finger above the velum palati and thus became aware of a morbid growth, the removal of which has alleviated as much suffering and prevented as much disablement as any surgical procedure ever devised by the wit of man. Not only by his thorough exposé of the whole subject did Wilhelm Meyer thus confer an inestimable boon on suffering humanity, but he has furnished a subsequent generation of rhinologists with their most lucrative source of income. No other event since the discovery of the laryngoscope has so contributed at once to the glory and profit of the specialty of laryngology. With much more reason than Tagliacozzi's contemporaries and followers gazed

¹ Dursy: *Zur Entwicklungsgeschichte des Kopfes des Menschen und der höheren Wirbelthiere*, Tübingen, 1869.

² Tornwaldt: *Ueber die Bedeutung der Bursa Pharyngea*, Wiesbaden, 1885.

³ Løwenberg: *Archiv für Ohrenheilkunde*, 1865, (1867) Vol. II, p. 116.

⁴ Voltolini: *Die Anwendung der Galvanokaustik*, etc., Wien, 1867, p. 66.

⁵ Wagner: *Archiv der Heilkunde*, 1865, VI, p. 318.

⁶ Meyer: *Medico-Chirurgical Transactions*, 1870, Vol. 53 (n. s., 35), p. 191.

upon his statue in Bologna, may the modern rhinologist, and his patient alike, with unstinted reverence, view the figure of Wilhelm Meyer, as it stands, erected by them in 1898, in the "Gefion Platz" in Copenhagen. While only five cases had been previously noted, and while Waldeyer and his followers have subsequently further elucidated the histology of lymphoid hypertrophy, nothing of vital importance remains to be said of the history of "Adenoids" after Wilhelm Meyer.

The Embryology and Histology of the Pharynx.—Schwabach¹ in 1888 also protested against the idea of Luschka that the bursa pharyngea had embryonic affinities with the hypophysis and contributed valuable papers to the literature of the development of the pharyngeal tonsil. G. Killian,² in 1888, in a masterly essay on the subject of the comparative embryology of the pharyngeal tonsil, disagreed with the view of Schwabach and regarded the pharyngeal bursa as an atavistic structure in the walls of which develop lymph follicles without the formation of crypts and that thus the development and structure is not analogous to that of the faucial tonsil. Mayer, Luschka, Tornwaldt, Schwabach, and Killian believed in the bursa as an embryonic formation. Ganghofner did not. Schwabach seems to have confused the pathological cavity with the physiological.

Schmidt,³ in 1863, had studied the embryonic development of the tonsils in mammals. He there broached a point in the embryogeny of the tissues which still remains a question among histologists and embryologists. He drew attention to the intimate relationship of the epithelium and of the lymphoid tissue in the structure of the tonsils. Ganghofner,⁴ in 1878, gave a full review of the literature on the structure and development of the pharyngeal tonsil and bursa, regarding the latter as a normal structure in the child, resulting from the firmer adhesion of the bottom of the middle recess with the underlying aponeurosis, a true recess representing a more or less deep depression of the mucosa of the pharynx.

Leukocyte Emigration.—Stöhr⁵ as early as 1882 noted the profuse emigration of lymphoid cells through the epithelial layers of the tonsil at all ages, and asserted it was a physiological and not a pathological state. He also observed that the line between epithelium and connective tissue is frequently obliterated. He seems to have been the first to note the wanderings of the leukocytes through the epithelium. Stöhr and Retterer about 1884 began a series of papers which greatly elucidated the structure and added

¹ Schwabach: *Archiv für mikroskop. Anatomie*, 1887, XXIX, p. 61, and 1888, XXXII, p. 187.

² G. Killian: *Morphologisches Jahrbuch*, 1888, XIV, p. 618.

³ Schmidt: *Zeitschrift für wissenschaftliche Zoologie*, 1863, XIII, p. 221.

⁴ Ganghofner: *Sitzungsbericht der K. K. Akademie der Wissenschaften*, Wien, 1878, Band, 78, p. 182.

⁵ Stöhr: *Biologisches Centralblatt*, 1882, Band II, No. 12, p. 369.

to our knowledge of the embryogenesis of the tissues of the lymphoid structures. Stöhr,¹ recognizing the mingling of the leukocytes with the epithelial layers of the lymphoid tissue, was of the opinion that they are originally derived in embryonic life from the blood stream and reach the situation of the lymph nodes, there proliferate, and thence emigrate through the epithelial layers to the surface forming the corpuscular elements of the buccal and pharyngeal secretions.

Epithelial Origin.—Retterer,² on the other hand, believed these tonsillar elements are derived from the epithelium of the ectoderm and entoderm and not from the mesoderm. The lymphoid cells are given off from the basal layers of the epithelium which are invaginated in the course of forming the crypts, while from the mesoderm comes the fibrous frame-work of the tonsils.

Cordes,³ Wood,⁴ and Wright,⁵ many years later, came to accept the view expressed at this time by Retterer at least insofar as pathological conditions are concerned. Their experience in the histological examination of tonsils convinced them that the basal layers of the epithelium in hypertrophied tonsils give rise to the lymphocytes, Wood also accepting this view for their embryonic origin. Hammar,⁶ in 1903, gave a very good résumé of the literature and a classical account of the embryology of the pharynx, and asserted that the embryonic origin of the lymphoid cells is neither from the blood, as Stöhr asserted, nor from the epithelium, as still elaborately maintained by Retterer, but from the fixed connective-tissue cells. Retterer in later papers asserts that the connective tissue is also derived from the basal layers of the epithelium. Both Stöhr and Retterer also noted the tendency of the lymph cells to gather around the epithelium of the ducts of the racemose glands, and Stöhr especially speaks of it in connection with his remarks on the histology of the lingual tonsil. Swain,⁷ in 1886, also gave an early and very good description of the anatomical and clinical features of the lingual tonsil. Bickel⁸ gave a very extensive literary review of the subject of the tonsils, of the fauces, tongue, and pharynx in 1884, beginning with Vesalius. He also gave an excellent anatomical account of the examination of a large number of postmortem specimens. Trautmann,⁹

¹ Stöhr: Virchow's Archiv, 1884, XCVII, p. 211.

² Retterer: Journal de l'anatomie et de la physiologie, 1888, XXIV, pp. 1 and 274. Ibid., November-December, 1908, XLIV, p. 470, and May-June, 1909, XLV, p. 225. Semaine Médicale, January 27, 1886, VI, p. 32.

³ Cordes: Archiv für Laryngologie und Rhinologie, XII, 1901, p. 203.

⁴ Wood: University of Pennsylvania Medical Bulletin, October, 1904, XVII, p. 246.

⁵ Wright: The Laryngoscope, July, 1909, XIX, p. 488.

⁶ Hammar: Archiv für mikroskop. Anatomie, 1903, LXI, p. 404.

⁷ Swain: Deutsches Archiv für klinische Medizin, 1886, XXXIX, p. 504.

⁸ Bickel: Virchow's Archiv, 1884, XCVII, p. 340.

⁹ Trautmann: Anatomische, pathologische und klinische Studien über Hyperplasie der Rachentonsille, etc., Berlin, 1886.

Bresgen,¹ Tornwaldt,² Schwabach³ in Germany and Morgan⁴ in this country, discussed the question of the existence of the pharyngeal bursa in man and the distribution of the lymphoid material in the pharynx. Meyer⁵ himself took part in it in a lengthy review of Trautmann's brochure. Schaeffer⁶ and others refused to accept Tornwaldt's idea, but from this time on Tornwaldt's disease has become an accepted term in rhinology. Many reports of cysts formed by the agglutination of the median and lateral folds were made for a time after Tornwaldt's paper. It was the source of much fruitful investigation. Poelchen⁷ published some observations on the anatomy of the nasopharynx which went to uphold Tornwaldt's contention of the existence of the pharyngeal bursa as an anatomical structure, but there was no frank acknowledgment of it as being more than a depression in the mucosa emphasized often by the hyperplasia of the median folds. Gerber⁸ and Ziem⁹ discussed the question of Tornwaldt's disease in 1890. Chiari¹⁰ regarded the pharyngeal bursa as an agglutinative inflammation of the walls of the median recess of the pharyngeal tonsil, which is a little more frequently met with than the like phenomena of the lateral recesses, neither being very common. Allen¹¹ contributed a valuable paper to the literature of the morphology and pathology of the tonsil in 1891. Wright,¹² in 1895, described cyst formations in the faucial and pharyngeal tonsils as due not only to the agglutination of surface folds or of the mouths of crypts but to degeneration of the parenchyma of the tonsil.

In the last twenty years a number of papers have been written of importance dealing largely with the anatomy of the tonsil. J. Killian,¹³ Finder,¹⁴ Goodale,¹⁵ and Levinstein¹⁶ wrote papers in which, while the anatomy and physiology of the tonsil was discussed, they also contributed matter of value to the literature of the embryogeny, pathology, and clinical aspects of the subject. Wright,¹⁷ in 1906, demonstrated the occurrence of fat in the lymphoid tissue of the tonsils, and showed experimentally that at least

¹ Bresgen: *Deutsche medizinische Wochenschrift*, No. 5, 1887, XIII, p. 86.

² Tornwaldt: *Ibid.*, No. 23, p. 501.

³ Schwabach: *Ibid.*, No. 26, p. 578.

⁴ Morgan: *Maryland Medical Journal*, March 5, 1887, XVI, p. 353.

⁵ Meyer: *Internat. Centralblatt für Laryngologie und Rhinologie*, 1886-7, Jahr., III, p. 60.

⁶ Schaeffer: *Monatsschrift für Ohrenheilkunde*, No. 8, 1888, XXII, p. 207.

⁷ Poelchen: *Virchow's Archiv*, 1890, Band 119, p. 118.

⁸ Gerber: *Therapeutische Monatsschrift*, 1890, IV, p. 24.

⁹ Ziem: *Ibid.*, 1890, IV, p. 187, also *Virchow's Archiv*, 1890, Band 119, p. 569.

¹⁰ Chiari: *Wiener klinische Wochenschrift*, No. 4, 1891.

¹¹ Allen: *Transactions American Laryngological Assoc.*, 1891, p. 12.

¹² Wright: *New York Medical Journal*, December 7, 1895, LXII, p. 705.

¹³ J. Killian: *Archiv für Laryngologie und Rhinologie*, 1898, VII, p. 167.

¹⁴ Finder: *Ibid.*, 1898, VIII, p. 354. ¹⁵ Goodale: *Ibid.*, 1902, XII, p. 399.

¹⁶ Levinstein: *Ibid.*, XXII, 1909, p. 209.

¹⁷ Wright: *New York Medical Journal*, December 15, 1906, Vol. 84, p. 1161.

some of it may be derived from the passing food, but it seemed probable that some of it is due to the change of the protein in the cell bodies of the lymphocytes, but some also may be due to the affinity of such cells, when their cytoplasm undergoes degenerative change, for fat in the general circulation.

Accessory Tonsil.—Jurasz,¹ Morgan,² and Bandler³ reported cases of the so-called accessory or supernumerary tonsil in 1885 and 1889. Since then a number of reports of such cases have been made, including also reports of papillomata of the tonsil. Many such reports, it seems probable, referred to exceptional instances of the retrograde metamorphosis of the tonsils. An auxiliary method of tonsillar regression was declared by Wright⁴ to be a process whereby small pieces of the tonsils are automatically severed from the general mass by fibrosis and absorption of the strands of tissue connecting them, a process which he called autoclasis of the tonsil.

Physiology of the Tonsil.—We must now return to such an account of the ideas in regard to tonsillar functions as have been discussed in the last thirty years which it is possible to glean from the work to some of which I have already devoted a few pages. In the first volume of Semon's *Centralblatt* (p. 10) issued in 1884, reference is made to expressions of opinion that are still true enough and are still made by the student of general medicine. Writers declared then and they declare now that the tonsils are part of the general lymphatic system. They missed then and they miss now the salient point which laryngologists have come to appreciate—the tonsils, pharyngeal and faucial—are indeed enlarged lymph glands, but unlike lymph glands elsewhere they are exposed to an external environment of infection which introduces at once a unique problem,—How does this particular lymph gland respond to its unique environment? It is the attempt to answer this which furnished the chief interest in the subject for a generation to laryngologists, handicapped as they have been by a deficiency in their training for the task of answering it, and handicapped by a deficiency of perception of the problem by those capable of aiding them.

At that time, as there has been before and since, a notion prevailed among the laity and among general practitioners to some extent that the tonsils had some connection with the sexual organs and with voice production; with the former question Semon⁵ busied himself in 1885 and Gould⁶ in 1886. Needless to say the former condemned the idea and it has been generally discredited in scientific circles. With such ideas I do not propose to encumber these pages.

¹ Jurasz: *Monatsschrift für Ohrenheilkunde*, 1885, XIX, p. 361 et seq.

² Morgan: *Transactions American Laryngological Ass'n*, 1889, p. 4.

³ Bandler: *Prager medizinische Wochenschrift*, No. 43, 1890, XV, p. 535.

⁴ Wright: *The Laryngoscope*, April 1904, XIV, p. 257.

⁵ Semon: *St. Thomas' Hospital Reports*, 1885, Vol. XIII, p. 125.

⁶ Gould: *British Medical Journal*, October 16, 1886, II, p. 720.

Stöhr¹ in the beginning of his research suspected that the meaning of the emigration of the leukocytes from the tonsil was that they take up the degenerated material of the parenchyma of the tonsil and carry it out of the body, but he does not venture to state that this is a functional act or that the material they carry out is deleterious. Hingston Fox developed practically the same idea² in 1886, based no doubt on the observations of Stöhr. Hill³ practically embodied this in a report to the Otological Section of the British Medical Association in 1888. Brücke,⁴ in 1854, had stated that both the faucial and the intestinal follicles add to the number of leukocytes in the lymph which passes through them. This was confirmed thirty years later by the more elaborate investigations of Flemming,⁵ Drews,⁶ and Paulsen⁷ in 1885. They showed that the leukocytes were manufactured by lymphocytes at the germinal centres of the lymph nodes. Brücke had looked upon such collections of lymphoid material in the fauces and the intestines as absorbing organs. The demonstration by Stöhr of a current of leukocytes going out of the tonsil seemed to contradict this assumption of Brücke, and in 1891 Hodenpyl⁸ in a work incidental to a valuable disquisition on the finer anatomy of the tonsil came to the conclusion from various experimental and histological observations that they have no absorptive power. He explained their infection with the germ of diphtheria by supposing that the latter grew on surfaces deprived of the epithelium. The clinical evidence, aided by the enthusiasm of a rising school of high contagionists in bacteriology, did much to prevent the acceptance of these views. In 1897 Goodale⁹ published his important observation on the absorptive power of the tonsils for inorganic matter. Carmine granules introduced in the crypts were seen apparently passing through the epithelial covering into the lymphoid tissue beneath. This gave an objective support to previous clinical and pathological observations. This work was repeated and confirmed by that of Hendelsohn¹⁰ in 1898. On the other hand, Brieger¹¹ repeated the experiments of Goodale and Hendelsohn with negative results, urging also that he had never found foreign matter under the epithelium of those who are exposed continually to dust. While Wright later obtained positive results, there are, as a matter of fact, a number of points about the technique of the demonstration

¹ Stöhr: *Correspondenzblatt für Schweizer Aerzte*, No. 17, September 1, 1890, XX, Jahrg., p. 537.

² Hingston Fox: *Journal of Anatomy and Physiology*, July, 1886, XX, p. 559.

³ Hill: *British Medical Journal*, September 1, 1888, II, p. 487.

⁴ Brücke: *Denkschrift der Wiener Akademie*, 1854.

⁵ Flemming: *Archiv für mikroskop. Anatomie*, 1885, XXIV, p. 53.

⁶ Drews: *Ibid.*, p. 338.

⁷ Paulsen: *Ibid.*, p. 345.

⁸ Hodenpyl: *International Journal of the Medical Sciences*, March, 1891.

⁹ Goodale: *Archiv für Laryngologie und Rhinologie*, 1897, VII, p. 90.

¹⁰ Hendelsohn: *Archiv für Laryngologie und Rhinologie*, 1898, VIII, p. 476.

¹¹ Brieger: *Archiv für Laryngologie und Rhinologie*, 1901, XII, p. 254.

of these observers that need the control of others. Notwithstanding Brieger's hesitation in accepting the experimental results of Goodale and Hendelsohn, he was, nevertheless, disposed to believe that the pharyngeal and faucial tonsils offer some protection against the infective diseases of childhood and adolescence. Just the nature of this protection he did not venture to define and, singular to say, he concluded that tonsillar hypertrophy is a part of a constitutional dyscrasia, hereditary, whereby enlargement of all the lymph glands is an expression of scrofula due to systemic tuberculosis or hereditary syphilis. Görke¹ wrote a number of important articles on the physiology and pathology of the lymphoid tissue in the throat in 1907 and the previous years, pointing out the processes by which it retrogresses after childhood and the reasons which he believed suffice to consider them, when not unduly enlarged, a protection rather than a menace to the organism, meaning thereby when they do not act as an obstruction to respiration and to the function of the Eustachian tube and to the drainage of the pharynx. Opposed to this was the idea that the sunken tonsil is often dangerous because of the structural changes which it has undergone. Between the idea that the tonsil should be removed because it was too large, and the belief that it is a source of danger when small, the operating laryngologist has reaped a golden harvest. Görke surmised that the circulating lymph of the tonsil has some special bacteriolytic effect. This subject, together with that of the operative procedures on the tonsils, was reviewed by Hicguet and others² in 1910. Schoenemann³ attempted, in 1907, to answer the question as to whether the tonsils and adenoids are harmful or protective to the organism. He regarded the Stöhr-Brieger theory of the export of harmful products as very improbable, regarding it as an irrelevant activity accessory to lymphoid metabolism. He believed the chief function of the tonsils is to be sought in the internal cell activity of the adenoid tissue. This hypothesis seems supported by no evidence, and scarcely any argument, by those who, like Schoenemann, have alluded to it. Levinstein⁴ declared no theory of the function of the tonsil could be considered safe from criticism, and there is no satisfactory evidence that they perform any important part in the physiology of the organism, but he did not deny that there are indications to the contrary. Indeed, it still remains one of those many attractive subjects that make medicine a delight to the student of biological science.

¹ Görke: *Archiv für Laryngologie und Rhinologie*, 1904, XVI, p. 144, 1907, XIX, p. 244.

² Congress of the Belgian Otorhinolaryngological Society. Ref. Semon's *Int. Centralblatt für Laryngologie und Rhinologie*, XXVII, 1911, p. 92. See also Broeckaert: *Archives Internationales de Laryngologie*, Nos. 2 and 3, 1910, Tome XXX, p. 406, 819.

³ Schoenemann: *Monatsschrift für Ohrenheilkunde*, etc., 1907, XLI, p. 179.

⁴ Levinstein: *Archiv für Laryngologie und Rhinologie*, 1910, XXIII, p. 75.

As the result of his observation and experiments and those of others in the question of tonsillar absorption, Wright, in 1905, starting from a stand-point of fundamental physico-chemical principles, reasoning that there must be an equilibrium¹ between infection and immunity in the tonsillar crypts which accounts for the constant presence of bacteria within them and their only occasional absorption by the cryptal walls, drew attention to the difference in the behaviour of dust from that of bacteria² in 1906. Poulain,³ Hammerschlag,⁴ and Stheemann⁵ having shown the relation of fat to some of the activities of the lymph glands, Wright,⁶ in 1911, in a series of papers attempted to show that the question of absorption or repulsion of bacteria and of inert matter at the surface of the tonsils is dependent upon lipoproteid phases of surface tension of the epithelial cells and upon the fat and lipid constituents of the tonsillar parenchyma. These varying from time to time furnish the mechanism whereby germs and dust are excluded or admitted. He claimed that while it is improper to speak of tonsillar function, the study of these biochemical phenomena would tend to explain much that is now unknown in the mechanism of tonsillar immunity and infection.

Bacteriology and Bacterial Infection of Tonsils.—The organisms first noted in the tonsils naturally belonged to the moulds which are associated with tonsillar keratosis, but this was rather due to the fact that they were erroneously supposed to form the masses which give to that affection its striking naked-eye appearance. B. Fraenkel⁷ gave the name of mycosis pharyngis to it in 1873. The predominant organism, called at one time *Bacillus fasciculatus* by E. Fraenkel, was later identified as the *Leptothrix buccalis*. Heryng⁸ described the disease in 1885. As long ago as in 1885 and 1886 a large number of English authors published contributions in the *British Medical Journal* and *The Lancet* to the subject of the relation of tonsillar inflammation to rheumatism, a question in which the interest has of late years been revived. The British Medical Association had appointed a committee to investigate the matter and it had reported that there is no etiological relationship between the two, as a result of statistics which they had collected. This is a subject so largely involved with the general history of medicine, it is still so actively discussed in contem-

¹ Wright: *Medical News*, March 4, 1905, LXXXVI, p. 385.

² Wright: *New York Medical Journal*, January 6, 1906, Vol. 83, p. 17.

³ Poulain: *Étude de la graisse dans le ganglion lymphatique normal et patholog.*, Thèse de Paris, G. Steinheil, Ed., 1902.

⁴ Hammerschlag: *Virchow's Archiv*, 1908, CXCV, p. 320.

⁵ Stheemann: *Beiträge zur pathologischen Anatomie*, etc., 1910, XLVIII, p. 170.

⁶ Wright: *New York Medical Journal*, February 11, et seq., 1911, XCIII, p. 257.

⁷ B. Fraenkel: *Berliner klinische Wochenschrift*, 1873, X, p. 94.

⁸ Heryng: *Zeitschrift für klinische Medizin*, 1885, VII, Heft 4, p. 358.

poraneous literature, it is still in such an unsettled state that I shall not attempt to do further than direct the reader to the series of papers in the two English journals above mentioned.

Diphtheria.—So markedly are the symptomatic and prognostic features of that most frequent form of croupous inflammation of the mucosæ associated with the presence of the bacillus, that all other forms are excluded from the term Diphtheria, which we have seen Bretonneau applying to the whole category. Looking back to the treatise of Bretonneau, we again see, as everywhere and always in medicine, that the progress has been one of advance in differentiation. We need not, therefore, review the abundant literature, which appeared in the long interval of nearly sixty years, which intervened between the work of Bretonneau and the discovery of the Klebs-Loeffler bacillus. Loeffler,¹ in 1884, described more fully and identified more clearly the bacillus of diphtheria previously observed by Klebs. Roux and Yersin,² in 1888, still further extended our knowledge of the bacterium usually found in croupous inflammations, so that it became possible as it had previously been with tuberculosis to classify the disease from the stand-point of the bacteriologist rather than from that of the pathologist. But before this we find frequent traces of the belief in the germ origin of the disease. Thus Shurly in America in 1879³ stated his belief in the microbial origin of diphtheria. Roux and Yersin began their studies on diphtheria in 1888 (l. c.), and continuing them for several years, they investigated the nature of the bacillus and its toxins, and laid the foundation for the production of the immunizing serum by Behring,⁴ E. Fraenkel,⁵ and Roux and Martin.⁶

About this time attention was again drawn to that class of infectious disease of the tissues around the upper air tube of which Hippocrates had so much to say and of which Ludwig wrote (l. c.). Senator, in 1888, gave a very careful description⁷ of phlegmon of the peripharyngeal tissues, and numerous papers on the subject have subsequently appeared.

In 1894, after the publication of the paper of Roux and Yersin, began the discussion of the merits of antitoxin in diphtheria. The serum of Behring came into active use, and in the *Centralblatt*

¹ Loeffler: *Veröffentlichungen des Kais. Gesundheitsamtes*, 1884.

² Roux and Yersin: *Annales de l'Institut Pasteur*, 1888, II, p. 629; 1889, III, p. 273; 1890, IV, p. 385.

³ Shurly: *Transactions Detroit Medical and Library Ass'n*, February, 1879, p. 13.

⁴ Behring: *Deutsche medizinische Wochenschrift*, Nos. 49-50, 1890, XVI, p. 1113, 1145; 1893, XVII ff.

⁵ E. Fraenkel: *Berliner klinische Wochenschrift*, No. 49, 1890, XXVII, p. 1133.

⁶ Roux and Martin: *Annales de l'Institut Pasteur*, No. 9, 1894, VIII, p. 609.

⁷ Senator: *Ueber Akute Infektiöse Phlegmon des Pharynx*, *Verhandlungen der Berliner medizinische Gesellschaft*, 1888, Band, XIX, Th. 2, p. 10.

für Laryngologie und Rhinologie, Jahrg. II, p. 586 et seq., may be found references to numerous reports on its practical use.¹

Intubation.—If bacteriology wrought great changes in the nosology of diphtheria, intubation, as introduced by O'Dwyer, brought about no less a revolution in the operative treatment. Unknown to him, the idea, as we have seen, had existed in the very earliest records of medicine. It is a matter of conjecture how far Hippocrates introduced his tubes into the air-way, but that he passed these beyond the fauces is perfectly apparent. All through the history of medicine, especially before the Renaissance, and after the eighteenth century, the references are numerous to this Hippocratic manœuvre, but how often it was practised is a matter of doubt, probably very infrequently. The first clear account of its use is in Bichat's description² of the operation as performed by Desault. He passed hollow sounds into the larynx, and gave temporary relief to a dyspnoëic patient, as did also a distinguished surgeon of Toulouse, following his example. This was near the end of the eighteenth century. Bichat gives careful directions as to the technique. They were to be passed through the nose. While Desault and perhaps others were occasionally successful in affording relief by operations performed in this manner, the operation could not rival that of tracheotomy. The same criticism may be applied to the revival of the practice by Loiseau in 1840³ and by Bouchut, who, in 1858, urged its use in the laryngeal stenosis of diphtheria.⁴ The chief honor which Bouchut seems to have acquired was to draw the fire of his famous countryman, Trousseau, who has brought tracheotomy into greater vogue for the condition. Trousseau's predilection for the operation of tracheotomy, which he practised with great frequency, no doubt had something to do with his unfavorable report on Bouchut's claims, but this predilection could not have arisen from the contemplation of his own results in diphtheria. They were atrocious. While, therefore, the idea had existed from hoary antiquity, and while during the preceding hundred years attempts were made from time to time to make it more practicable, there can be no question that success was first attained by Joseph O'Dwyer, who published first in 1885 the account⁵ of his long, patient, and persistent endeavors. The success which attended them is fresh in the minds of us all. The remarkable results attained of late years by the administration of antitoxin

¹ See especially British Medical Journal, December 22-29, 1894; Bullétin Médical, December 9, 1894, VIII, p. 1067; Berliner klinische Wochenschrift, No. 36, 1894, XXI, p. 827; Deutsche med. Woch., No. 15, 16, 17, 18, 19, 20, 32, 1894.

² Œuvres Chirurgicales de Desault, Edit. by Bichat, Paris, 1798-9.

³ Referred by him to this date in a communication published in Gaz. des Hôpitaux, 1858, p. 491.

⁴ Bull. de l'Académie Impériale de Médecine, November, 1858, XXIII, p. 1160; l'Union Médicale, 1858, No. 130, XII, p. 517.

⁵ O'Dwyer: New York Medical Journal, August 8, 1885, XLII, p. 145.

in laryngeal diphtheria has very greatly diminished the number of cases in which relief from dyspnoea in laryngeal diphtheria is imperatively demanded.

Follicular Tonsillitis.—Owing to the facilities for differential diagnosis afforded by the identification of the Klebs-Loeffler bacillus, croupous tonsillitis became more easily distinguished from diphtheria, but in Holt's paper¹ it may be seen that this was appreciated from clinical observation before the bacterial new knowledge was disseminated. Something of the state of knowledge of the subject and of the relation of tonsillitis to rheumatism, scarlet fever, and diphtheria at this time may be seen in a paper of B. Fraenkel² and Fox.³ Cases have occasionally been reported⁴ in which diphtheria followed operations on tonsils and adenoids, but these have been so rarely noted that the fears expressed of such an event in former years have not been realized. In 1895 Sendziak⁵ contributed to laryngological literature in Germany an account of some original work which helped to establish the fact that follicular tonsillitis in spite of the presence of the pseudo-diphtheria bacillus is not identical with true pharyngeal diphtheria. The same may be said of the communications of Veillon⁶ and of Jaccoud⁷ in France and of Wolfenden⁸ in England. Park⁹ published a paper on the bacteria present in the normal throat and on their relation to acute throat inflammations. He demonstrated streptococci in healthy throats which seemed harmless, and he noted the change in number and in virulence during inflammations and during changes of the weather. Buschke,¹⁰ in an extensive article in 1894, published his belief that the tonsils are portals of infection for the bacterial agents of sepsis.

Numerous articles, after this, ascribed various organic affections—pleurisy, endocarditis, nephritis, rheumatism—to tonsillar infection, while in addition to the pyogenic cocci and the Klebs-Loeffler bacillus other organisms were found associated with tonsillar inflammation.¹¹ Suchannek¹² published some valuable observations

¹ Holt: New York Medical Journal, May 8, 1886, XLIII, p. 517.

² B. Fraenkel: Berliner klinische Wochenschrift, No. 17 and 18, 1886, XXIII, p. 265, 287.

³ Fox: The Lancet, July 31, 1886, II, p. 200.

⁴ Caillé: New York Medical Journal, August 4, 1894, LX, p. 150; Medical Record, June 2, 1894, XLV, p. 704.

⁵ Sendziak: Archiv für Laryngologie und Rhinologie, 1895, Band II, Heft 2, p. 180.

⁶ Veillon: Archiv de Médecine expériment., 1894, VI, p. 161.

⁷ Jaccoud: l'Union Médicale, July 5, 1894, LVIII, p. 13.

⁸ Wolfenden: New York Medical Journal, September 15, 1894, LX, p. 348.

⁹ Park: Medical Record, January 27, 1894, XLV, p. 117.

¹⁰ Buschke: Deutsche Zeitschrift für Chirurgie, 1894, Band 38, 4-5 Heft, p. 441.

¹¹ Lermoyez, Helme, and Barbier: A Case of Chronic Tonsillar Inflammation Due to the Bacterium Coli Communis; Bullétin Société Médicale des hôpitaux de Paris, June 22-28, 1894, 3 Sér., XI, p. 449.

¹² Suchannek: Bresgen's Sammlung zwangloser Abhandlungen, u. s. w., Heft 1, 1895.

on the histology of pyæmic infection of the tonsils with a bibliography bearing on the relation the process has to various systemic affections (rheumatism) and to the involvement of distant organs. B. Fraenkel and E. Meyer,¹ in 1896, contributed articles to the literature of the bacteriology of lacunar tonsillitis. Park² drew attention to the frequency with which diphtheria bacilli are found in healthy throats.

From these and innumerable other works dealing directly or incidentally with the subject it has long since been known that large numbers and a number of varieties of germs, sometimes pathogenic, live as saprophytes in the crypts of the faucial and pharyngeal tonsil, in persons enjoying a fair degree of good health, both local and systemic.

Vincent's Angina.—Vincent,³ in 1898, demonstrated fusiform bacilli and spirilla in a clinically distinct form of angina, as he believed, and it has since been known under his name, though Plaut⁴ in Germany, in 1905, engaged in a controversy with him as to priority. Many others⁵ quickly reported cases. In many papers on the incidence of the Vincent bacilli in membranous tonsillitis, attention was called⁶ to the fact that the identification of them as the etiological factor is a matter of some doubt, inasmuch as they are frequently found in fairly normal throats and associated in throat lesions with other pathogenic bacteria.

Tuberculosis of the Tonsil.—The question of the relationship of tuberculosis to the tonsils has taken a rather more complicated course. After Villemin had demonstrated its communicability, but before Koch had demonstrated the bacillus, Cohnheim,⁷ in 1878, raised the question if tuberculous glands in the neck were not due to some primary affection of the buccal and pharyngeal mucosa and of the tonsils. Tuberculosis of the nose and of the ear had been reported. Orth,⁸ in 1879, in some feeding experiments found not only that there was produced in guinea-pigs cervical tuberculous adenitis, but in one case tuberculous tonsils. In 1884 Baumgarten⁹ confirmed this. Cornil and Ranvier, in the 1884 edition of the manual of pathological histology, described the

¹ B. Fraenkel and E. Meyer: *Archiv für Laryngologie und Rhinologie*, 1896, Band IV, pp. 130 and 249.

² Park: *Medical News*, May 12, 1900, LXXVI, p. 759.

³ Vincent: *Archives Internationales de laryngologie*, etc., 1898, XI, p. 44.

⁴ Plaut: *Münchener medizinische Wochenschrift*, No. 27, 1905; Vincent: *Presse Médicale*, March 29, 1905, XIII, p. 193.

⁵ Craig: *Medical News*, March 10, 1900, LXXVI, p. 374. Letulle: *Bull. et Mém. Société Médicale des hôpitaux*, December 14, 1900, 3 Sér., XVII, p. 1197. Conrad: *Archiv für Laryngologie und Rhin.*, 1903, XIV, p. 525.

⁶ For instance: Blühdorn; *Deutsche medizinische Woch.*, No. 25, 1911, XXXVII, p. 1154.

⁷ Cohnheim: *Die Tuberculose vom Standpunkt der Infektionslehre*, 1881.

⁸ Orth: *Lehrbuch der Speciellen pathologische Anatomie*, Band I, p. 663. Virchow's *Archiv*, 1879, Band 76, p. 217.

⁹ Baumgarten: *Centralblatt für klinische Medizin*, No. 2, 1884, V, p. 25.

lesion of tonsillar tuberculosis and Strassmann¹ in that year spoke of its frequency in phthisical patients. He found it 13 times in 21 such patients. This seems to have been the beginning of the special literature of the subject, as it drew attention to its latency in the tonsil in cases of tuberculosis. Abraham,² in 1885, wrote on tonsillar tuberculosis in English. In 1891 Dmochowski³ came to the conclusion that tuberculous deposits in the tonsils, both faucial and lingual, are due to auto-infection. Couvreur,⁴ in 1892, quoted a number of reports in which it seemed probable that a tuberculous tonsil was the starting-point of a descending tuberculous cervical adenitis. Schlenker⁵ published investigations on tuberculosis in man which included observations on the tonsils and the cervical lymph glands, and drew the conclusions more or less supported by recent work that the tonsils are infected sometimes primarily by the bacilli in the food—more often by the bacilli in the sputum from the lungs. He gave careful account of postmortem observation in 24 cases and a full bibliography of this early stage of the question. Lermoyez,⁶ in 1894, referred to two cases in which generalized tuberculosis followed the operation for the removal of adenoids. Another report of a case was made by Wright⁷ in 1896. Krückmann,⁸ as a result of postmortem examination in 64 cases, confirmed the observations of Strassmann, Dmochowski and Schlenker.

Naturally all this work resulted in fixing upon the tonsils, as the source of infection in cervical adenitis, the attention of laryngologists and later of the general practitioner, and they were receptive to the demonstrations which followed. After the report of Dieulafoy, experiment and observation in the question became much more frequent. The paper of Dieulafoy,⁹ in 1895, excited great interest. He showed that tuberculosis of the tonsil often existed without cervical symptoms and called it larval tuberculosis. Out of sixty-one cases of the hypertrophy of the lingual, faucial, and pharyngeal tonsils, in eight cases, or about twelve per cent., he detected tubercle by animal inoculation. Whether all the results were due to the tubercle bacillus in the tonsil, or in its crypts, was a question. It was shown by Cornil that if the bacilli

¹ Strassmann: *Virchow's Archiv*, 1884, XCVI, p. 319.

² Abraham: *Tubercle of the Tonsil*, *Dublin Journal of Medical Science*, October, 1885, LXXX, p. 346.

³ Dmochowski: *Beiträge zur pathologischen Anatomie*, etc., 1891, X, p. 481.

⁴ Couvreur: *De l'adénopathie cervicale tuberculeuse considérée surtout dans ses rapports avec la tuberculose pulmonaire*, Paris, 1892.

⁵ Schlenker: *Virchow's Archiv*, 1893, 134, p. 145.

⁶ Lermoyez: *Bull. et Mém. de la Société Médicale des hôpitaux*, July 20, 1894, Sér. 3, XI, p. 559; *Annales des Maladies de l'oreille*, etc., No. 10, October, 1894, XX, p. 979.

⁷ Wright: *New York Medical Journal*, September 26, 1896, LXIV, p. 412.

⁸ Krückmann: *Virchow's Archiv*, 1894, Band 138, p. 534.

⁹ Dieulafoy: *Bull. de l'Académie de Médecine*, April 31, May 7-14, 1895, Sér. 3, XXXIII, p. 437 et seq.; *Archives Internat. de Laryngologie et Rhinologie*, July-August, 1895, VIII, p. 191.

were in the stroma they had not produced recognizable histological lesion. Others who attempted to confirm Dieulafoy's results by his technique were much embarrassed by the animals used (guinea-pigs), succumbing to infection by others of the cryptal flora, but subsequent histological investigations have shown the essential accuracy of Dieulafoy's results, though on the whole the percentage of larval tuberculosis in all unselected cases of hypertrophied tonsils has been shown to be hardly more than a half that percentage in the average of the reports, a very large number having now appeared.¹ It is impossible further to extend the reference to this important subject beyond the few years following Dieulafoy's paper. Ten years later it had entered on a new phase. Latent tuberculosis in general was found to be almost universal in adult life, and the percentage very high in children, if we are to reckon the number of people harboring the tubercle bacillus. The advent of the technique of skin reactions, the use of antiformin in experimental and microscopic work, have confirmed the conclusions of the statistics of postmortem examinations, furnished many years ago by Naegeli—that we are all, in adult life, a little tuberculous. Sobernheim and Blitz,² by means of the von Pirquet reaction, found that large numbers of children with adenoids and tonsils react, indicating a latent tuberculosis, but the adenoids removed produced no animal tuberculosis when injected after treatment by the antiformin method. The children who before had shown a positive von Pirquet reaction showed a positive reaction *after* the removal of the adenoids. There is a good bibliographical reference in their article. Beitzke,³ in 1906, had drawn attention to the fact that the cervical lymphatics, in children at least, do not communicate with the thoracic, so that beyond the level of the larynx there can be no descending or ascending infection between the tonsils and the lungs, and that pulmonary tuberculosis, so far as tonsillar infection in children is concerned, must be a blood-born disease, the lymphatics from the pharynx being drained direct into the vena cava. In 1912 he further showed, as did Joest⁴ and others, that markedly increased positive evidence of the

¹ G. Gottstein: Berl. klinische Wochenschr., No. 31, 1896, XXXIII, p. 689. Brindel: Revue Hébd. de Laryngol., etc., No. 30-31, 1896, XVI, 881, 913. Ruge: Virchow's Archiv, 1896, Band 144, p. 431. Goruc: Annales des Maladies de l'Oreille, etc., No. 5, 1897, XXIII, p. 437. Walsham: British Med. Journal, May 7, 1898, I, p. 1199. McBride and Turner: Edinburgh Med. Journal, April, May, and June, 1897, n. s., I, pp. 355, 471, 598. Friedmann: Ziegler's Beiträge zur patholog. Anat., etc., 1900, XXVIII, p. 66. Labbé and Levi-Sirugue: Gazette des Hôpitaux, February 17, 1900, LXXIII, p. 193. Lartigau and Nicoll: Amer. Jour. Med. Sci., June, 1902, CXXIII, p. 1031.

² Sobernheim and Blitz: Archiv f. Laryngologie u. Rhinologie., 1911, Band 25, p. 121.

³ Beitzke: Virchow's Archiv, 1906, Band 184, p. 1.

⁴ Beitzke-Joest, etc.: Verhandlungen der deutschen pathologischen Gesellschaft, 1912.

existence of latent tubercle in the general lymph glands could be shown by histological examination and experimental observation.

The question recently raised¹ in bacteriological literature as to the identity of the bacillus of tubercle producing tonsillar and glandular tuberculosis in children promises to prove of vital interest to the student of tonsillar tuberculosis.

Tonsillar Syphilis.—There is little of special laryngological interest from a historical point of view in the literature of syphilis of the nose and throat. A very large number of reports may be mentioned² of the primary lesion noted more often on the tonsils and lips than elsewhere in its extragenital incidence. Bulkley,³ in 1893, reported a large number of cases, 15 chancres of the lip, 20 chancres of the tonsil out of a total of 110 cases altogether of extragenital chancres noted in his own practice. Numerous such reports have appeared in literature since then.

Operations for Tonsils and Adenoids.—Practically at every epoch in the history of medicine the removal of the tonsils has met with opposition even by medical men—no more in antiquity than in the era immediately following the paper of Meyer. Evulsion of the tonsils continued a practice with many operators after the invention of the modern forms of tonsillotomes and has been revived of late years in the attempts now in vogue at a more complete removal of lymphoid tissue from the throat. The question of how to operate has been very carefully studied, and doubtless there has been considerable improvement, if we are to accept the view that it is desirable to remove as much of the lymphoid hypertrophy as possible from the vault of the pharynx and from the oropharynx. The question when to operate has unfortunately been very inadequately discussed. This defect in the scientific study of the problem has been largely due to the incomplete appreciation of the fact that the existence of a considerable amount of tissue in the naso- and oropharynx is a normal condition and entirely compatible with good health. At the International Congress in 1884 Bosworth insisted that the faucial tonsils do not exist as anatomical entities in the normal throat. Semon and Fraenkel denied this and they further deprecated the recommendation of Bosworth that every tonsil should be extirpated. Bosworth⁴ repeated this doctrine

¹ Park and Krumwiede: *Journal of Medical Research*, Oct., 1910, XXIII, No. 2, p. 205.

² Spillman: *Rev. méd. de l'Est*, 1878, X, 292. Hulot: *Ann. de dermat. and syph.*, 1878-9, X, p. 29. Schiragew: *St. Petersburg. medizinische Wochenschrift*, No. 39, 1880, V, p. 323. Hamonic: *Annales de Dermatologie et de Syph.*, 1882, 2 Sér., III, p. 393. Von Boeck: *Ref.: Monatshefte f. praktische Dermatologie*, October, 1883, II, p. 317. Morel-Lavallée: *Annales de Dermatologie et de Syph.*, July-August, 1883, 2 Sér., IV, p. 39. Hue: *La France Médicale*, May 31, 1883, I, p. 752. Taylor: *Medical Record*, May 24, 1884, XXV, p. 593. Knight: *New York Medical Journal*, No. 24, 1884, XXXIX, p. 662.

³ Bulkley: *Boston Medical and Surgical Journal*, April 16, 1893, Vol. 128, p. 345.

⁴ Bosworth: *Medical Record*, March 12, 1892, XLI, p. 300.

more emphatically in 1892, and in spite of many protests expressed from time to time that this is an inadequate view of the question, we are practically today on that basis, both as to tonsils and adenoids. The description of the symptoms and sequelæ of the latter have received no essential addition since Wilhelm Meyer's first article. In 1895 he published¹ a review of the various aspects in practice, in literature, and in history, which the subject of adenoids had assumed since his paper in 1868. It is scarcely necessary to do more than refer in a cursory manner to some of these.

Indication for Operation on Adenoids.—Guye,² of Amsterdam, first in 1884 and later on other occasions, emphasized the importance of the effect of adenoids on the mentality of children, claiming there is a specific result of the postnasal obstruction, probably due to interference with the circulation, which is evidenced in their inability to fix their attention continuously on any subject, a mental condition which makes them backward in school. To this symptom he gave the name of *Aprosexia*, and his communications excited wide interest. Though the matter had been emphasized in Meyer's paper, it thus received from Guye additional emphasis. Scarcely a paper on adenoids has been published since Meyer's original one which does not dwell to a greater or less extent upon the deformities of the jaw and the chest caused by the presence of postnasal adenoids. As to the jaw there is reference elsewhere in this work to the publications of Grossheintz and others, which goes to show that at least in very many cases the evidence points to the fact that the jaw shape is racial or inherited. The adenoids are probably the sequence and not the cause of high palates and narrow jaws. The paper of Lavrand³ deals with the conventional side of the question while the measurements given by Fraenkel of Basle in a dissertation⁴ in 1896 show that there are other factors in the etiology of the high palatal arch.

Schwartz⁵ and Siebenmann,⁶ in 1897, wrote upon the relation of cranial form to palatal form. While there were points upon which they disagreed, the consensus of the great majority of such observations goes to establish the truth of the assertion that the high palatal arch is not the sequence of postnasal obstruction. The

¹ Meyer: *Hospitals Tidende*, February 6, 1895, 4, R. III, p. 145. Ref.; *Internat. Centralblatt für Laryngologie und Rhinologie*, 1895, XI, p. 965.

² Guye: *Fifth International Congress of Hygiene and Demography*, 1884, Tome II, p. 120 (French ed.). *Deutsche medizinische Wochenschrift*, No. 40, 1888, XIV, p. 815; *British Medical Journal*, September 28, 1889, II, p. 709; *Practitioner*, September 1, 1891, XLVII, p. 198.

³ Lavrand: *Revue de Laryngologie et de Rhinologie*, No. 16, August 15, 1894, XIV, p. 687.

⁴ Fraenkel: Ref.; *Internat. Centralblatt für Laryngologie und Rhinologie*, 1897, XIII, p. 339.

⁵ Schwartz: *Zeitschrift für Ohrenheilkunde*, 1897, XXXII, p. 67.

⁶ Siebenmann: *Münchener medizinische Wochenschrift*, No. 36, 1897, XLIV, p. 983.

points less frequently touched upon may be noted briefly. Bliss¹ reported in 1892 the results of an examination of 415 young deaf mutes as to the condition of the nose and throat. In the light of subsequent experience it does not appear that the proportion of large tonsils and adenoids was greater than the average among them. Among the reflexes ascribed to the presence of nasopharyngeal adenoids, enuresis in children was repeatedly discussed.² Lichtwitz and Sabrazes³ as did Masini found a mild leukocytosis in children with adenoids, diminished hæmoglobin, and increased lymphocyte and eosinophile count. Operation tends to restore the blood condition to normal. While this received some attention in literature it has been for the most part ascribed by writers to anæmia incident on lack of oxygenation of the blood. Masini,⁴ in 1898, claimed that he had obtained a rise of blood-pressure in rabbits by the injection in the veins of a watery extract of the tonsils of dogs and calves, from which he reasoned the tonsils possess an internal secretion. His experimental work was devoid of control. An increase in the large and small leukocytes was also observed.⁵ Acute inflammations of the pharyngeal tonsil have been rarely discussed, though doubtless they often occur.⁶

The instruments used in the operation for the removal of the faucial tonsils have been for the most part referred to. In the removal of adenoids they have been practically of two types, that of the curette and that of the forceps, though innumerable of pattern. Meyer's ring knife and the index finger armed or not with the steel nail were the representatives of the former type in use⁷ in 1885, when Gottstein's curette came into use and Störk's choanal forceps began to be modified in the numerous patterns which exist to-day.⁸

Anæsthesia in Tonsil and Adenoid Operations.—The operation at first done without an anæsthetic, narcosis began to be advocated⁹

¹ Bliss: Medical News, November 18, 1892, LXI, p. 576.

² Koerner: Münchener medizinische Wochenschrift, No. 27, 1890, XXXVII, p. 476. Centralblatt für klinische Medizin, No. 23, 1891, XII, p. 417. Dionisio; Gazz. Med. di Torino, June 1, 1893. Otto: St. Petersburg. medizinische Wochenschrift, No. 38, 1893, n. f., X, p. 345.

³ Lichtwitz and Sabrazes: Archiv für Laryngologie und Rhinologie, 1900, X, 278.

⁴ Masini: La Clinica Medica Italiana, May, 1898, XXXVII, p. 319.

⁵ Masini and Genta: Annali di Laringologia ed Otologia, July, 1900, I, p. 254.

⁶ Beckmann: Berliner klinische Wochenschrift, No. 50, 1902; Münchener medizinische Wochenschrift, No. 22, 1902, XLIX, p. 946. Ausset and Dorion: Echo Médicale du Nord., August 4, 1901, V, p. 353.

⁷ Baber: British Medical Journal, March 21, 1885, I, p. 603.

⁸ Gottstein: Berliner klinische Wochenschrift, No. 2, 1886, XXIII, p. 25. Loewenberg: Deutsche medizinische Wochenschrift, No. 16, 1886, XII, p. 265. Schütz: Centralblatt für Chirurgie und Orthopäd. Mechanik, July, 1886, Jahrg. II, No. 10, p. 129. Gradle: Medical Record, December 10, 1887, XXXII, p. 751.

⁹ Hopmann: Deutsche medizinische Wochenschrift, No. 33, 1885, XI, p. 572. Michael: Wiener Klinik, Heft XII, 1885, p. 363.

at this time. In 1894 a discussion took place¹ at a meeting of the London Laryngological Society on the merits of the different agents of anæsthesia advisable for the operation of the removal of adenoids. Gradually it was found that satisfactory results were not obtained without some form of anæsthetic for this purpose, and subsequently it has grown in favor even for tonsillotomy alone. This raised the question of the position of the patient during operation. All possible postures of the body have been suggested, and it is still a matter of discussion by laryngological writers. Cocaine, nitrous oxide, and ethyl chloride gas, chloroform and ether have all been urged² for anæsthesia. The latter, always the favorite in America, has perhaps grown in favor abroad, but the position of the patient still remains largely a matter of individual preference. With the spread of the popularity of the removal of tonsils and adenoids the frequency of untoward results was naturally more and more marked. Repeated reports of alarming hemorrhage following the removal of the faucial tonsils are found in the ninth decade of the nineteenth century.

Hemorrhage after Operation.—In 1887 Zuckerkandl³ dealt extensively with the subject of hemorrhage after tonsillotomy, with which by that time there had already been considerable experience. He discussed at length the literature of the subject. The growing frequency of the accident, the obstinacy with which the bleeding continues and the difficulty in checking it gave rise about this time or a little later to the popularity of ignipuncture of the tonsils. Wright,⁴ in 1890, collected a bibliography extending over twenty-five years, in which 32 cases of alarming tonsillar hemorrhage, with 2 fatal cases, were reported. In 1902 Damianos and Hermann⁵ collected reports of 150 cases occurring in the previous sixty years. Instruments to control tonsillar hemorrhage were invented by Butts⁶ and Proebsting.⁷ Cases of fatal hemorrhage after tonsillotomy were rarely reported unless accompanied by the removal of adenoids,⁸ and subsequently a number of cases with fatal termination were reported after the removal of nasopharyngeal growths.⁹ Haymann¹⁰ has collected an extensive bibliography of bleeding after adenoid operations; many of the cases were fatal, forming

¹ Internat. Centralblatt für Laryngologie und Rhinologie, 1894, XI, p. 270.

² British Medical Journal, January 13, May 5, May 19, 1894, I, pp. 108, 996, 1106. Lancet, Jan. 6, 13, 20; Feb. 3, 1894, I, pp. 64, 122, 179, 300.

³ Zuckerkandl: Wiener medizinische Jahrbücher, 1887, Heft VI, p. 309.

⁴ Wright: New York Medical Journal, August 30, 1890, LII, p. 234.

⁵ Damianos and Hermann: Wiener klinische Wochenschrift, No. 9, 1902, XV, p. 225.

⁶ Butts: Medical Record, July 1, 1893, XLIV, p. 11.

⁷ Proebsting: Archiv für Laryngologie und Rhinologie, 1906, XVIII, 386.

⁸ Barkan: Medical News, April 14, 1894, LXIV, p. 411.

⁹ Beausoleil: Journal de Médecine de Bordeaux, No. 23, June 9, 1895, XXV, p. 265. Lunin, Burger, Goldsmith, etc.: Ref.: Internat. Centralblatt für Laryngologie und Rhinologie, 1903, XIX, p. 582.

¹⁰ Haymann: Archiv für Laryngologie und Rhinologie, 1909, Bd., 21, p. 15.

a marked contrast to the cases of bleeding after the removal of the faucial tonsils, but singular to say, the latter accident has attracted by far the greater amount of attention.

Galvanocautery in Tonsillar Hypertrophy.—One consequence of the conservatism excited in laryngologists by the reports of alarming tonsillar hemorrhage was the frequent recommendation of laying open the tonsillar crypts with galvanocautery and bistoury, and in 1890 Botey¹ used the galvanocautery for tonsillar hypertrophy. There was considerable discussion in 1892 in America and the immediately subsequent years as to the cases in which ignipuncture or the galvanocautery snare should be used to replace the cutting instruments.² In France, Huguenin³ dealt with the same subject. Ruault⁴ proposed removal piecemeal (*morcellement*) with a specially devised cutting forceps. Knight,⁵ Sendziak,⁶ Lichtwitz⁷ recommended galvanocautery snares for the removal of tonsils. Hopmann,⁸ in 1899, made a careful and extended study of the anatomy and the operative procedures in the subject of adenoids, with an historical account of the latter, in which these and other matters are reviewed.

Sequelæ of Adenoid Operations.—Among the few sequelæ of adenoid operations we may mention torticollis and the recurrence of the growth. Torticollis as a complication of adenotomy noted in 1894 by Knight and McKernon has occasionally been reported since then.⁹ In 1901 Görke¹⁰ drew attention to the question of the recurrence of nasopharyngeal lymphoid tissue after operation and to the fact that no operation ever removes all the lymphoid tissue of the pharynx. He wrote from an historical standpoint. Natier,¹¹ in 1903, wrote a clinical paper on the same subject, pointing out the recurrences were often more apparent than real, some of the symptoms remaining after operation or recurring because of underlying factors not always dependent on the lesion.

After 1905 there gradually appeared in the literature dealing

¹ Botey: *Revista di Ciencias Medicas di Barcelona*, No. 10, 1890, XVI, p. 293. Ref.: *Internat. Centralblatt für Laryngologie*, 1890-91, VII, p. 312.

² Knight: *Medical Record*, March 12, 1892, XLI, p. 300. Agramonte: *Ibid.* Asch: *Ibid.* Delavan: *Ibid.* Robinson: *Ibid.* Loeb: *Medical News*, March, 19, 1892, LX, p. 321. Knight: *Medical Record*, May 14, 1892, XLI, p. 559. De Blois: *Boston Medical and Surgical Journal*, October 12, 1893, Vol. 129, p. 377.

³ Huguenin: *Concours Médical*, 1892, XIV, p. 304.

⁴ Ruault: *Union Médical*, 1893, Sér. 3, LV, p. 74.

⁵ Knight: *Transactions American Laryngological Ass'n*, 1892, p. 113.

⁶ Sendziak: *Revue de Laryngologie*, 1893, XIII, p. 129.

⁷ Lichtwitz: *Médecine Moderne*, January 30, February 2, 1895, VI, pp. 65, 73.

⁸ Hopmann: *Deut. med. Wochens.*, 1885, XI, p. 572.

⁹ Knight: *Annals of Ophthalmology and Otology*, No. 2, 1894, III, p. 161. Thost: *Monatsschrift für Ohrenheilkunde*, 1896, XXX, pp. 165, 224. Ferreri: *Archives Internat. d'otologie*, 1904, XVIII, p. 744. Neufeld: *Archiv für Laryngologie und Rhinologie*, 1908, XX, p. 480.

¹⁰ Görke: *Archiv für Laryngologie und Rhinologie*, 1901, XII, p. 278.

¹¹ Natier: *Bull. de la Société belge d'otologie et de laryngologie*, 1903, p. 199.

with hypertrophied tonsils a tendency to regard the diffuse or sunken tonsil as more apt to permit the entrance of infection. This led, in America at first and chiefly, to greater care and thoroughness in removing all the tonsillar tissue. By means of finger or probe the tonsils were separated as much as possible from the surrounding tissue and removed by guillotine or snare. Many instruments were invented for this purpose. Much injury was done to surrounding tissues, but for the most part this led to little subsequent damage. This was a movement in laryngology which had its inception in America and was there carried perhaps to some excess. The literature in regard to it is voluminous and not adapted to orderly review nor to attempts to establish any claims to priority. While the movement for the enucleation or more thorough removal of the tonsils had its origin in North America the procedure soon found favor in Great Britain and on the continent as testified by many articles on the subject.

Bone and Cartilage in the Tonsils.—While it seems desirable to avoid the history of neoplasms of the tonsils, inasmuch as that leads us too far outside of our special province, I may refer to the literature of bony and cartilaginous growths in the tonsils. In the literature of the embryology of the tonsils mention is made of the inclusion of the pharyngeal arches containing cartilage, in their embryogenesis, but this has received no support. Orth is said by Deichert to have noted cartilage and bone in the tonsils in 1893. In 1895 Deichert¹ made a special study of the subject. There are a few clinical reports of bone in the tonsils by authors who supposed its presence there due to a prolongation of the styloid process of the skull,² but for the most part there has been a tendency to confine the subject to a discussion of the phenomenon as one of metaplasia or of embryonic origin. This can be found fairly well set forth in the articles of Reitmann,³ Walsham,⁴ Wingrave,⁵ Töpfer,⁶ Nösske,⁷ and Halkin,⁸ though there have been many subsequent reports.

NASAL ANATOMY, PHYSIOLOGY, AND PATHOLOGY.

It seems at first glance somewhat strange that the study of nasal disease should not have more attracted the attention of

¹ Deichert: *Virchow's Archiv*, 1895, Band 141, p. 435.

² Stirling: *Atlanta Medical and Surgical Journal*, July, 1896, XIII, p. 328. Richards: *Journal American Medical Association*, July 22, 1901, XXXVII, p. 242.

³ Reitmann: *Monatsschrift für Ohrenheilkunde*, No. 8, 1893.

⁴ Walsham: *The Lancet*, August 13, 1898, II, p. 394; *British Medical Journal*, October 22, 1898, II, p. 1254.

⁵ Wingrave: *Lancet*, 1898, II, p. 750.

⁶ Töpfer: *Archiv für Laryngologie and Rhinologie*, 1900, XI, p. 1.

⁷ Nösske: *Deutsche Zeitschrift für Chirurgie*, 1903, Band 66, Heft 5-6, p. 559.

⁸ Halkin: *La Presse otolaryngolog. belge.*, 1905, IV, p. 433.

physicians even before the discovery of the laryngoscope. Nasal operations had been performed, as we have seen, since the beginning of medical annals. The Hindus, Hippocrates, the Arabians, Aranzi and his followers, were accustomed to perform anterior rhinoscopy, and one would naturally think some device would have been adopted for the efficient illumination of the internal nose. We have seen that Hippocrates used a cannula for intranasal cauterization, and one wonders that this did not sooner develop into a nasal speculum.

Nasal Specula.—Guy de Cauliac referred to a device of Haly Abbas which we have noted, a “speculum ad Solem,” which may have been used for dilating the nostrils, but from certain passages in the Arabian authors, as well as in his own works, I cannot but suspect that this old master-surgeon of the Middle Ages misinterpreted his perhaps faulty transcript of the original manuscript. Recent scholarship¹ has unearthed a significant passage in the works of Arnold of Villanova (1240–1313). If one will turn to the place indicated,² one will find the author describing very carefully and minutely the symptoms of leprosy and the physical appearances of the face, eyes, etc., in these cases. He then goes on to say: “Likewise they are to be known from the wound (ulcer) existing in the nostrils, and these should be examined more deeply; for which purpose one should take a *small bifurcated branch of wood like a forceps*, and this should be placed in the nose, opening it, and one should look in with a lighted candle, and if ulceration or excoriation is seen well in the depths of the nose, that is a reliable sign of leprosy and one which will not be recognized except by the well instructed.” It is plain, therefore, that one of our modern forms of nasal specula was formed from the fork of a tree branch by the doctors of the Dark Ages, and we incidentally receive another hint as to obscurity in the differentiation of disease.

From time to time in the works on surgery mention may be found and some illustration noted of nasal specula, chiefly devised for protecting the nose from the incandescent iron. Thus Garengeot³ pictures a speculum nasi through which hot cautery irons may be thrust to sear the os unguis in order to destroy it. “Ainsi voila son usage expliqué.” Dionis in his work on surgery⁴ depicts an instrument which is still occasionally called by his name, and is, in metal, practically the counterpart of the device of Villanova in wood.

Neglect of Nasal Disease.—We have reviewed the separate works of Deschamps, Cloquet, and Piorry on the nose, and have seen that knowledge of intranasal disease was fully abreast if not

¹ Archiv f. Laryngologie, 1900, XI, Heft 3, p. 482.

² Opera Arnoldi de Villanova, 1509, f. 214, Signa Leprosorum.

³ Nouveau Traité des Instruments, Paris, 1727, Tome II, p. 12.

⁴ Cours d'Opérations de Chirurgie, Paris, 1716, p. 479, Fig. XXXVII, E.

somewhat in advance of the knowledge of laryngeal disease up to the time of the fruitful labors of Czermak and Türck. The next fifteen years were almost exclusively devoted to the development of the knowledge of laryngeal morbid conditions as revealed in the laryngoscope and to the technique of operative interference. In the first edition of Solis Cohen's book on Diseases of the Throat in 1872, containing more than 200 pages, scarcely 90 are devoted to diseases of the nose. In 1879 twenty pages were added in the second edition, but little or nothing of this extra space was devoted to the nose. A reference to any one of the recent text-books, Lennox Browne's last edition for instance, will show that the proportion has been more than reversed in the thirty years of the active evolution of our knowledge of the normal and abnormal states of the upper air passages. In the first edition of Cohen's work, just referred to, the 90 pages are taken up with a consideration of epistaxis, coryza, ozæna, the nasal douche, anosmia, foreign bodies, nasal polypi, for the removal of which the use of the nasal forceps was still advised. He does little more than refer to affections of the accessory sinuses. Spencer Watson and Michel, in 1875, published brochures on diseases of the nose, the latter being translated into English by Shurly in 1876, but it was after 1880 that the impulse to the more exhaustive study of intranasal phenomena began, and in another ten years the number of journal publications dealing with the nose and nasopharynx had already exceeded in number those referring to the larynx and air tubes. Notwithstanding the enormous increase in all departments of the literature of our specialty, this discrepancy has continued to gradually become more marked.¹

Reflex Neuroses.—The first marked evidence of this awakening to the importance of nasal phenomena may be seen in the history of the interest aroused in reflex nasal neuroses. Certainly no other subject was so calculated to stimulate inquiry into all manner of nasal lesions. How grossly, after a few years, this subject was exaggerated and distorted is apparent, now that the exaggeration is decreasing. Notwithstanding the fact that John N. Mackenzie² has pointed out that spasmodic affections of respiration had been noted by Coelius Aurelianus, Galen, and many other subsequent writers in the pre-rhinoscopic era, Voltolini³ was the first to note the phenomena at a time when the local conditions in the nose could be carefully studied by actual inspection. Voltolini drew attention to the intimate connection between asthma and nasal polypi, and asserted that he had seen the asthma disappear on the removal of the polypi. He referred the idea of reflex action

¹ A reference to the summary of the literature in the first issue of each year of Semon's *Internationales Centralblatt für Laryngologie* will make this evident.

² *Trans. Amer. Lar. Ass'n*, 1886, p. 154, 1887; p. 102.

³ Voltolini: *Die Anwendungen der Galvanokaustik*, 2 Aufl., Wien., 1871.

from the irritation of the mucosa back to the physiology of Johann Müller, and we have seen the matter discussed in the lectures of Marshall Hall, in 1836.

Gross Anatomy.—The history of the gross anatomy of the nose, internal as well as external, is the history of anatomy in general. Knowledge in regard to it had been very largely perfected long before the rise of modern laryngology. The work of Zuckerkandl, beginning about 1882, and that of Onodi succeeding it, added much of detail and of accuracy to the already large fund of knowledge of the nasal chambers and of their accessory cavities, but all text-books on anatomy before that period contain the essentials of it from the stand-point of anatomy in general. While this is true of the anatomy of the nose and the nasal chambers proper, the exactitude which exists today in our knowledge of the accessory sinuses is largely of modern origin. This is referred to elsewhere under the heading of sinus disease, where the works of Zuckerkandl, of Onodi and of Killian are repeatedly mentioned. It is well to mention some literature in regard to measurements made to establish the relative dimensions of the nasal chambers. E. Fraenkel, of Basel, in a dissertation in 1896, concluded that the height of the palate and the narrowness of the jaws were racial and congenital characteristics and not influenced by the presence of adenoids in childhood. Grosheintz¹ and Meisser, on the other hand, in 1898, under the names hypsistaphylia, leptoprosopia, and chamæprosopia, contributed extensive articles to the demonstration of the influence that high palate, narrow or wide jaws have on various diseases of the nose and throat—atrophic rhinitis, adenoids and tonsils, etc. Fifty years before this period the coincidence of the high-arched palate and the presence of enlarged faucial tonsils had been noted, and when Meyer, in 1868, described postnasal adenoids, attention was more actively directed to this coincidence, and for thirty years scarcely a treatise was published on the subject of adenoids and tonsils, but it was pointed out that the narrow jaws, like the narrow chests, were the sequelæ of the lesion. It was not until the rise of the discussion which the papers of Meisser and Grosheintz inaugurated that a more rational view was taken of the sequence of cause and effect. As we shall subsequently see, the coincidence of wide nasal fossæ and atrophic rhinitis was also involved in the same more rational anatomical considerations.

While the greater part of our existing knowledge of gross intranasal anatomy goes back several centuries, this is not true of our knowledge of its histology.

The Erectile Tissue.—It is difficult to know just where to pick up the modern story of our knowledge of the finer structure of

¹ Grosheintz and Meisser: *Archiv für Laryngologie und Rhinologie*, 1898, VIII, pp. 395 and 533.

the nasal mucosa. The most natural point of beginning, in view of the developments of modern rhinology, would seem to be at the discovery of the erectile nature of some parts of it, but this seems to go back a long way, even perhaps to Schneider himself. It is said to have been known to Benedict Ruppert¹ in 1754. It is difficult to understand exactly what this ancient conception of the nature of the structure of the mucosa presenting this phenomenon was. Long after the correct description of the anatomy of the erectile bodies had been published, the idea prevailed that their erectile nature depends upon the loose areolar mesh-work. Even in text-books of a comparatively recent period will be found representations of experimental states produced by blowing air or injecting liquids not into the bloodvessels, but into the loose connective tissue. This artificial emphysema may be produced anywhere in the cadaver by such procedures, and it seems strange that representations of that should have been adduced to explain the mechanism of turbinate congestion and collapse. It was not until about 1850 that it began to be understood by anatomists that it is the bloodvessels which are the chief agents in its causation. We find in their first edition that Todd and Bowman² recognized not only the glands with which their names are associated, but they declared that the thickness and sponginess of the mucosa is due "chiefly perhaps to the presence of ample and capacious submucous plexuses of both arteries and veins, of which the latter are by far more large and tortuous." They also recognize that this arrangement tends to warm the inspired air. In Hyrtl's text-book,³ in the second edition, published in 1851, his description of nasal anatomy is decidedly inferior to that of the English authors whose work for the times was admirable. Hyrtl recognized the excessive swelling and collapse of the nasal mucosa but did not venture on an explanation. In 1853 Kohlrausch⁴ published his classical description of the erectile tissue of the nasal mucosa. He also recognized that the dilatation of these vascular channels plays an important part in the expression of the secretions of the glands lying between them and the surface.

For about thirty years there was little advance to be noted in the knowledge of the vascular supply of the nasal mucosa, or in the minute structure of the stroma in which it lies, and with which it is so intimately connected in the performance of its functions. So intimate is this physiological and anatomical connection that the account of their exploration must be considered together.

¹ See Historical Notes on the Discovery of the Nasal Erectile Tissue, by Dr John N. Mackenzie: Boston Medical and Surgical Journal, January 1, 1885 CXII, p. 1.

² Todd and Bowman: The Physiological Anatomy and Physiology of Man, Philadelphia, 1850, p. 391.

³ Hyrtl: Lehrbuch der Anatomie des Menschen., 2 Aufl., Wien, 1851.

⁴ Kohlrausch: Archiv f. Anatomie, Physiologie, etc., Jahrg. 1853, p. 149.

In the first edition of Zuckerkandl's¹ work on the anatomy of the internal nose, in 1882, the author made a beginning of that minute and careful study of the subject which was afterward expanded in his later editions (1892 and 1893) and subsequently further developed by many writers of anatomical and pathological memoirs. While the pathological histology of hypertrophic and atrophic rhinitis and of œdematous nasal polypi is more fully developed in his second volume it still is far from a complete exposé of the knowledge even then extant as to the histology of the nasal mucosa. This is only partly remedied in his larger volume published in 1893. He, however, included in the latter his account of the vascular supply of the mucous membrane, which still remains of great value to the student. This description of the bloodvessels was first published in 1884.²

Bresgen³ largely as the result of clinical observation was inclined to think the erectile tissue of the turbinate bodies the result of vascular dilatation in acute and chronic rhinitis, in other words—pathological—not physiological structures. Coinciding, as the chief development of the venous sinuses does, with that period of life in which rhinitis is frequent, this idea of Bresgen, which may seem so strange to us at first thought, was discredited at the time of its publication by Zuckerkandl's work. On second thought it may easily occur to us that the advent of adolescence and the growth of erectile tissue throughout the body, in the lower animals as in man, may well have as an adjuvant a process of intranasal congestion which we are accustomed to look upon as pathological, but which, from the point of view just exposed, might be looked upon as physiological.

The Glands.—Todd and Bowman had recognized the tubular glands as confined largely to the olfactory region, though not exclusively so. They moreover recognized that they were analogous to the tubular sweat glands of the skin. In 1886 Dogiel⁴ contributed a valuable paper to the anatomy of the glands in the olfactory region, regarding them as entirely "albuminous." Paulsen⁵ regarded them as mixed in character, but this was by virtue of their possessing two kinds of epithelial cells, one excreting a watery, albuminous secretion, the other a viscid, mucoid fluid. He observed that there were apparently two morphologically different cells—one small, cuboidal and granular, the other large, bottle-shaped, and having a

¹ Zuckerkandl: *Normale und pathologische Anatomie der Nasenhöhle, etc.*, Wien, 1882.

² Zuckerkandl: *Denkschriften der Mathematisch-Naturwissenschaftlichen Klasse der Königlichen Akademie der Wissenschaften*, Wien, Band 49, 1884.

³ Bresgen: *Deutsche medicinische Wochenschrift*, Nos. 35 and 36, 1885, XI, p. 609.

⁴ Dogiel: *Archiv f. mikroskop. Anatomie*, 1886, XXVI, p. 50.

⁵ Paulsen: *Ibid.*, p. 307.

cytoplasm reacting to stains for mucin. Stöhr¹ and R. Heidenhain² had already in a study of glandular histology interpreted such appearances as indicating the vicarious possibilities of cell structure in the tubes and the acini of the same glands. Paulsen,³ in 1888, showed the epithelium of all the accessory cavities to be supplied with cilia. He never failed to find glands in them. He showed beaker cells to be plentiful everywhere. Aschenbrandt,⁴ in 1885, by making a window in the nasal bones of rabbits was able to note the secretion from the glands is a continuous one, excited by the contact of blotting paper to the mucosa to greater activity and accompanied by the dilatation of the capillaries. He also made various chemical examinations of it. He showed that electrical excitation of the sphenopalatine ganglion results in dilatation of the turbinate bodies and of the septal mucosa. Degeneration of the mucosa follows extirpation of the ganglion. Stimulation of it results in the simultaneous flow from the Bowman glands of watery fluid and from the acinous glands of mucus. The amount of secretion varies with the degree of congestion of the mucosa. He had previously shown that the nerve centres send none or only feeble stimuli to the tracheal glands and to those of the larynx. He concluded that the results he obtained in the nose were due to excitation of the termination of twigs of the trigeminus in the glandular epithelium. He also came to the conclusion that the salivary glands were supplied by the same nerve as the serous glands of the nose, viz., the second branch of the trigeminus. Brunn,⁵ in 1892, made a contribution to the literature of the finer anatomy of the human intranasal mucosa, which though chiefly taken up, as were most of the essays on the microscopic anatomy of the nose before this date, with a study of the olfactory peripheral nerve supply, had considerable to say of the glands.

Intra-epithelial Glands.—In 1893 Zarniko⁶ drew attention to the existence of intra-epithelial gland formation in the nasal mucosa. In the publications of Hyrtl, Henle and of some of the earlier histologists there is mention of taste-buds in the epithelium of the nasal mucosa. It seems probable that these structures were what they observed, since the occurrence of taste-buds similar to those of the tongue and connected with twigs of the olfactory nerve have been observed only in certain fishes and in some others

¹ Stöhr: Verhandlungen der physikalisch-medicinischen Gesellschaft zu Würzburg, 1887, XX, 1, p. 5.

² R. Heidenhain: A résumé of the question in its broader application may be found with copious references in M. Heidenhain's *Plasma und Zelle*, 1907, II, p. 343 et seq. (Bardleben's Handbuch d. Anat., Band 8).

³ Paulsen: Archiv f. mikroskop Anatomie, 1888, XXXII, p. 222.

⁴ Aschenbrandt: Monatschrift f. Ohrenheilkunde, etc., No. 3, March, 1885, XIX, p. 65.

⁵ Brunn: Archiv f. Mikroskop. Anatomie, 1892, Band 39, p. 632.

⁶ Zarniko: Zeitschrift f. Ohrenheilkunde, 1903, XLV, p. 211.

of the lower animals. Boenninghaus,¹ in 1895, also showed the presence of small glandular acini in the surface epithelium of the chronic inflamed nasal mucosa, an observation subsequently confirmed by Glas² and others. While the work of Cordes³ in 1900 tended to confirm the findings of Boenninghaus he ascribed the structures to pathological changes in the ducts of glands on their way to the surface from underlying acini. These intra-epithelial structures are often seen in histological work in the mucous membranes.

Smooth Muscle Cells.—Herzfeld,⁴ in 1889, drew attention to the fact that the nasal erectile tissue is rich in organic muscle fiber. He claimed that this does not lie free in the stroma but that it is attached to the vessel walls. He showed also the abundance of elastic tissue in the stroma. He drew attention to the fact that the deep veins go directly from the venous sinuses to the channels in the underlying bone. He showed structure resembling erectile tissue in the mucosa of the nasal septum. Zuckerkandl agreed with Herzfeld that the smooth muscle fiber seen in the stroma of the erectile bodies was always more or less intimately connected with the coats of the bloodvessels. Schiefferdecker,⁵ in 1900, did not agree with this statement, and Wright,⁶ in 1910, testified to observing isolated smooth muscle fibers in the stroma, but he was inclined to think that in the course of the development they had been separated from the vessels by the growth of indifferent connective tissue.

Vascular Mechanism.—In 1893 Zuckerkandl published the first volume of the second edition of his work. This greatly enlarged and made more exact the observations previously published. He pointed out that not only is the erectile tissue under the guidance of the vasomotor elements of the sphenopalatine ganglia, but, as elsewhere in some instances, that the anatomical arrangement of artery and vein are such that the dilatation of the artery will compress the vein. This point was further elaborated by Wright⁷ in 1895.

Nasal Sexual Development.—John N. Mackenzie⁸ and Fliess⁹ and many others having shown the clinical evidences of connection

¹ Boenninghaus: *Archiv f. Laryngologie und Rhinologie*, 1895, III, Heft 3, p. 372.

² Glas: *Archiv f. Laryngologie und Rhinologie*, 1904, XVI, p. 236, full bibliography.

³ Cordes: *Archiv f. Laryngologie und Rhinologie*, 1900, X, Heft 1, p. 23.

⁴ Herzfeld: *Archiv f. mikroskop. Anatomie*, 1889, XXXIV, p. 197.

⁵ Schiefferdecker: *Handbuch der Laryngologie* (Heymann), Wien, 1900, III, p. 87; bibliography to 1896.

⁶ Wright: *New York Medical Journal*, February 12, et seq., XCI, p. 313.

⁷ Wright: *American Journal of the Medical Sciences*, May, 1895, CIX, p. 516.

⁸ Mackenzie: *American Journal of the Medical Sciences*, July, 1883, Vol. 86, p. 106. *Johns Hopkins Hospital Bulletin*, No. 82, 1898, IX, p. 10. *Journal of Laryngology*, March, 1898, XIII, p. 109.

⁹ Fliess: *Die Beziehung zwischen Nase und weiblichen Geschlechtsorganen*, 1897.

between the nasal mucosa and the genital apparatus in man, Wright,¹ in 1898, drew attention to the anatomical difference in the erectile bodies on the septum of an ox and on that of a bull, the castrated animal showing the erectile tissue markedly less developed than the animal who has been left in the possession of his genital organs.

Elastic Fibers.—Kubo,² in 1907, described the erectile tissue of the nose and devoted considerable space to the description of the elastic fiber in it, a subject also treated by Wright³ in 1910.

All this work was of course in its development governed by and parallel with, usually preceded by, work on the same histological elements in other organs of the body published in special histological journals or text-books.

Olfactory Epithelium.—The study of the epithelium of the nasal mucosa in its connection with the terminal organs of olfaction was the aspect of histological work which chiefly interested the earlier workers in the finer anatomy of the nasal mucosa. Todd and Bowman had made the discovery that the epithelium in the olfactory regions often has no cilia. Kölliker,⁴ in 1852, denied that this was so for man, though confirming it for other animals. Eckhard,⁵ in 1858, confirmed the statement for rabbits, but declared that the frog and man possess a ciliated epithelium in the olfactory regions. Ecker,⁶ in 1855, made a study of the minute anatomy of the human nasal mucosa and described not only the columnar epithelium of the olfactory region, but the peculiar cells which lie between them which he recognized, as did Eckhard and Schultze about this time, were the terminal organs of the olfactory nerve. While thus early Ecker and Eckhard described the olfactory epithelium as end organs of the nerve of olfaction, Schultze who had made contemporaneous observations published some years later his classic work⁷ on the structure of the nasal mucosa with especial relation to the olfactory apparatus in men and animals. Luschka,⁸ in 1864, contradicted the observation of Schultze who had made the assertion that the epithelium of the olfactory region has no cilia. Welcker also is said to have made this observation.

It would be tiresome and unprofitable to follow further the strife over these points of the distribution of ciliated cells, olfactory

¹ Wright: New York Medical Journal, November 19, 1898, LXVIII, p. 732.

² Kubo; Archiv f. Laryngologie und Rhinologie, 1907, XIX, p. 191.

³ Wright: New York Medical Journal, April 9, 1910, XCI, p. 729.

⁴ Kölliker: Mikroskop. Anatomie, Leipzig, 1852-4, 2 abth., 2 hälfte, p. 766.

⁵ Eckhard: Beiträge zur Anatomie und Physiologie, 1858, I, p. 77.

⁶ Ecker: Berichte über die Verhandlungen der Gesellschaft für Beförderung der Naturwissenschaften zu Freiburg, No. 12, November, 1855.

⁷ Schultze: Untersuchungen über den Bau der Nasenschleimhaut, namentlich die Structur und Endigungsweise der Geruchsnerven bei dem Menschen und den Wirbelthieren.

⁸ Luschka: Centralblatt für die medizinische Wissenschaft, No. 22, May 21, 1864, II, p. 337.

terminal cells and Bowman's glands through the works of Exner,¹ Waldeyer,² Dogiel,³ Suchannek,⁴ Merkel,⁵ Disse,⁶ and many others. The amount of literature on the subject for twenty years was prodigious. It has finally emerged that while there is an olfactory zone in which the columnar cells are not ciliated for the most part and a respiratory zone where for the most part they are ciliated, that while the tubular glands are for the most part confined to the olfactory regions, nevertheless there is a border zone where ciliated and non-ciliated cells, tubular glands and racemose glands, mingled with olfactory cells, exist together in irregular distribution, not only in the pig,⁷ but in man. Schultze and the earlier observers traced the olfactory twigs only to the inferior border of the superior turbinate, but Kölliker and later observers have traced it nearly to the level of the lower border of the middle turbinate on its medial surface.

Nasal Embryology. Balfour⁸ in a work which has long since become classical, wrote in 1881, exhaustively on the embryology of the olfactory organ in all forms of animals. It was on the material collected for this work that for the most part Marshall⁹ based his paper in 1879. Dogiel (l. c.), Morrill,¹⁰ Disse,¹¹ all wrote valuable papers on the embryogeny of the nerve, the latter giving a full bibliography. Disse, His, and others, had early described the embryogenesis and anatomy of the olfactory cells and of the supporting cells which make up the less superficial layers of the region. I refer elsewhere to the work of Killian and of others in the embryogeny of the nose and nasal accessory sinuses. It remains to mention a more recent work by Frazer,¹² who described the supporting cells which make up the less superficial layers of the epithelium of the olfactory region.

In the first decade of the twentieth century the interest in the olfactory part of the nose, as manifested by histologists, was moderate, while previous to 1900 the attention given to it was almost exclusive. It was probably owing to ignorance of any other function to be ascribed to the nose that it was left to later writers more fully to develop our knowledge of other structures in the nose. Even the work of Kohlrausch on the erectile bodies aroused

¹ Exner: Sitzungsberichte d. Math-nat. Classe, K. Akad. d. Wiss., Wien, 1872, Band 65, 3 abth., Heft I, p. 7.

² Waldeyer: Archiv für Psychiatrie und Nervenheilkunde, 1884, XV, p. 279.

³ Dogiel: Archiv für mikroskop. Anatomie, 1887, XXIX, p. 74.

⁴ Suchannek: Archiv für mikroskop. Anatomie, 1890, XXXVI, p. 375.

⁵ Merkel: Handbuch der topographischen Anatomie, 1891.

⁶ Disse: Anatomische Hefte 28-30, 1897, IX, p. 255.

⁷ Alcock: Anatomical Record, 1910, IV, p. 123.

⁸ Balfour: A Treatise on Comparative Embryology, 2 Vols., London, 1880-81.

⁹ A. Milnes Marshall: Quarterly Journal of Microscopic Science, 1879, New Ser., XIX, p. 300.

¹⁰ Morrill: Journal of Comparative Neurology, 1898, VIII, p. 180.

¹¹ Disse: l. c. (1897).

¹² Frazer: Journal of Anatomy and Physiology, 1910-11, XLV, p. 347.

little interest until the rise of the modern school of clinical rhinologists. Very little advance in the anatomical knowledge of the olfactory epithelium has been signalized since the publication of Schultze's monograph, so exhaustive and exact was it, but nearly all the description of the finer histology of the nasal mucosa has followed our clinical appreciation of the fact that the most important functions of the nasal chambers are to warm, moisten and filter the inspired air of its dust and bacterial contents.

Nasal Lymphatics.—The anatomy of the lymphatic supply of the nose as of other regions of the body goes back chiefly to the classical work of Sappey¹ in 1874. In the following year Key and Retzius² made the observation quoted in every rhinological and anatomical text-book since then, that the lymph spaces of the nasal mucosa communicate with those of the meninges through the cribriform plate. Zuckerkandl repeating some of their experiments called the statement into some doubt in 1893, but on the whole it has been upheld. Kuttner³ for the external nose in 1899, Most⁴ for the internal nose and nasopharynx in 1901, Sieur and Jacob,⁵ in the same year for the nasal fossæ and the sinuses, and later André,⁶ Grünwald,⁷ Falconi,⁸ Poli,⁹ all contributed valuable work to the elucidation of the lymph supply of the nose and its adnexa. In addition to the work directed to specific points in the histology of the nasal chambers more or less covered, though by no means with exhaustive reference, in the foregoing pages, there has been a moderate number of treatises published on the subject as a whole, such for instance, as the extensive paper of Oppikofer,¹⁰ in 1907, the Atlas of Seifert and Kahn¹¹ in 1895 and above all the valuable work of Schiefferdecker¹² in 1900.

While there are some points of special interest in the history of the development of our knowledge of nasal neoplasms, their differentiation for the most part finds its place in the general history of pathological histology. In what follows, therefore, no attempt at completeness can be made in this history of modern rhinology, so

¹ Sappey: Anatomie, physiologie, pathologie des vaisseaux lymphatiques considérés chez l'homme et les vertébrés, Paris, 1874.

² Key and Retzius: Studien in der Anatomie des Nervensystems und des Bindegewebes, Stockholm, 1875, Band I, pp. 217-221.

³ Kuttner: Beiträge zur klinischen Chirurgie, October, 1899, XXV, p. 33.

⁴ Most: Archiv für Anatomie und Physiologie, Anatomische Abt., 1901, p. 75.

⁵ Sieur and Jacob: Recherches anatomiques, cliniques et opératoires sur les fosses nasales et leur sinus, Paris, 1901.

⁶ André: Contribution à l'étude des lymphatiques du nez et des fosses nasales, Thèse de Paris, 1905.

⁷ Grünwald: Archiv für Laryngologie und Rhinologie, 1910, XXIII, p. 183.

⁸ Falconi: see Poli.

⁹ Poli: Archiv für Laryngologie und Rhinologie, 1911, XXV, p. 253.

¹⁰ Oppikofer: Archiv f. Laryngologie und Rhinologie, 1906, XIX, p. 28.

¹¹ Seifert and Kahn: Atlas der Histopathologie der Nase, der Mundrachenhöhle und des Kehlkopfes, Wiesbaden, 1895.

¹² Schiefferdecker: Heymann's Handbuch, III, 1900, p. 87.

far as it relates to tumors, especially true tumors. As far as operative procedures are concerned, those major operations involving extensive exposure of the nasal chambers and their accessory cavities are referred to in the account of sinus disease, but these also belong to another domain constituting a part of the modern history of surgery.

Œdematous Nasal Polypi.—The history of nasal polypus is so intimately bound up with the history of the histology of the nasal mucosa in general that it is difficult to separate the two in modern rhinology. The conception of the nasal polypus we have followed down to the time of Morgagni. It remains to follow it during the nineteenth century. In the surgery of Chelius¹ as late as 1852 we find that he regarded the nasal polypus as a local infiltration of the mucosa with serum, a view which we have seen prevail almost since the downfall of the Galenic pathology. Frerich² is said to have been the first to point out that its surface is covered by epithelium similar to that of the surrounding tissue.

On referring to an early (1854) American edition of Paget's "Surgical Pathology," we find he classes nasal polypi among the fibrocellular tumors (p. 386), and in this class he also put those growths shortly afterward described by Virchow under the name of myxoma in the "Krankhafte Geschwülste" (ed. 1863, p. 417), who having previously described myxoma in other publications, dwelt upon the relationship it bears to the retrograde metamorphosis of fatty tumors and of fat tissue, being frequently therefore found in connection with lipomata. He states that myxoma "in adults is relatively infrequent, even in the atrophic metamorphosis of fat tissue in the mucous membranes."³ I need only refer in passing to the remarkable mistake made by Billroth⁴ in ascribing the structure usually found in rectal polypi to those found in the nasal cavity. He says he examined twenty-three cases of nasal polypi, and they were nearly all adenomatous in structure.

It needs only a reference to a few of the modern text-books on pathology to show that the definition of Virchow as to myxoma, in spite of much well-grounded criticism, is still universally accepted, and yet in not a few of them has crept the idea that the structure of the nasal polyp conforms to it. Billroth⁵ and Cornil and Ranvier⁶

¹ Chelius: *Handbuch der Chirurgie*, 7th edit., Heidelberg, 1852, Band II, p. 530.

² Frerich: *De Polyporum Structura Penitior*, 1843.

³ Virchow (*Virchow's Arch. f. path. Anat.*, 1900, Band 162, p. 163, Heft. 1), remarks incidentally as to this matter: "Es ist ein blosses Spiel mit Worten, wenn man junge pathologische Zellen und Gewebe embryonale nennt." Some account of the question of the doubt as to Virchow's classification of myxoma may be readily found in Councilman's article on "Myxoma" in Wood's "Reference Hand-book of the Medical Sciences."

⁴ Billroth: *Ueber den Bau der Schleimpolypen*, Berlin, 1854.

⁵ Billroth: *Surgical Pathology*, 1882.

⁶ Cornil and Ranvier: *Manuel d'histologie pathologique*, 2 éd., Paris, 1881.

follow him explicitly. Birch-Hirschfeld¹ speaks of nasal polypi as soft fibromata or myxofibromata. Evidently he had no experience of his own with these growths, because in his description of myxoma he describes them in the sense of the others. He misquoted Hopmann, who as we shall see presently directly repudiated the idea of myxoma of the nose. Weichselbaum² gave a characteristic wood-cut and the usual description of true myxoma. Ziegler³ says that the nasal polypi are made up of œdematous connective tissue and mucous tissue, and must therefore be ranked among the fibromata and myxomata, but he differs in no way from other pathologists in his description of the latter, which are always combined, he says, with the histological forms of other tumors. Delafield and Prudden, in the 1892 edition of their "Pathological Anatomy," state that it is frequently difficult to distinguish between the two; but in the illustration they give of the structure of a mucous polyp of the nose, there is no resemblance to the picture they give of a higher amplification as typical of myxoma. In later editions this is corrected.

When we attempt to find who was responsible for the introduction of the term "myxoma" into nasal pathology, we are baffled by the apparent insidiousness of the process. It seems to have crept in through its use by writers who are either unfamiliar with the myxoma of Virchow, or else unfamiliar with the histological details and the pathogenesis of nasal polypi.

The first mention of myxoma occurring in the nose which I have been able to find is a report by S. W. Gross in 1871.⁴ We find here the "myxoma" error in full bloom.

A glance at the text-books on the nose, which began to appear first a third of a century ago, convinces one that the term, if not the conception, of Virchow was well established in the literature of the subject. Michel, indeed, who published in 1875 the first extended work of modern date on the diseases of the nasal cavity, did not, so far as I can see from the translation of Shurly, speak of the polypi as myxomatous, and his conception of their etiology and pathogenesis does not coincide with the view of there being a new growth of tissue. Cohen, whose work first appeared in 1879, accepted the classification of myxoma. Störk, in 1880, did not use the word in connection with them, but in Bosworth's first edition in 1881, they are so classified, Zuckerkandl⁵ very curiously fell

¹ Birch-Hirschfeld: *Lehrbuch der pathologischen Anatomie*, 1887, Vol. II, p. 381; 1889, Vol. I, p. 151.

² Weichselbaum: *Grundriss der pathologischen Histologie*, Leipzig, 1892.

³ Ziegler: *Lehrbuch der allgemeinen Pathologie und der pathologischen Anatomie*, Jena, 1895, Vol. II, p. 625; 1895, Vol. I, p. 397.

⁴ Gross: *Transactions Pathological Society of Philadelphia*, 1871-73, IV, p. 219.

⁵ Zuckerkandl: *Normale und pathologische Anatomie der Nasenhöhle*, Wien, 1882, p. 76.

into the serious error of Billroth, quoting him with assent in saying they are adenomatous, but he makes no reference to them as myxomatous. Beverley Robinson, in his treatise on "Nasal Catarrh," the second edition of which appeared in 1885, referred to nasal polypi as myxomatous. Morell Mackenzie began his chapter on nasal polypi by saying they are new formations nearly always of a myxomatous character.¹ I will not pursue text-book literature into more recent time. Suffice it to say that in nearly all of the special works on the nose this error in nomenclature, if not in conception, still exists.

It is to Hopmann that we are indebted for the first serious attempt to dispel it.² In 1885 he refuted not only the mistake of Billroth as to their adenomatous nature, but, quoting from the German translation of Mackenzie's book, he denied the latter's assertion as to the myxomatous character of nasal polypi. They are, he asserted, to be looked upon as soft, œdematous fibromata. Chiari, in 1887, said: "On the ground of an histological examination of twenty-three nasal polypi, polypoid hypertrophies, and papillomata, I came to the conclusion that also in nasal polypi it was only a matter of serous infiltration of a hypertrophy of the mucosa." In many subsequent papers this view has been incontrovertibly established—most conclusively, I think, by Hajek³—and it has been urged in this country by Wright⁴ and others. A paper dealing with this subject exhaustively was that of Cordes⁵ in 1900. There is very little to be found in it which had not been stated previously by other observers, but it is a very satisfactory confirmation of much work done by others, the publications of which are scattered through rhinological literature.

Woakes,⁶ in 1885, believed that nasal polypi accompany and are caused by an inflammation advancing from the mucosa through the periosteum to the bone structure itself. He, at least as early as that, plainly traced the affection to an inflammatory condition. Wright,⁷ in 1897, declared that myxoma in the sense of the histologists does not occur in the nose. This has been practically upheld since the proper differentiation was accepted. In 1901 Hajek and Polyak⁸ reported a nasal growth which they seemed to have good reason

¹ Mackenzie: *A Manual of Diseases of the Throat and Nose*, N. Y., 1884, Vol. 2, p. 350.

² Hopmann: *Monatsschrift für Ohrenheilkunde*, June, 1885, XIX, p. 161. It is less clearly combated in his paper in *Virchow's Archiv f. path. Anat.*, 1883, XCIII, p. 213.

³ Hajek: *Archiv f. Laryngologie*, etc., 1896, Band IV, Heft 3, p. 277.

⁴ Wright: *New York Medical Journal*, November 4, 1893, LVIII, p. 521.

⁵ Cordes: *Archiv f. Laryngologie*, etc., 1900, XI, Heft 2, p. 280.

⁶ Woakes: *British Medical Journal*, April 4, 1885, I, p. 701.

⁷ Wright: *Transactions American Laryngological Association*, 1897, p. 61. *Archiv f. Laryngologie*, etc., 1897, VII, p. 96.

⁸ Hajek and Polyak: *Archiv f. Laryngologie und Rhinologie*, 1910, XXIII, p. 43.

to believe was a true myxomatous tumor, reporting it as a myxoma lymphangiectaticum. If so, as they remark, it is probably a unique case. It was a deeply seated growth of the base of the skull distorting the bony nasal frame-work in a patient who died of tuberculous disease of the lungs. A paper was published by Okada¹ on the histology of nasal polypi in which considerable emphasis was laid upon what he called mucous degeneration of the surface epithelium. Wright,² in 1898, described the occurrence of hyaline bodies in nasal polypi, especially in adenomata, which he regarded as due to degenerative processes which result in the overgrowth of certain of the granules in some of the cell bodies of the connective tissue. Kalischer³ reported, in 1895, having frequently found nerve fibers in œdematous nasal polypi.

Nasal Papillomata and Papillary Hypertrophies.—There has been in the modern history of laryngology another more exact differentiation in nasal pathology since the publication of Billroth, of which we must take account. His declaration that all nasal polypi are adenomatous, as we have seen, found refutation in the work of Hopmann. The latter author was less happy in his contribution to the literature of another class of nasal growths. Hopmann,⁴ in 1883, described a number of cases of papilloma of the nose as observed by him and studied by him microscopically. These nearly all occurred on the inferior turbinated bone. Supported by the half-admission of Morell Mackenzie,⁵ Schech,⁶ Schaeffer,⁷ Krause,⁸ Moldenhauer,⁹ Chiari,¹⁰ Juraz,¹¹ and Bayer,¹² this mistake persisted in the literature of nasal pathology to some extent for a number of years. Lacoarret¹³ and Moure¹⁴ in 1889 protested against the idea, declaring such tumors were merely hypertrophies of the mucous membrane or granulation tissue. As pointed out by Wright,¹⁵ in 1891, the mistake was one more of nomenclature than

¹ Okada: *Archiv f. Laryngologie und Rhinologie*, 1898, VII, p. 204.

² Wright: *American Journal of the Medical Sciences*, October, 1898, CXVI, p. 445.

³ Kalischer: *Arch. f. Laryngologie, etc.*, 1895, Vol. 2, No. 2, p. 269.

⁴ Hopmann: *Virchow's Archiv f. path. Anat.*, 1883, XCIII, p. 213.

⁵ Mackenzie: *Diseases of the Throat and Nose*, 1884, Vol. II, p. 377.

⁶ Schech: *Krankheiten der Mundhöhle, etc.*, Leipzig, 1888, p. 267.

⁷ Schaeffer: Quoted by Hopmann in *Wien. medizinische Presse*, 1883, XXIV, 1227.

⁸ Krause: Quoted by Hopmann in *Wien. medizinische Presse*, 1883, XXIV, 1227.

⁹ Moldenhauer: Quoted by Hopmann in *Wien. medizinische Presse*, 1883, XXIV, 1227.

¹⁰ Chiari: *Revue mensuelle de laryngologie*, March, 1886, No. 3, VI, p. 121.

¹¹ Juraz: *Die Krankheiten der oberen Luftwege*, Heidelberg, 1890, p. 90.

¹² Bayer: Quoted by Hopmann in *Wien. medizinische Presse*, 1883, XXIV, 1227.

¹³ Lacoarret: *Revue mensuelle de laryngologie*, No. 17, 1889, IX, et seq., p. 497.

¹⁴ Moure: *Ref. in Centralblatt für Laryngologie*, 1889-90, VI, p. 324.

¹⁵ Wright: *New York Medical Journal*, December 26, 1891, LIV, p. 711.

of pathology. It has long since become firmly established that papillary hypertrophy of the nasal mucosa, such as often occurs on the lower and posterior aspects of the inferior turbinate bones has a structure differing entirely and a genesis differing very much from that of a papilloma or fibroma papillare in the sense of Virchow. This was more explicitly set forth by Wright¹ in 1895. A number of cases of true papilloma in the nose have been reported. Unlike myxoma, papilloma occurs in the nose but not with the frequency which we would be compelled to admit had Hopmann's nomenclature been accepted. Kiesselbach² reported cases of papillary growths under the name of epithelioma papillare in conformance with the nomenclature and conception of Billroth and Hopmann—they being what we are now accustomed to regard as papillary hypertrophies. For a few years both this term and that of Hopmann, confounding papillary hypertrophies with true papillomata were used, causing much uncertainty in the literature of nasal pathology. Arrowsmith³ in reporting a case of true papilloma of the nose collated a bibliography of fifteen reports and Newcomb⁴ extended the bibliography in the report of another case in 1901. He referred to nine cases mentioned in literature since Arrowsmith's bibliography was published. For the most part since that date the proper differentiation has been made by observers of cases. Chavanne,⁵ in 1907, gave a very good account of papillomata of the nasal fossæ with a summary of many of the cases hitherto reported and an extensive bibliography. In 1897 Hellmann⁶ wrote an article on the subject of nasal papilloma and their transformation into carcinomata, from Hopmann's standpoint, separating the cases of papilloma into hard and soft. There is no appreciation of the proper histological differentiation between true papilloma and papillary fibroma or papillary adenoma. His paper contains a large but not exhaustive bibliography of previous work. He has had no support in his belief that there is a frequent malignant transformation of cases of hard papillomata into epitheliomata, but in much of the German literature the true papillomata became known as "hard" papillomata and Hopmann's papillomata or papillary hypertrophies were spoken of as soft papillomata, a quite inadequate distinction. Notwithstanding occasional evidence of the unfortunate results of this confusion in nomenclature, the essential difference in the nature of the true and the false nasal papillomata is at present well understood.

¹ Wright: New York Medical Journal, October 13, 1894, LX, p. 453.

² Kiesselbach: Virchow's Archiv f. path. Anat., 1893, Band 132, p. 371.

³ Arrowsmith: The Laryngoscope, 1897, III, p. 283.

⁴ Newcomb: Transactions of the American Laryngological Association, 1901, p. 130.

⁵ Chavanne: Annales des maladies de l'Oreille, etc., August, 1907, XXXIII, Pt. 2, p. 113.

⁶ Hellmann: Archiv für Laryngologie und Rhinologie, 1897, VI, p. 171.

Verneuil,¹ in 1886, reported a case of what appeared to be a benign nasal papilloma which repeatedly recurred, and in spite of extensive operations for its removal, continued to recur over the whole of the nasal mucosa. In 1908 Wright² referred to two similar cases coming under his own observation. There was persistent surface epithelial proliferation and extension without infiltration lasting many years unchecked by radical operation. Histologically these cases were essentially benign, and clinically, so far as was known, they did not result fatally, though their persistence and their recurrence were the sources of much suffering on the part of the patients.

Nasal Adenomata and Papillary Hypertrophies.—The connection between papillary hypertrophies and adenomata in the nose and their gradual merging into one another across an indefinite boundary line was pointed out by Wright,³ in 1897, who referred to the work of Billroth, and reported cases some of which were plainly on one side of the line and some on the other. If this difficulty of differentiation has been felt in the classification of adenomata and of inflammatory papillary hypertrophies, in rhinological practice, it has been felt largely as a question of academic interest only. Quite a different matter has been the question of differentiation between benign and malignant adenomata. It is no doubt true if we rule out those cases manifestly of inflammatory origin and those cases whose subsequent histories prove them to be malignant, adenomata in the nose is of rare occurrence. Such is the conclusion of Saitta,⁴ who concluded that pure adenoma is very rare indeed; the mixed form is more common, though they are separate individual growths and are by no means secondary to inflammatory hypertrophy. Though they have no specific symptoms distinguishing them from other growths, and though they are of benign nature, he points out the readiness with which they become malignant, yet advised against premature operation. Citelli and Calamida,⁵ in 1902, referred to several cases of growths in the nose which they classified as epitheliomata. They seem to belong, however, among the papillary adenomata and the papillary hypertrophies.

Angiomata and Bleeding Septal Polypi.—The salient points of interest in the subject of vascular neoplasms of the nasal chambers has been the nature of the hypertrophy of the posterior ends of the inferior turbinated bodies and the frequency with which angiomata are seen on the septum. It is quite well understood that the former

¹ Verneuil: *Bull. et Mém. de la société de Chirurgie de Paris*, 1886, XII, p. 658.

² Wright: *The Laryngoscope*, February, 1908, XVIII, p. 81.

³ Wright: *New York Medical Journal*, November 13, 1897, LXVI, p. 653.

⁴ Saitta: *Archivii Italiani di Laringologia, etc.*, 1897, fasc. 4, XVII, p. 157.

⁵ Citelli and Calamida: *Archiv für Laryngologie und Rhinologie*, 1902, XIII, p. 273.

are not to be classed among the true tumors. Neumann,¹ in 1861, contributed to the knowledge of cavernous tumors a description of the gross and minute appearances of a vascular growth removed from the nose, but as there is no indication of its site of intranasal attachment and origin the report has only historical interest. Virchow,² in 1863, was in doubt if the hypertrophies at the posterior end of the inferior turbinated bodies should be called angiomas or not, calling attention to Neumann's description of the condition.³ As in many other fields the father of the modern nomenclature of tumors was at a loss to draw the line between the true and the false. Biological science as it advances is continually showing the arbitrary nature of such divisions. Morell Mackenzie,⁴ in 1884, and Lange,⁵ in 1892, had referred to such cases, but for thirty years vascular tumors of the anterior nares had been spoken of as rare phenomena.⁶ As a matter of fact they are the most common of all the benign neoplasms of the nasal fossæ which have any claim to be classed in the category of true tumors.

Kiesselbach's Area.—In 1880 and 1884⁷ Kiesselbach had drawn attention to the clinical experience which pointed to the anterior portion of the cartilaginous nasal septum as an area in which the bloodvessels formed a plexus from which hemorrhage most frequently occurred. In this area it was subsequently shown the vascular neoplasms were most apt to be found, and in 1892 a number of articles appeared by Schwager, Alexander, Scheier, and Heymann⁸ in which many cases were reported, and since which, under the name of bleeding polypi of the nasal septum, the affection has been well understood, though the neoplasms are frequently spoken of as angiomas. Glas,⁹ in 1905, included them in an extended account of the angiomas of the nose, with a considerable bibliography. He drew attention to the fact that these growths develop usually as the result of an inflammation of the mucosa which has resulted in an atrophy of the connective tissue and that they are associated with a disarrangement of the elastic elements in it. Torhorst,¹⁰ in 1906, in reporting thirteen cases gave an exhaustive bibliography of the subject of bleeding polypi of the septum. Many reports since then have appeared from time to time, but nothing new thus far appears to have been elicited.

Nasal Cysts.—The subject of cysts of the nasal fossæ, so far as they have an especial interest in the history of rhinology, presents

¹ Neumann: Virchow's Archiv f. path. Anat., 1861, XXI, p. 280.

² Virchow: Die Krankhaften Geschwülste, Berlin, 1863, Band 3, p. 306.

³ Neumann: l. c.

⁴ Mackenzie: Diseases of the Throat and Nose, 1884, V. 2.

⁵ Lange: Wiener medizinische Presse, 1892, No. 52, XXXIII, 2071.

⁶ Ricketts: Cincinnati Lancet Clinic, January 3, 1891, n. s., XXVI, p. 1.

⁷ Kiesselbach: Berliner klinische Wochenschrift, 1884, No. 24, XXI, p. 375.

⁸ Archiv für Laryngologie und Rhinologie, 1894, I, pp. 105, 265, 269, 273.

⁹ Glas: Archiv für Laryngologie und Rhinologie, 1905, XVII, p. 22.

¹⁰ Torhorst: Archiv für Laryngologie und Rhinologie, 1906, XVIII, p. 268.

three salient points: (1) The relation of antral cysts to the question of antral hydrops; (2) the origin of dentigerous cysts; (3) bony nasal cysts. The literature of these points will be largely discussed under the head of the Accessory Sinuses. It may be added that in 1855 Luschka¹ in the course of an article on the mucous polypi of the maxillary antrum gave some details of the normal histology of the antral mucosa, showing that in places glands are plentiful in the mucosa and that small cystic dilatations are not uncommon. Giralès² after correcting some inaccuracies of Cruveilhier³ in the description of the gross anatomy of the sinus takes up the subject of the histology of the mucosa and the formation of cysts out of the dilated ducts and acini of its glands. Virchow⁴ devotes a page or two to a mention of cystic polypi of the maxillary antrum, which sometimes simulate, or, as he, supporting Giralès,⁵ claimed, really constitutes the condition known as Hydrops of the Antrum, and while there has been considerable dissenting opinion, Alexander,⁶ in 1897, being compelled to admit the possibility of a serous disease of the maxillary antrum, declared there is good reason to believe this is usually the origin of clear fluid in the cavity. Dmochowski⁷ and Noltenius (l. c.) have taken the other view of it.

Osteomata.—The other neoplasms that occur in the nose scarcely need mention as a matter of rhinological history. Osteoma perhaps may be referred to as a neoplasm rather more frequent in the nose than in other regions of the body. Bornhaupt,⁸ in 1881, could collate the reports of about 49 cases. Gützer,⁹ in 1910, reviewed the literature in reporting a case thirty years later. The monographs dealing with the neoplasms of a benign nature in the nose, which discuss the subject most exhaustively, are those of Hasslauer and Heymann. In 1900 Hasslauer¹⁰ wrote an essay on the benign tumors of the nasal septum with a bibliography of the previous literature. He divided them into œdematous polypi and polypoid hypertrophy, warty growths or papillomata, dividing the latter into hard and soft, the bleeding septal polyp, a term suggested by Schadowaldt, true fibromata, a very rare form of growth, adenoma in its benign form scarcely less rare, myxoma, cysts, enchondroma, tuberculoma, and syphiloma. Heymann,¹¹ however, has given the

¹ Luschka: Virchow's Archiv f. path. Anat., 1855, VIII, p. 419.

² Giralès: Virchow's Archiv f. path. Anat., 1856, IX, p. 463.

³ Cruveilhier: Traité d'anatomie, Tome IV, 3d ed., 1852, p. 55.

⁴ Virchow: Die krankhaften Geschwülste, Berlin, 1863, Vol. I, p. 244.

⁵ Giralès: l. c.

⁶ Alexander: Archiv für Laryngologie und Rhinologie, 1897, VI, p. 130.

⁷ Dmochowski: Centralblatt für Allgemeine Pathologie, etc., March 14, 1895, VI, p. 177.

⁸ Bornhaupt: Archiv für klinische Chirurgie, 1881, XXVI, p. 589.

⁹ Gützer: Medical Record, July 2, 1910, LXXVIII, p. 12.

¹⁰ Hasslauer: Archiv für Laryngologie und Rhinologie, 1900, X, p. 60.

¹¹ Heymann: Handbuch der Laryngologie und Rhinologie, 1900, Band III, p. 783.

most admirable account of benign nasal neoplasms in general, with an exhaustive bibliography carried up to 1900. Some aspects of the granulomata, tuberculous and syphilitic, have some special interest in rhinology.

Tuberculoma.—According to Chiari,¹ who himself wrote on the subject in 1893, Riedel,² in 1878, and Tornwaldt,³ in 1880, were the first to describe tuberculoma of the nasal mucosa. Manasse,⁴ in 1897, drew attention to the difficulty in making the histological differentiation between syphilitic and tuberculous granulomata in the nose, owing to the presence of giant cells and coagulation necrosis in syphilomata, especially of the former, indistinguishable from those of tubercle. There have been a large number of reports, since then, of primary nasal tuberculosis, so-called, and of nasal tuberculoma. Those of Sachs,⁵ Zarniko,⁶ Rossi-Marcelli,⁷ Fein,⁸ Oppenheimer,⁹ Möller,¹⁰ Rosenbach¹¹ may be referred to, but the contributions of Caboche,¹² who discussed it as a larval affection and in its relation to ozæna, and that of Chavanne,¹³ who subdivided it into the acute form seen in miliary tuberculosis and into the chronic form including tuberculoma and lupus, are the most complete and exhaustive monographs on the subject.

Nasal Syphilis.—Extragenital chancres occur on all the accessible mucous surfaces and in some regions where it would seem impossible that the affection could be carried. As to the nose, a list of the reports of such cases may be found in Schech's¹⁴ article on the subject in 1900 and a large number of reports have appeared since then, as may be seen from Semon's *Centralblatt*. Secondary and tertiary forms of syphilis in the nose have not formed important topics of discussion in rhinological literature.

Protozoal Granulomata in the Nose.—These are the rarest of all affections if we are to judge from the literature. Blanchard¹⁵

¹ Chiari: *Archiv für Laryngologie und Rhinologie*, 1894, I, p. 121.

² Riedel: *Deutsche Zeitschrift für Chirurgie*, 1878, X, p. 56.

³ Tornwaldt: *Deutsches Archiv für klinische Medizin*, 1880, XXVII, p. 586.

⁴ Manasse: *Virchow's Archiv f. path. Anat.*, 1897, Band 147, p. 23.

⁵ Sachs: *Münchener medizinische Wochenschrift*, 1897, No. 38, XLIV, p. 1039.

⁶ Zarniko: *Deutsche medizinische Wochenschrift*, 1897, XXIII, Vereinsbeilage, No. 28, p. 205.

⁷ Rossi-Marcelli: *Archivii Italiani di Laringologia*, 1906, XXVI, p. 107.

⁸ Fein: *Berliner klinische Wochenschrift*, 1906, No. 48, XLIII, p. 1543.

⁹ Oppenheimer: *New York Medical Journal*, June 11, 1910, XCI, p. 1218.

¹⁰ Möller: *Internationales Centralblatt für Laryngologie und Rhinologie*, 1911, XXVII, 194.

¹¹ Rosenbach: *Archiv für Laryngologie und Rhinologie*, 1911, XXIV, 231.

¹² Caboche: *Annales des maladies de l'oreille, du larynx, etc.*, October, 1907, No. 10, XXX, pt. 2, p. 260.

¹³ Chavanne: *Annales des maladies de l'oreille, du larynx, etc.*, August, 1909, No. 8, XXXV, pt. 2, p. 240.

¹⁴ Schech: *Heymann's Handbuch*, 1900, Band III, p. 931.

¹⁵ Blanchard: *Bull. de l'Acad. de Méd.*, November 13, 1900, 3 Série, XLIV, p. 504.

presented two cases of nasal polypi for Dr. Seeber, of the University of Buenos Ayres, who claimed certain cases of nasal polypi were caused by a sporozoön, differing from the coccidia which develop in the connective tissue. In 1903 O'Kinealy¹ described a papillomatous mass in the nasal fossa of a case in India which contained organisms subsequently classified among the sporozoa and given the name of *Rhinosporidium Kinealyi*. A few other cases reported from India furnished material for the study of the organisms by Minchin and Fantham² and by Beattie.³ Wright⁴ described, in 1907, a similar case occurring in America.

Malignant Nasal Neoplasms.—This section on malignant nasal neoplasms would be a long one were I to refer even to a moiety of the important works on the subject. Bosworth,⁵ in 1889, gave a résumé of 41 cases of sarcoma of the nasal passages previously reported in literature, while in 1900 Kümmel⁶ found 90 references to the subject in forty years. While the number of cases of malignant epithelial growths is markedly less, the latter author refers to an equal number of reports. Gurlt⁷ pointed out that of all cases of sarcoma 2 per cent. occur in the nose, of carcinoma 0.04 per cent., *i. e.*, sarcoma is fifty times more often seen in the nose than carcinoma. Other exhaustive monographs on the subject may be mentioned: Gouguenheim and Hélyar,⁸ in 1893, on malignant tumors of the nasal septum; Dreyfuss⁹ on nasal epitheliomata. He referred to reports of 12 cases in addition to his own. Finder,¹⁰ in 1896, wrote on malignant growths in the nose; Cordes,¹¹ in 1903, on adenocarcinoma of the nose; Donogány and Lénárt,¹² in 1904, on the primary carcinoma of Krompecher in the nose; Althoff,¹³ on endothelioma of the nose in 1907. Many cases of malignant disease of the nose reported in the first decade of the twentieth century, like malignant disease of other organs, were classified as endotheliomata. Even at present the distinction between certain forms of carcinoma and certain forms of sarcoma is so uncertain, as outlined by

¹ O'Kinealy: *Journal of Laryngology*, 1903, XVIII, p. 375.

² Minchin and Fantham: *Quarterly Journal of Microscopical Science*, 1905, XLIX, p. 521.

³ Beattie: *Journal of Pathology and Bacteriology*, 1906, XI, p. 270.

⁴ Wright: *New York Medical Journal*, December 21, 1907, Vol. 86, p. 1149.

⁵ Bosworth: *Diseases of the Nose and Nasopharynx*, 1889, p. 437.

⁶ Kümmel: *Heymann's Handbuch*, 1900, Band III, p. 874.

⁷ Gurlt: *Archiv für klinische Chirurgie*, 1880, XXV, p. 421.

⁸ Gouguenheim and Hélyar: *Annales des maladies de l'oreille*, 1893, XIX, p. 295.

⁹ Dreyfuss: *Archives internationales de laryngologie de rhinologie et d'otologie*, 1892, V, p. 65; *Wiener medizinische Presse*, Nos. 36, 37, 38, 40, 1892, XXXIII, 1417, et. seq.

¹⁰ Finder: *Archiv für Laryngologie und Rhinologie*, 1896, V, p. 302.

¹¹ Cordes: *Berliner klinische Wochenschrift*, February 23, 1903, No. 8, XL, p. 164.

¹² Donogány and Lénárt: *Archiv für Laryngologie und Rhinologie*, 1904, XV, p. 586.

¹³ Althoff: *Ibid.*, 1907, XIX, p. 220.

histologists, that much confusion in clinical reports has resulted. Uffenorde,¹ in 1908, gave an exhaustive account and a bibliography of nasal chondromata, describing also operations for the relief of the conditions. The rarer forms of nasal growths observed have been a cylindroma by Dembowski,² in 1891, a lymphangioma by Hamm,³ two cases of congenital glioma by Clark,⁴ in 1905, a case of rhabdomyoma by Vail.⁵ Serapin,⁶ in 1903, spoke of the mixed tumors of the palate, and numbers of cases have been reported, to some of which Coffin⁷ referred, in 1909, in reporting a case, which make it probable that such growths are of teratoid nature.

CHRONIC INTRANASAL DISEASE AND ITS MODERN TREATMENT.

Reflex Neuroses.—The evident dependence of the congestion of the erectile mucosa upon reflex action connected it not only with the neuroses of hay fever and asthma, but with the histological changes in the stroma. A perusal of the subsequent literature will again reveal the process of differentiation in nasal affections, as we have so frequently had occasion to note in the course of this history. Schaeffer⁸ had drawn attention to local disease of the upper air passages as an exciting cause for asthma and other neuroses, but it was not until the publication of W. Hack's⁹ paper on "Reflex Neuroses," in 1882, that the attention of laryngologists was arrested. There followed a large number of contributions to medical literature by Elsberg,¹⁰ John N. Mackenzie,¹¹ Roe, Daly, Bosworth, and many others. They elaborated this chapter in laryngology to an extent which now seems overdrawn, much more prominence being given to local conditions than to the underlying systemic neurosis in the etiology.

Intranasal Surgery.—This immediately stimulated an interest in intranasal surgery, and no one can now deny that, for a while, the nose was a much abused organ. Chronic hypertrophy of the

¹ Uffenorde: *Archiv für Laryngologie und Rhinologie*, 1908, XX, p. 255.

² Dembowski: *Deutsche Zeitschrift für Chirurgie*, 1891, XXXII, p. 385.

³ Hamm: *Münchener medizinische Wochenschrift*, February 24, 1903, No. 8, L, p. 332.

⁴ Clark: *American Journal of the Medical Sciences*, May, 1905, CXXIX, p. 769.

⁵ Vail: *The Laryngoscope*, December, 1908, XVIII, p. 933.

⁶ Serapin: *Ref.; Internat. Centralblatt für Laryngologie und Rhinologie*, 1904, XX, p. 338.

⁷ Coffin: *Annals of Otology, Rhinology and Laryngology*, December, 1909, XVIII, p. 788.

⁸ Schaeffer: *Deutsche medizinische Wochenschrift*, Nos. 32, 33, 1879, V, pp. 403, 418.

⁹ Hack: *Berliner klinische Wochenschrift*, 1882, XIX, p. 379.

¹⁰ Elsberg: *Trans. Am. Lar. Ass'n*, 1883, p. 79.

¹¹ Mackenzie: *Am. Jour. Med. Sc.*, July, 1883, Vol. 86, p. 106.

mucosa was perhaps the lesion which first attracted the chief attention. We have seen that the treatment of nasal obstruction, due to hypertrophy of the mucosa, by means of nasal bougies, had been recommended by Deschamp and Cloquet in the beginning of the century, and we find this method again proposed in America at the beginning of the development of modern rhinology.¹

Caustics and Cautery.—The application of acids which we have seen in the records of ancient medicine was one of the sheet anchors of intranasal therapy, but later was much neglected. Now it sprang suddenly into favor, some of the weaker acids, such as chromic or chloracetic, being found preferable to the painful action of the stronger mineral acids. Soon, however, these caustic applications gave place in a large extent to the actual cautery, a still older therapeutic measure, as we have seen in the Hippocratic treatises; but now the hot metal, by means of the electric current, brilliant illumination, and cocaine, had become much more manageable in its application. The introduction of this method of cauterization goes back in pre-laryngoscopic times to the work of Middeldorpf, who in 1854 published² illustrations of a cautery armamentarium practically the same as that used for many years in rhinology, before advantage was taken of the electric lighting current, now at everyone's service. The rheostat has almost entirely displaced the "plunge battery" and the storage battery. Voltolini, in 1867, (l. c.) further developed the technique by the aid of laryngoscopy. He also was the originator at this time of electrolysis in various affections of the nose and throat. The improvement in the source of the electric discharge soon brought the method of galvanic cauterization into universal use. An ingenious operation frequently needs only the recommendation of novelty, and Michael's amusing little poem entitled "Rhinologie," read at the International Congress of 1890,³ shows that even by that time intranasal cauterization was becoming a little ridiculous. For almost every affection of every organ, from the uterus to the eyes, after the spread of Hack's ideas,

"Dann wird die Nase ausgebrannt,
Denn das hilft immer wie bekannt."

The Dental Engine.—Other methods of removing intranasal obstruction came rapidly into use. The dental engine seems to have been first used by Solis Cohen.⁴ He destroyed an exostosis of the nasal passage by this means in 1878. Seiler seems to have been

¹ In a report of the proceedings of the New York Laryngological Society we find Asch, Wagner, and Smith advising the use of intranasal bougies in hypertrophy of the inferior turbinated bone. *N. Y. Med. Jour.*, 1874, Vol. XIX, p. 422.

² *Die Galvanocaustic*, von Albrecht Theodor Middeldorpf, 1854.

³ *Vid.*: *Internat. Centralblatt f. Lar.*, 1890, VII, p. 133.

⁴ Cohen: *The Medical and Surgical Reporter*, July 13, 1878, XXXIX, p. 30.

the first to suggest the use of the electromotor for driving the dental engine in this operation.¹ After the introduction of this adjuvant the apparatus became a part of the armamentarium of every laryngologist, at least in America, though much later in Europe.

Since the publication of the first edition of this book, the use of the nasal trephine and nasal burrs has much declined and has been largely superseded by other methods of technique.

Septal Operations.—In 1887 Bosworth reported his invention of a nasal saw for septal ecchondroses,² and this method of their removal was so practical that its performance immediately became very common, but this also since the advent of submucous operations has been largely abandoned.

It is an entirely arbitrary procedure to begin the history of operations on the nasal septum with the operative surgery of Dieffenbach. We have already had occasion to notice the antiquity of operations on the external nose for the purpose of restoring its symmetry destroyed by the vengeful ferocity of man. The tragic account by Dieffenbach³ of how a woman revealed to him in the darkened secrecy of her home a face mutilated by disease, a horrible vision that made her an outcast on earth and her existence a torture to herself, is one of the passages in medical literature which stand forth with a dramatic intensity from the somnolent and dreary pages it falls to the lot of the medical historian to read. We may use this lurid gleam of human suffering as the point of departure for us in an account of operations on the internal frame-work of the nose as differentiated from those plastic procedures so skilfully practised before Hippocrates by the Hindus. With the possible exception of operation on the accessory sinuses no division of modern rhinology has exhibited such a record of triumphant achievement as has attended the later evolution of septal operations. Indeed, the record transcends that of sinus surgery in the consideration that few or no victims have been immolated on the altar of man's presumption in venturing where angels ought to fear to tread. As a matter of fact, restoring the proper aëration and drainage of the nasal chambers and their accessory sinuses has acted as a preventive of those conditions which have formed, too frequently, excuses for rash and unbalanced surgical technicians to intrude where common-sense and common prudence should have caused them to hold their hands.

The surgeons in the early part of the last century, Langenbeck,⁴ Dieffenbach, Chassaignac,⁵ Gross, and other writers of surgical

¹ Seiler: Diseases of the Throat, 2d Edit., Phil., 1883, p. 248.

² Bosworth: Medical Record, January 29, 1887, XXXI, p. 115.

³ Dieffenbach: Die operative Chirurgie, Leipzig, 1845, Band I, p. 366.

⁴ Langenbeck: Handbuch der Anatomie, Göttingen, 1843.

⁵ Chassaignac: Gazette des Hôpitaux, 1851, p. 419.

text-books, recommended shaving off the thickenings of the nasal septum. Heylen,¹ as early as 1847, and Dumarquay,² in 1859, seem to have gained access to the internal nose by an external incision and thus to have secured room for a submucous excision of portions of the cartilaginous septum. As early as 1832 or 1833, Blandin, and in 1868, Ruprecht,³ used a punch forceps to perforate the cartilage at its greatest convexity.

Etiology of Septal Deviations.—Langenbeck, in 1842, is said to have been the first to describe septal ecchondroses and exostoses as crests and spurs. Theile,⁴ in 1855, established the great frequency of deviations by the examination of a large number of skulls, reporting that out of 117 he found only 29 symmetrical septa, the majority being deviated to the left. A full discussion of this matter was not entered into until much later. In the years following 1880 descriptions and classifications of the various forms of septal deformity were made by Allen,⁵ Zuckerkandl, Schaus,⁶ Loewenberg,⁷ Ingals,⁸ and others. Discussions as to the etiology included the consideration as factors, lack of coördination in the development of the septum in its relation to the cranial bones first suggested by Morgagni, traumatism,⁹ systemic dyscrasias, local inflammations,¹⁰ racial characters, pressure of hypertrophied turbinates.¹¹ The causes of deviated septa were ascribed to rickets in 1883 by Loewenberg, and in rare cases to cretinism by Allen¹² in 1895. In the discussion on Dr. Delavan's paper¹³ at the meeting of the American Laryngological Association in 1887, John N. Mackenzie drew attention to the rarity of deviation of the septum in the negro race. Welcker,¹⁴ in 1882, stated that he had not seen deviation of the nasal septum earlier than the fourth and Zuckerkandl not earlier than the seventh year. In 1892, in a number of memoirs, Potiquet¹⁵ showed the relation of septal deformity to the mechanics of the development in adolescence of the bones of the face. Indeed, Morgagni's original ideas as a whole have prevailed in our con-

¹ Heylen: *Annales de la soc. de méd. d'Anvers.*, Gaz. Méd., 1847, p. 810.

² Dumarquay: *Gazette des Hôpitaux*, 1859, XXXII, p. 470.

³ Ruprecht: *Wiener med. Wochenschrift*, 1868, XVIII, p. 1157.

⁴ Theile: *Henle's Zeitschrift für rationelle Medizin*, 1855, n. f., VI, p. 242.

⁵ Allen: *American Journal of the Medical Sciences*, January, 1880, LXXIX, p. 60.

⁶ Schaus: *Archiv für klinische Chirurgie*, 1887, XXV, p. 147.

⁷ Loewenberg: *Zeitschrift für Ohrenheilkunde*, 1883, XIII, p. 11.

⁸ Ingals: *Transactions American Laryngological Ass'n*, 1882, p. 61.

⁹ See the long list of authors regarding traumatism as a factor in the etiology, in Bosworth: *Treatise on Diseases of the Nose and Throat*, N. Y., 1889, Vol. I, p. 287, and Roe: *Transactions American Laryngological Ass'n*, 1896, p. 203.

¹⁰ MacDonald: *Diseases of the Nose*, 2d ed., London, 1892.

¹¹ Baumgarten: *Deutsche medizinische Wochenschrift*, 1886, XII, p. 373.

¹² Allen: *New York Medical Journal*, 1895, LXI, p. 139.

¹³ Delavan: *Transactions American Laryngological Ass'n*, 1887, p. 202, et seq.

¹⁴ Welcker: *Die Asymmetrie der Nase und des Nasenskelets*, 1882.

¹⁵ Potiquet: *Bull. et Mém. de la Société de laryng. de Paris*, No. 7, 1892. *Méd. moderne*, March 17-24, 1892, III, pp. 153, 169.

ception of the causes of septal distortion. This is revealed not only in these later works but in the earlier ones of Theile and Chassaignac.¹ In addition to those already referred to, Morell Mackenzie² also examined many hundreds of skulls and published, in 1884, results in conformity with those mentioned. Trendelenburg, as quoted by Schaus,³ first drew attention to the coincidence of high-arched palates and deviated septa, a question much discussed in the literature as to the etiology of ozæna mentioned elsewhere. Coincident with the discussions as to the etiology of septal irregularities arose the propositions for their correction. We have seen that the submucous operation for the removal of spurs had been conceived and executed long before. Again, in 1882, submucous operations for the removal of spurs was proposed by Ingals (l. c.), who used a nasal saw for the cartilage after raising a flap. The latter was then sutured into place again. Many practised this operation, but for the simple removal of spurs it was found to be cumbersome and troublesome, out of proportion to the result secured in comparison with the simpler operation of the removal of the mucous membrane with the cartilage. Ignoring the suggestion of Quelmalz, who advised the patient by repeated attempts each day to try to bend the distorted nose into symmetry, Dieffenbach, Heylen, Chassaignac, Dumarquay, in the first half of the nineteenth century, seem to have made the first serious attempts to straighten the septum either by removing portions of the cartilage or incising it as a submucous procedure.

Although the germ of the submucous operation was already existent in medical publications, efforts to straighten the deviated septum followed at first the proposal of Adams,⁴ who, in 1875, invented a forceps for its forcible fracture, after which it was to be supported by splints. Steele and Glasgow put cutting blades in Adams' forceps in 1881.⁵ Roe, who also in many publications described many other ingenious procedures to correct asymmetry of the nose, subsequently⁶ greatly elaborated the instruments and the methods based on this principle while the operation of Asch,⁷ described in 1890, based on the same principles was widely practised in America for a number of years until supplanted by the modern submucous operation. I need only mention the pin operation advocated by Roberts,⁸ to the use of the snare by Jarvis,⁹ and of

¹ Chassaignac: *Bull. de la Soc. de Chir.*, 1851-2, II, p. 253.

² Morell Mackenzie: *Diseases of Throat and Nose*, Philadelphia, 1884, II, 423.

³ Schaus: l. c., 1887.

⁴ Adams: *British Medical Journal*, October 2, 1875, II, p. 421.

⁵ Steele: *St. Louis Courier of Medicine*, 1879, I, p. 485. Glasgow: *Trans. American Laryngological Ass'n*, 1881, p. 117.

⁶ Roe: *Transactions American Laryngological Ass'n*, 1902, p. 221.

⁷ Asch: *Transactions American Laryngological Ass'n*, 1890, p. 76.

⁸ Roberts: Practised much earlier, though published in 1900; *Surgical Treatment of Disfigurements and Deformities of the Face*, Philadelphia, 1900.

⁹ Jarvis: *Transactions American Laryngological Ass'n*, 1882, p. 69.

trephines and chisels by Seiler, in 1882, to the disarticulation of the septum from the floor of the nose by Watson,¹ in 1896.

Submucous Operation for Deviated Septa.—In 1885 Burkhardt² had recommended leaving the mucous membrane on both sides of the septum when cartilage was removed, but it was many years after this before the technique was brought to its present perfection. As we have seen from time to time, submucous extirpation of septal spurs had been performed under great difficulty. It was not until the use of cocaine came into universal requisition that it could be profitably attempted, and not until after the introduction of the use of adrenalin combined with it that there was opportunity for the successful evolution of the procedure. Krieg's first publication³ in 1886 was little known, but in 1889 he again advised⁴ the resection of the cartilage with its mucous coverings on the convex side, leaving the mucous membrane of the concave side to regenerate fresh cartilage. He refers to Hartmann and Petersen, in 1882, who had resected some of the bent cartilage and its mucous coverings and then reinserted it to grow in its old place in better position. Krieg operated successfully by his method on 23 cases.

Boenninghaus,⁵ in 1899, improved the technique of Krieg. This has rendered operation for straightening the nasal septum a fully justifiable one. Before Boenninghaus, on the whole, the results obtained scarcely did so in spite of the many devices adopted. Both Hajek⁶ and Menzel,⁷ in 1904, in their simultaneously published articles, improved the technique of Krieg and Boenninghaus by leaving the mucosa of both sides of the septum, but Zarniko⁸ drew attention to the fact that G. Killian⁹ had recommended it four years previously.

In America Freer,¹⁰ in 1903, described methods for the submucous ablation of deviated and thickened parts of the nasal septum and invented for the purpose a large number of knives, forceps, rongeurs, etc., of special pattern which have been extensively used in America since then. Killian¹¹ further elaborated the description of his method of operating in 1904, and Freer embodied much of this in

¹ Watson: Transactions American Laryngological Ass'n, 1896, p. 218.

² Burkhardt: Bericht über die chirurgische Abtheilung der Ludwigshospitals Charlottenhilfe während der Jahre, 1885-87.

³ Krieg: Medizinisches Correspondenzblatt des Württemberg: aerztl. Landesvereins, No. 26, 1886, LVI, p. 201.

⁴ Krieg: Berliner klinische Wochenschrift, No. 31, 1889, XXVI, p. 699.

⁵ Boenninghaus: Archiv für Laryngologie und Rhinologie, 1899, IX, p. 269.

⁶ Hajek: Archiv für Laryngologie und Rhinologie, 1903, XV, p. 45.

⁷ Menzel: Ibid., p. 48.

⁸ Zarniko: Archiv für Laryngologie und Rhinologie, 1904, XV, p. 248.

⁹ Killian: Verhandlungen der Gesellschaft deutscher Naturforscher und Aerzte, 1899, (1900), II Th., II Hälfte, p. 392. Müller: Archiv für Laryngologie und Rhinologie, 1904, XV, p. 312. Weil: Ibid., p. 578, also wrote on the subject.

¹⁰ Freer: Journal American Medical Ass'n, December 5, 1903, XLI, p. 1391.

¹¹ Killian: Archiv für Laryngologie und Rhinologie, 1904, XVI, 362.

a second paper¹ in America in 1905. It is chiefly to Killian, therefore, we are indebted if not for the conception at least for the thorough elaboration of the present accepted method of dealing with deviations and spurs of the nasal septum.

Nasal Snares.—Spencer Watson² described a method of removing polypi with a ring knife. Though Jarvis' snare had been in use in this country several years, Morel-Lavalle³ made use of an external incision in the removal of a simple polyp. Others, even in this country, were in the habit of using caustics and even the sponge method of Hippocrates, as revived by Voltolini, and the more brutal, if also more efficient, method of evulsion with forceps, galvano-caustic snare, etc.

We have already followed the history of the nasal snare down to the nineteenth century, and we have to note one more reproduction and modification of Hippocrates' loop before we reach the Jarvis Snare. It is that of William Robertson.⁴ He used harpsichord wire which, however, did not run through a cannula but through lateral guides at the side of a steel post.

Jarvis' chief improvement⁵ on the snare of Fallopius consisted in the method of drawing the wire through the cannula. He made use of an outer cannula at the distal end for the attachment of the wire and the adjustment of the milled nut to a screw thread on the inner cannula, by the use of which the loop could be powerfully, accurately, and slowly tightened. This immediately made the nasal snare the most efficient instrument for the removal of soft intranasal tissue, and the numerous subsequent modifications testify to the fact.

Cocaine.—All this activity and zeal for the removal of intranasal tissue would have been very much less had it not been for the epoch-making discovery by Carl Koller, in 1884,⁶ of the surgical possibilities of cocaine. The three greatest events in the history of modern laryngology and rhinology are the demonstration of the utility of the laryngoscope by Czermak and Türck, the observation of adenoids by Wilhelm Meyer, and the advent of cocaine. Its use in laryngology was introduced by Jelinek.⁷ The impunity, so far as pain is concerned, with which the mucous membranes of the nose and throat may be burned and lacerated has done perhaps more than anything else toward the development of the technique of laryngology. A merciful Creator having invented

¹ Freer: Transactions American Laryngological Ass'n, 1905, p. 29.

² Watson: Lancet, February 23, 1884, I, p. 335.

³ Morel-Lavalle: Progrès méd., April 26, 1884, XII, p. 333.

⁴ Robertson: Edinburgh Medical Journal, 1805, I, p. 410.

⁵ Trans. Am. Lar. Ass'n, 1880, p. 130. He apparently was unaware of previous, at least of Fallopius' invention.

⁶ Wiener med. Woch., 1884, No. 43, XXXIV, p. 1276, seq. N. Y. Med. Journal, January 3, 1885, XLI, p. 19.

⁷ Wiener med. Woch., 1884, No. 45, XXXIV, p. 1332.

pain for the protection of the tissues of the animal world, its abolition by the ingenuity of man has been necessarily followed by much ruthless and unjustifiable destruction of them, but nevertheless among drugs cocaine ranks only second to the general anæsthetics in the mercies vouchsafed to the human race.

Adrenalin.—In 1856 Vulpian¹ had noted that blood from the adrenals gave a specific reaction to ferric chloride and Arnold² tried to isolate the substance ten years later. Many others³ did considerable work in the chemistry of the substance, but it remained for Takamini⁴ and Aldrich,⁵ independently of one another, to isolate it in a chemically pure form in 1901. The impure extract of the suprarenal capsules had long been known to have an effect upon the blood-pressure, its property of increasing the arterial tension having been accepted since Vulpian's work. The work of Weiss and Harris,⁶ in 1904, showed that this is due to or at least associated with contraction of the peripheral arterioles. W. H. Bates⁷ is said to have been the first to use an aqueous extract of the suprarenal gland on the conjunctiva in 1896. Velich⁸ and Königstein⁹ published articles on the use of it in the nose and throat in Vienna in 1897, while the paper of Swain,¹⁰ in 1898, introduced it in America, though he seems to have at that time experimented with it, not as a hæmostatic but as a vasoconstrictor when locally applied. Publications in large numbers rapidly followed and the preparation of a pure extract by Takamini and Aldrich, in 1901, soon made it a practicable agent for use in keeping the field clear of blood in intranasal operations. As an adjuvant to cocaine its introduction did more than any other two things to advance and perfect intranasal surgery.

Thrombokinasé or Thrombine.—Batelli,¹¹ in 1910, devised the practical method of separating thrombokinasé, the ferment body of the tissues recognized by Morowitz as the active element in the causation of the coagulation of the blood. This method was practised by Strong,¹² in 1911, at the Manhattan Eye, Ear, Nose, and Throat Hospital in New York and the resultant product, a fine powder, dusted over bleeding surfaces promptly checked all parenchymatous oozing. Unlike adrenalin it has no reaction of vessel

¹ Vulpian: *Comptes rendus soc. biol.*, 1856, 2 sér., III, p. 223.

² Arnold: *Virchow's Archiv f. path. Anat.*, 1866, XXXV, p. 64.

³ For a fuller account of the chemical history of adrenalin see Hirsch: *Handbuch der Biochemie*, etc., (Oppenheimer), Jena, 1910, Band 3, h. 1, p. 314.

⁴ Takamini: *American Journal of Pharmacy*, 1901, LXXIII, p. 523.

⁵ Aldrich: *American Journal of Physiology*, 1901, V, 457.

⁶ Weiss and Harris: *Pflüger's Archiv f. d. ges. Physiol.*, 1904, CIII, p. 510.

⁷ W. H. Bates: *New York Medical Journal*, May 16, 1896, LXIII, p. 647.

⁸ Velich: *Wiener medizinische Blätter*, 1897, XX, p. 735.

⁹ Königstein: *Wiener medizinische Presse*, 1897, XXXVIII, p. 857.

¹⁰ Swain: *Transactions American Laryngological Association*, 1898, p. 165.

¹¹ Batelli: *Comptes rendus de la soc. de biologie*, 1910, LXVIII, p. 789.

¹² Strong: *New York Medical Journal*, March 23, 1912, XCV, p. 591.

relaxation, and it can be used on surfaces effectively which are already bleeding.

Inhalations and Detergents.—When we seek the origin of the local topical treatment of catarrh of the upper air passages by detergents we are immediately transported far back into the misty records of Hindu medicine, and the same may be said of inhalations. We need not trace these through the intervening ages, but, after the incidental references which have found their way into the foregoing pages, I am sure the reader will not regard the taunt of the Frenchman altogether without its sting: "Tout ce que les médecins modernes ont fait pour guérir le rhume de cerveau, ç'a été, de l'appeler Coryza." Had he been familiar with medical history, he would not have been ready to concede us even that meager praise.

The compressed-air spray seems, however, to have really been an invention of a comparatively recent date, but we are compelled to seek distant fields for the history of the actual inception of that idea. Galen is said to have prophesied we would some day succeed in isolating the pneuma in the atmosphere which is taken into the blood in respiration. We have noted the observations by Lower and Mayow in the seventeenth century. Priestley, in actually isolating oxygen from other substances, scarcely knew more of it, still terming it dephlogisticated air, than did his predecessors in the seventeenth century;¹ but the time was ripe for its elucidation, which quickly followed under the admirable and accurate experimentation of Lavoisier. He was the first to give it the name of Oxygen² in 1777. This very soon aroused great interest in the gas as a medicinal agent, and devices were adopted for its inhalation by Beddoes and Watt in 1796.³ Some years before this John Mudge,⁴ knowing nothing of the pulmonary residual air, nor of the ciliated epithelium, advised the inhalation of steam, combined with opium, with the idea that the medicament would thus reach the ultimate bronchioles. His apparatus was very much like the present croup kettle with a flexible tube. When Davy announced the existence of residual air in the lungs the significance of it was immediately appreciated by Magendie, who comprehended the impossibility of thus applying medication to the ultimate ramifications of the pulmonary tree.

The Compressed-air Spray.—The idea of the use of sprays in the air passages seems to have originated at one of the French baths. Some apparatus for spraying the body had been in existence for some years, when it occurred to Dr. Auphan, in 1849, to utilize it

¹ Priestley: *Experiments and Observations on Different Kinds of Air*, London, 1775.

² *Comptes Rendus de l'Académie des Sciences*, September 5, 1777.

³ *Considerations on the Medicinal Use and on the Production of Factitious Airs*, Bristol, 1796.

⁴ *A Radical and Expeditious Cure for a Recent Catarrhus Cough*, 4 ed., London, 1782.

for inhalation. Sales-Girons succeeded in inventing a portable apparatus for the purpose. It was a very awkward affair, somewhat on the principle of some of the present inhalation globes. A fine stream was broken into particles by being thrown with force against a concave surface. Mathieu, Bergson, and others improved this somewhat, and finally the latter conceived the idea of breaking the stream of water into a spray by a blast of air or steam blown across its exit from a narrow tube. This of course necessitated the employment of compressed air. This ingenious invention, under various names and modifications, was received with great enthusiasm by the budding specialty of laryngology. The mucous surfaces were deluged with all sorts of drugs suspended in watery and oily media. The futility of much of this sort of therapy has gradually become apparent, but since the introduction of antiseptics it has found its place in laryngological practice, its chief virtue consisting in impressing the patient with the resources and skill of his doctor. At first attempts were made to use warm sprays, but as early as 1861, Dumarquay¹ drew attention to the fact that watery sprays have approximately the same temperature after they are nebulized, whatever may have been the previous temperature of the fluid. I find the use of nebulized sprays first recommended in America by Solis Cohen in 1866.²

Improvements in Illumination.—Besides the great strides made in operative technique, a few advances have been made in the art of rhinoscopy and laryngoscopy themselves. Intensification of illumination was obtained in the early history of laryngoscopy by the use of the oxyhydrogen lime light, the idea beginning, as we have seen, with Voltolini, while in Fauvel's book³ the more perfect apparatus of Drummond was recommended for the purpose. French has used Aranzi's idea, a ray of light reinforced by a water lens, and found the best illumination in the rays of the sun thus intensified. His application of the arc light to the purpose is also very efficient, he having adopted both these expedients in his photographs of the larynx and nasopharynx.⁴ Türck⁵ and others had attempted to magnify the laryngoscopic image by means of lenses and concave mirrors, and Hirschberg,⁶ later, attempted the same thing. These attempts have proved of no practical value. By means of stroboscopy, Oertel,⁷ in 1878, showed the wave lines of different tones in the vibrations of the vocal cords.

¹ Bullétin de l'Académie Impériale de Médecine, 1861-62, XXVII, p. 26. A fuller account of the history of sprays may be found in Lewin's book, *Inhalations-Thérapie*, to which I am indebted for some of the above information.

² Medical Record, 1866-67, I, p. 147.

³ *Traité pratique des maladies du Larynx*, Paris, 1876.

⁴ Vid. Trans. Am. Lar. Ass'n, 1882, 1883, 1886, 1888, 1896.

⁵ Türck: *Zeitsch. der K. K. Gesell. der Aerzte zu Wien*, 1859, No. 52, p. 817.

⁶ Hirschberg: *Virchow's Archiv f. path. Anat.*, 1877, LXIX, p. 146.

⁷ Oertel: *Centralblatt f. die medicin. Wissenschaft*, 1878, XVI, p. 99.

THE ACCESSORY NASAL SINUSES.¹

The period of my activities in laryngology, covering as it does more than twenty-five years, includes in its experiences the rise of interest in and the eager cultivation of our modern knowledge of diseases of the accessory sinuses of the nose. It witnessed the absurd exaggerations of notions as to the frequency with which sinus disease requires surgical intervention, and the rash resort to devastating destruction of nasal structure in operative measures designed to afford relief to affections more or less trifling in themselves. It experienced the disasters, "the doctor's mistakes which the earth covers," the disappointments of too enthusiastic operators and too credulous patients. It saw reputations, world-wide in the narrow domain of our specialty made out of a manual dexterity perhaps, but also out of an intrepidity of spirit which often encroached too much upon the rights of humanity and too often disregarded the precepts of conscientious professional conduct. It saw on the other hand the unselfish pursuit of knowledge, the single-minded endeavor to spread its beneficent influence and make it a heritage of future medical men. A period of twenty-five years has seen this slow and modest toil rewarded by the fruition of a more rational way of looking on sinus disease as usually a minor evil with which the system is often able to cope unaided or assisted only by moderate and comparatively harmless intervention. It has seen effective relief rendered in those dangerous cases of suppurative and neoplastic disease which pursued their course unchecked to a fatal issue a generation ago.

There is doubtless still much to be learned, many improvements still to make, much enlightenment still to be gained in the study of sinus disease, but it is safe to say that the prefatory stage to the sober scientific investigation of it has passed by.

There can be no doubt that the material causes of the activities in this field of medical science had their foundations in that development of mechanical and technical art which produced the laryngoscope and the illumination of hidden recesses of the body by means of intensified gas light, electric incandescence, and the mysterious powers of the actinic rays produced by atomic disintegration. Still more far reaching in its effects was the intellectual expansion which resulted in the extension of anatomical study, both gross and microscopic, to the bony tissues and their softer linings in the nose and the adnexa.

It is unsafe to prophesy, but it seems very probable that further advance is to be made in the future along physiological lines which must include investigations in the microbiology and the metabolism of the nasal mucosa and its ramifications in the sinuses, and to this

¹ Reprinted without alteration from *The Laryngoscope*, February, 1913.

there must be allied the consideration of the relationship which this special microbiology and special metabolism bears to like phenomena in the general system.

We have seen how completely and exhaustively the subject of the surgical treatment of the Antrum of Highmore has been dealt with in literature, largely before the nineteenth century.

Beginnings of Interest in Sinus Disease.—After the beginning of the development of Modern Rhinology in the early eighties, interest was gradually aroused in the subject of accessory sinus disease. In the discussion at the meeting of the German Naturalists in 1886, the idea, traces of which we have seen in earlier literature, again arose as to the connection between sinus disease and ozænatous atrophic rhinitis. The etiology of maxillary sinus disease in the vast majority of the cases was at this time ascribed to carious teeth. Among those who accepted this view were Killian,¹ Schmiegelow,² and MacBride.³

Mikulicz⁴ brought into vogue his operation of perforating the maxillary sinus with a trocar and cannula from the nasal chambers, but the perforation through the alveolus still remained the more common procedure as long as the teeth were accepted as the chief factors in the etiology of suppuration.

Interest was soon aroused in America, and Dr. J. H. Bryan in 1889 read a paper before the American Medical Association on the subject. Considerable had been said as to the difficulty in diagnosing the presence of pus in the maxillary sinus, and the trocar of Krause was devised for exploratory puncture, irrigation, and the insufflation of iodoform and other powders.⁵

Transillumination.—Another method of diagnosis attracted much more attention. Dr. Theodor Heryng,⁶ in 1889, urged the idea of Voltolini, the electric transillumination of the antrum. MacBride and Vohsen both read papers on this subject at the International Congress in 1889. Even as early as this, in the discussion of Vohsen's paper, Freudenthal and Heymann pointed out that transillumination is not by any means a reliable method by itself for diagnosis of sinus disease, and in spite of the considerable vogue the procedure has had in rhinology, this remains, twenty-five years later, the prevailing sentiment.

Latent Suppuration.—Lichtwitz⁷ and Jeanty⁸ described cases of latent suppuration of the Antrum of Highmore, pointing out that

¹ Killian: *Monatsschrift f. Ohrenheilkunde*, etc., 1887, 10, 11, XXI, pp. 276, 321.

² Schmiegelow: *Hospitals Tidende*, 1888, 3 R., VI, pp. 49, 83, 133, 198.

³ MacBride: *Edin. Med. Jour.*, April, 1888, XXXIII, p. 887.

⁴ Mikulicz; *Archiv f. klin. Chirurg.*, 3 Heft., 1887, XXXIV, p. 626.

⁵ Moritz Schmidt: *Berliner klinische Wochenschrift*, 1888, No. 50, XXV, p. 1012. Friedländer: *Berliner klinische Wochenschrift*, 1889, No. 37, XXVI, p. 815.

⁶ Heryng: *Berliner klinische Wochenschrift*, 1889, No. 35, XXVI, p. 774.

⁷ Lichtwitz: *Präger medizinische Wochenschrift*, 1892, 15, 16, XVII, p. 155, 167.

⁸ Jeanty: *De l'empyème latente*, etc., Bordeaux, 1891.

it was frequently bilateral. Writers became more cautious and critical as to the results of the treatment then in vogue, chiefly drainage through an alveolar perforation. Many cases of antrum disease alone failed to respond to this treatment, while the fact that the upper row of sinuses was furnishing the pus and the antrum was but a reservoir, for it was still unknown or unappreciated.

Necrosing Ethmoiditis.—As to the ethmoid cells, in 1887 Woakes¹ drew attention to a cleavage of the middle turbinate bone which he declared to be due to necrosing ethmoiditis. Although it has subsequently been shown that this apparent cleavage of the bone is often really a presentation of a polyp from beneath it, having its attachment to the hiatus simulinaris or its neighborhood, this work of Woakes created great interest in the pathological states of the ethmoidal labyrinth and led to the liveliest discussions for several years. Bosworth,² in 1891, wrote on the various forms of disease of the ethmoid cells. Grünwald,³ in 1893, published his well-known brochure on nasal suppurations, special attention being drawn to the affections of the ethmoid and sphenoid cavities. Although there were a number of other articles on disease of the cavities at this time, these three contributions to the subject in England, America, and Germany formed perhaps the greatest stimulus to the flood of literature of the subject which followed. Grünwald's radical views as to occurrence, complications, and treatment, Woakes' exaggerated views as to the connection of ethmoiditis and nasal polypi, and the still more exaggerated views of Bosworth as to ethmoiditis and the etiology of asthma and hay fever furnished themes for animated attack and defence.

Frontal Sinus.—Schaeffer,⁴ in 1890, had proposed to drain the frontal sinus by enlarging its communication through the infundibulum with the middle meatus. In 1891 Baumgarten,⁵ Montaz,⁶ Silcock,⁷ Grünwald,⁸ and others wrote papers on frontal sinus disease, most of them counseling the trephining of the sinus externally. Among the ophthalmologists, disease of the frontal sinuses and ethmoidal cells had for a long time been known as the origin of orbital abscess⁹ and many operations were performed by them in which these cavities were reached from an incision at the inner and upper angle of the orbit. Brain abscess having its origin in

¹ Woakes: *Nasal Polypus*, Phil., 1887.

² Bosworth: *New York Medical Journal*, November 7, 1891, LIV, p. 505.

³ Grünwald: *Die Lehre von den Naseneiterungen*, etc., München, 1893.

⁴ Schaeffer: *Deutsche medizinische Wochenschrift*, 1890, No. 41, XVI, p. 905.

⁵ Baumgarten: *Pester medizinische Chirurgische Presse*, 1891, 10, XXVII, p. 226.

⁶ Montaz: *Des Sinus frontaux et de leur trépanation*, 1891.

⁷ Silcock: *British Medical Journal*, April 25, 1891, I, p. 912.

⁸ Grünwald: *Münchener medizinische Wochenschrift*, 1891, Nos. 40, 41, XXXVIII, p. 699, 721.

⁹ Guillemin: *Étude sur les abcès des Sinus frontaux*, 1892.

suppuration of the frontal sinuses was noted in 1892.¹ Lichtwitz,² in 1893, again urged the practicability of reaching the frontal sinus through the nose by means of probe and cannula. For years this idea was discredited as dangerous and even impossible in the majority of cases by many writers.

Woakes had claimed ethmoiditis as the chief factor in the etiology of nasal polypi, and Grünwald had traced that of ozæna to affections of the accessory sinuses, an idea which is still more or less prevalent among a minority of rhinologists. Among others Chiari³ soon opposed these views, referring to 128 cases of atrophic rhinitis with ozæna without sinus disease and 61 cases of nasal polypi without caries of the ethmoid cells. These matters, as many others which engaged the attention of clinical observers in rhinology, could not be intelligently discussed without a more accurate knowledge of the anatomical relations and postmortem conditions of the accessory sinuses.

Postmortem Examinations.—In 1877 Schalle⁴ had described a method of examining these cavities in the cadaver without disfiguration. This had been the great drawback to a thorough understanding of anatomical and pathological points of interest and importance, and consequently a decided hindrance to clinical activity. Since 1882 the invaluable work of Zuckerkandl,⁵ subsequently much enlarged, had been almost the sole guide of surgical procedure as it was subsequently the inspiration of much work in the anatomy and pathology of these regions. In 1891 Harke,⁶ referring to the work of Schalle, introduced an improvement in the postmortem technique of the examination of the nasal chambers and the sinuses. Subsequently, in 1895–6, Harke,⁷ Dmochowski,⁸ and E. Fraenkel⁹ did a great deal to extend our knowledge of the anatomy, pathology, and bacteriology of the nasal accessory cavities.

The discovery made postmortem that such a large proportion of cases show evidence of latent disease of or purulent collections in the Antrum of Highmore did much not only to establish this point, but did much also to show that patients may carry around with them for years foci of pus in the cavities of the nose without inconvenience or danger. The prevalence of epidemics of influenza throughout the civilized world during the period of growing interest

¹ Bericht des Allgemeinen Krankenhauses in Wien für 1890. Wiener Medizinische Blätter, No. 13, 1892, XV, p. 200.

² Lichtwitz: Annales des maladies de l'oreille du nez, etc., 1893, XIX, p. 132.

³ Chiari: Wiener klinische Wochenschrift, No. 14, 1894, VII, p. 420.

⁴ Schalle: Virchow's Archiv f. path. Anat., 1877, LXXI, p. 206.

⁵ Zuckerkandl: Normale und pathologische Anatomie der Nasenhöhle und ihrer pneumatischen Anhängen, 1882, 1892, 1893.

⁶ Harke: Virchow's Archiv f. path. Anat., 1891, CXXV, p. 410.

⁷ Harke: Beiträge zur Pathologie und Therapie der oberen Atmungswege, etc., Wiesbaden, 1895.

⁸ Dmochowski: Archiv für Laryngologie und Rhinologie, etc., 1895, III, Heft 3, p. 255.

⁹ E. Fraenkel: Virchow's Archiv, 1896, Band 143, p. 42.

in these conditions stimulated the study of them, as it gave rise to the opportunity for it. It was early recognized that this affection was the cause of the occurrence of many acute attacks and that these became the starting-points of much subsequent chronic disease. While these opportunities for clinical study doubtless bore an important part in the causes which underlay the study of sinus disease it could not have been carried to the fruition of the present-day status of our knowledge but for the continuation of the pursuit of the fundamental embryological, anatomical, and pathological facts brought out in the works of Sieur and Jacobs, Killian, Onodi, and others.

Bacteriology.—Von Besser,¹ in 1889, had shown the presence of pyogenic organisms in the normal maxillary antrum. Dmochowski, in 1895, showed that in nearly 20 per cent. of postmortem examinations of cases dead of various diseases there was a pathological state of the mucosa of the maxillary antrum. Like results were also obtained by Eugen Fraenkel in postmortem examinations of a large number of cases about the same time. For many years these were the only investigations of importance which were published on the flora of the accessory sinuses. In 1910 Turner and Lewis² published important papers on their bacteriology in which they showed the dominant organisms were not constant, but that pneumococci, streptococci, staphylococci, *bacteriæ coli*, diphtheriæ, influenzæ were all found in various cases. They emphasized a point, which had been occasionally mentioned by others, that when the purulent matter contained a large number of lymphocytes, and when the prevailing organism is a streptococcus, the chronic cases are apt to be rebellious to treatment and simple douching does not suffice. When these conditions do not prevail simple douching was often sufficient. They placed the figure of proportionate frequency of the dental factor in maxillary sinus suppuration at one-third of the cases. Sobernheim,³ in 1910, also made observations on the bacterial flora in chronic empyema of the maxillary sinus in which he came to somewhat analogous conclusions as did Turner, but found in some cases that the pus was sterile—in seven out of the twenty-five cases examined. This certainly is a surprisingly large number of negative results, and conclusions from it must be accepted with caution.

Histology.—Weichselbaum and Zuckerkandl, especially Zuckerkandl, in his later editions (1893), had made a special study of the minute anatomy of the mucosa of the accessory sinuses. Wingrave⁴ showed sections of granulation tissue from the frontal sinus in

¹ Von Besser: *Beiträge zur pathologischen Anatomie*, 1889, VI, p. 333.

² Turner and Lewis: *Edinburgh Medical Journal*, April, 1910, n. s., IV, p. 293. Lewis: *Journal of Pathology and Bacteriology*, July, 1911, XVI, p. 29.

³ Sobernheim: *Archiv für Laryngologie und Rhinologie*, etc., 1910, Heft 2, XXIII, p. 159.

⁴ Wingrave: *British Med. Jour.*, 1898, I, p. 1268.

1898. André¹ had, in 1905, written a thesis on the lymphatics of the nose, including reference to those of the accessory cavities, Grünwald,² in 1910, referring to André's work, supplemented it, and his observations go to contradict the conclusion that the lymphatic vessels of the sinuses communicate through the bony walls with those of the nasal chamber. On the contrary they seem only to follow the mucous membrane itself. It may be remarked that familiarity with the histology of the mucosa and an appreciation of the limitations of the injection technique, on which this opinion is based, may well lead us to doubt that in life infection is only thus carried by the lymph channels. There are many of them so very minute that they may well give passage of bacteria and not to injected material. However, the channels of infection along which the germs spread to new localities are still moot points in every region of the body. It seems very probable that even the nearby spread of infection takes place in the blood current rather than by the lymph spaces. The work of Oppikofer³ deserves notice for its extended investigation of the normal and pathological anatomical conditions of the sinuses, especially of their histological anatomy. It signalizes one of the forward steps taken in the more thorough attempts to study the actual processes of disease as revealed by the microscope, but it also deals with facts in the gross anatomy of the parts. Eschweiler⁴ contributed to the histology of the mucous membrane of the frontal sinuses, and Oppikofer⁵ subsequently extended his work. Goetjes,⁶ in 1909, devoted an essay solely to the pathological anatomy and histology of the sphenoidal sinus, having examined it in 31 cases postmortem. Like previous observers, he concluded that pathological changes observed postmortem were, as a rule, acute conditions arising during the later stages of the affections of which the patients died. They often contained stomach contents. He did not agree with the statement of some of the previous observers, who claimed that in the majority of the cases there had been an antecedent rhinitis, and there is some reason to believe that this is at least less frequently the case than in inflammatory affections of the other sinuses.

Cysts.—Turner,⁷ in 1903, made a valuable contribution to the pathology of bone cysts in the accessory sinuses of the nose, especially with regard to those of the maxillary sinus developed

¹ André: Contribution a l'étude des lymphatiques du nez et des fosses nasales, Thèse de Paris, 1905.

² Grünwald: Archiv für Laryngologie und Rhinologie, etc., 1910, Heft 1, XXIII, p. 1.

³ Oppikofer: Archiv für Laryngologie und Rhinologie, etc., 1906, XIX, p. 28.

⁴ Eschweiler: Archiv für Laryngologie und Rhinologie, 1905, XVII, p. 437.

⁵ Oppikofer: Archiv für Laryngologie und Rhinologie, 1909, XXI, h. 3, p. 422.

⁶ Goetjes: Archiv für Laryngologie und Rhinologie, 1909, XXII, p. 129.

⁷ Turner: Edinburgh Medical Journal, 1903, n. s., XIV, pp. 299, 405, 511. The Laryngoscope, November, 1904, XIV, p. 817.

from the dental embryogenetic foci. As to the cysts of the ethmoid Onodi¹ was warranted in saying that they are anomalies in the development of the ethmoidal labyrinth. They are of a different character and origin from the cysts of the maxillary sinus. In the ethmoid it was found that the exaggerated development or pathological processes sometimes led to a cyst cavity formed out of the bulla or other small cell at the anterior end of the middle turbinate. This was occasionally found to contain pus or a glairy mucus. The cause of the cysts occasioned some discussion. Their occurrence chiefly in women is a curious phenomenon of sex pathology. Zuckerkandl, Glasmacher,² MacBride,³ Knight,⁴ and others noted their occurrence, and various theories were advanced as to their pathogenesis, but it was not until the publication of Stieda,⁵ in 1895, that it was recognized that they are the products of inflammatory action set up in the walls of preëxisting mucosa lined cavities in the turbinated bones, whereby the osteoblasts, forming bone on the outer or convex surface and osteoclasts, absorbing it on the concave or inner surface, we have as a result in some cases the formation of a very large cavity.⁶ A very exceptional report was made by Noltenius,⁷ in 1895, of 37 cases of "serous disease" of the maxillary sinus in which on exploratory puncture clear fluid was washed from the antrum. The large number of cases reported by one observer attracted attention and is still unique, though a less number of cases have from time to time been reported, usually supposed to be due to cyst formation in the antrum. Cysts of the mucous membrane of the maxillary antrum were exhaustively described by Alexander,⁸ and the differential diagnosis of this condition from antrum empyema was the subject of a paper by Kunert⁹ in 1897. Gerber¹⁰ and Shambaugh,¹¹ in 1906, wrote of nasal cysts in the nose and maxillary sinus, their relation to the "hydrops" of the latter, and their embryogenetic origin from the teeth roots. Hoffmann,¹² in 1911, extended his previous observations (1902) on cysts of the maxillary sinus in which he described his histological findings in cases of dental origin. Oppikofer¹³ also contributed an exhaustive article in 1911 to the literature

¹ Onodi: *Archiv für Laryngologie und Rhinologie*, 1904, XV, p. 306.

² Glasmacher: *Berliner klinische Wochenschrift*, 1884, XXI, p. 571.

³ MacBride: *British Medical Journal*, 1888, II, p. 1116.

⁴ Knight: *Transactions American Laryngological Ass'n*, 1891, p. 57.

⁵ Stieda: *Archiv für Laryngologie*, 1895, III, p. 359.

⁶ Wright: *New York Medical Journal*, June 27, 1896, lxiii, p. 827. *American Journal of the Medical Sciences*, May, 1907, Vol. 133, p. 760.

⁷ Noltenius: *Monatsschrift für Ohrenheilkunde*, No. 4, 1895, XXIX, p. 114.

⁸ Alexander: *Berliner klin. Wochenschrift*, 1897, XXXIII, p. 103.

⁹ Kunert: *Archiv für Laryngologie und Rhinologie*, 1897, VII, p. 34.

¹⁰ Gerber: *Archiv für Laryngologie und Rhinologie*, 1904, XVI, p. 502.

¹¹ Shambaugh: *The Laryngoscope*, July, 1906, XVI, p. 527.

¹² Hoffmann: *Zeitschrift für Laryngologie und Rhinologie*, 1911, III, p. 467.

¹³ Oppikofer: *Verhandlung des Vereins deutscher Laryngologen*, 1911, p. 613. *Archiv für Laryngologie und Rhinologie*, 1911, XXV, Heft 1, p. 45.

of dental cysts describing fully a number of cases and the histological findings, while many points in their pathogenesis are yet unexplained. He seemed to think it clear that they have their origin in inflammation of the roots of the teeth and their envelopes—caries and granulation tissue representing the initial stage of their formation. There is probably a proliferation of the epithelium thus aroused with a subsequent degeneration of the epithelium furnishing the fluid contents of the cyst, though this is one of the points far from settled.

Teeth in the Nose.—Intimately connected with the subject of dental cysts of the maxillary sinus are those anomalies of development of the teeth in the upper jaw which lead not only to cysts of their roots but to displacement and inversion of their crowns and the wandering of the teeth through the bony walls of the superior maxillæ. Naturally many of these become inhabitants of the maxillary sinus and instances of this had been noted even in prelaryngoscopic days by the poet Goethe and early in the study of sinus disease we find many reports in literature.¹ A number of cases of teeth in the nose and nasal sinuses have been reported in the last two or three years.² Underwood³ contributed an article in 1910 to the anatomy and pathology of the maxillary sinus in which he dealt with its embryogenetic origin in connection with the teeth, comparing conditions in various races of men.

Mucocele.—Mucocele of the accessory sinuses, a rare condition which had been noted by Kuhnt, was described by Avellis,⁴ in 1900, by Baurowicz,⁵ in 1901, by Bowlby,⁶ in 1902, by Guisez,⁷ in 1903, and by Onodi⁸ and Moure,⁹ in 1905. Since then there have been a very large number of reports recorded.

Malignant Tumors.—Reports of malignant tumors located in the accessory sinuses may be found scattered through general literature from almost the very beginning of medical records, and I shall have to content myself with brief reference to those reports for five years following the paper of Schwenn,¹⁰ inasmuch as in laryngological literature this is the first extended reference especially

¹ Wright: *The Medical Record*, October 12, 1889, XXXVI, p. 396. Wright: *The Medical Record*, May 19, 1894, XLV, p. 641. Knapp: *Archives of Otolaryngology*, 1894, XXIII, p. 71. Ducloux: *N. Y. Medical Journal*, December 1, 1900, LXXII, p. 928. Liaras: *Ref.*, *N. Y. Medical Journal*, November 17, 1900, LXXII, p. 868.

² See Semon's *Internat. Centralblatt für Laryngologie und Rhinologie*, 1911, XXVII, p. 399.

³ Underwood: *Journal of Anatomy and Physiology*, July, 1910, XLIV, p. 354.

⁴ Avellis: *Archiv für Laryngologie und Rhinologie*, 1900, Band X, p. 1.

⁵ Baurowicz: *Archiv für Laryngologie und Rhinologie*, 1901, XII, p. 303.

⁶ Bowlby: *British Medical Journal*, May 3, 1902, I, p. 1084.

⁷ Guisez: *Annales d. Mal. de l'Oreille*, 1904, XXX, Pt. I, p. 152.

⁸ Onodi: *Archiv für Laryngologie und Rhinologie*, 1905, XVII, p. 415.

⁹ Moure: *Révue hebdomadaire de Laryngologie, Rhinologie, etc.*, No. 1, 1905, XXV, Pt. I, p. 4.

¹⁰ Schwenn: *Archiv für Laryngologie und Rhinologie*, 1900, XI, p. 351.

confined to malignant tumors of these cavities. In 1900 he reported ten cases of malignant tumors in the accessory sinuses, two in the maxillary, seven in the ethmoid, one in the sphenoid. Kirschner, Brindel, Citelli, Onodi, Avellis, Harmer, and Calamida¹ were the chief reporters of cases of malignant sinus disease from 1900 to 1906, but since then many more cases may be found on record.

Choanal Polypi.—Observations were made by several writers² who called attention to the fact that many of the nasal polypi, especially those presenting posteriorly in the choanæ, had their origin from and were attached to the upper part of the maxillary sinus and in the hiatus semilunaris and not in the nasal chambers proper. Kubo proposed to operate on these by first exposing their base of attachment by the external operation (canine fossa) on the maxillary sinus. Subsequent discussion has shown that by no means all polypi are thus attached. It seems probable that this origin when existing is found only in cases of the soft œdematous polypi, not of the hard growths of adolescence.³

Sinus Tuberculosis.—Weichselbaum,⁴ in an article on nasal tuberculosis in 1881, referred to it as occurring in the accessory sinuses. Three or four cases of tuberculosis of the ethmoidal labyrinth have been reported⁵ since then.

Rhinitis Caseosa.—Cozzolino at the International Congress for Otology and Laryngology in 1889 had spoken of rhinitis caseosa or cholesteatomatosa as a disease in itself. Subsequently it became evident that it was a peculiar caseation of the retained nasal discharges excited, often by the presence of a foreign body, but also in cases of retention of pus in the sinuses extending over long periods of time.⁶

Sinus Ozæna.—Robertson,⁷ in England, in 1893, advocated the ideas both of Woakes as to the origin of nasal polypus and of Grünwald as to the origin of ozæna. Alexander,⁸ in 1909, seems

¹ Kirschner: *Archiv für Laryngologie und Rhinologie*, 1904, XV, p. 1. Brindel: *Gazette hebdomadaire des sciences médicales de Bordeaux*, No. 12, 1904, XXV, p. 139. Citelli: *Archiv für Laryngologie und Rhinologie*, 1904, XV, p. 252. Barth and Onodi: *Archiv für Laryngologie und Rhinologie*, 1903, XV, p. 167. Avellis: *Verhandlungen d. Vereins Süddeutscher Laryngologen*, June 12, 1905, p. 49. Harmer: *Internat. Centralblatt für Laryngologie*, 1905, XXI, p. 539. Calamida: *Archives internationales de laryngologie, etc.*, March, April, 1905, XIX, p. 385.

² Lermoyez: *Ann. d. mal. de l'oreille*, 1909, XXXV, Pt. I, p. 601. Kubo: *Archiv für Laryngologie*, 1908, XXI, p. 82.

³ Jacques: *Archiv für Laryngologie*, 1911, XXV, p. 318.

⁴ Weichselbaum: *Allgemeine Wiener medizinische Zeitung*, No. 27-28, 1881, XXVI, pp. 268, 277.

⁵ Finder: *Charité Annalen*, 1911, XXXV, p. 565.

⁶ Hartmann: *Deutsche medizinische Wochenschrift*, No. 10, 1889, XV, p. 190. Strazza: *Bolletino delle malattie dell'orechio, della gola, etc.*, No. 9, 1893, XI, p. 199. Bryan: *N. Y. Medical Journal*, January 28, 1893, LVII, p. 97. Klingel: *Archiv für Laryngologie und Rhinologie*, 1895, III, p. 199.

⁷ Robertson: *The Lancet*, April 29, 1893, I, p. 983.

⁸ Alexander: *Archiv für Laryngologie und Rhinologie*, 1909, XXII, p. 260.

to voice the present-day opinion that the only foundation for the contention of Grünwald that ozæna is a disease of the accessory sinuses lies in the fact that atrophic rhinitis and ozæna are primarily a bone disease and the accessory sinuses are involved in the changes of the mucosa producing ozæna just insofar as their bony walls are involved in the general pathological process of the frame-work of the nasal chambers. I omit mention here of the very large number of papers and discussions which have occurred since the publication of the papers of Grünwald, in which his views are upheld, because they rest largely on clinical observations, uncontrolled by postmortem examination and unenlightened by a knowledge of histological findings.

Embryogeny of the Sinuses.—The exhaustive investigations of Killian had shown the embryogenetic explanation for many anomalies in the anatomy of the frontal sinuses and these came to light in the practical observations of those practising the various forms of frontal sinus operations.¹ Anomalies in the configuration of the frontal sinuses had been early noted. The absence of one or the other, the presence of septa partial or complete dividing them into compartments or pockets, often much embarrassed the operators. These anomalies occasionally led to perforations through the bone and to the wounding of the dura or even of the brain substance. Compartments were left unopened or incompletely drained and other complications were met with. Many of these difficulties were avoided after the introduction of the use of the x-ray in diagnosis. It is to the embryogenetic and the gross anatomical studies of Sieur and Jacob, Killian, Onodi, and others that we must return in order to take up the thread of original observation which led to the great advance in the therapy and operative technique of sinus disease. In 1895 Killian² published his first articles on the anatomy of the nose of the human embryo and in these articles he extended and made more exact and definite the work of Zuckerkandl and laid the foundation for his later development of the surgery of the accessory sinuses. In England Tilley³ published some work on the surgical anatomy of the frontal and ethmoid sinuses in which attention was drawn to their variability. In America Bryan,⁴ in 1895, and Myles,⁵ in 1896, published valuable papers in which the anatomy and surgery of the accessory sinuses were discussed. Subsequently in America Coakley was an earnest

¹ Hartmann: *Verhandlungen der Gesellschaft deutscher Naturforscher und Aerzte*, 1898, 2 th., 2 hälfte, p. 287. Stewart: *Lancet*, December 10, 1898, II, p. 1547.

² Killian: *Archiv für Laryngologie*, 1895, II, p. 234, 1895, III, p. 17; 1896, IV, p. 1.

³ Tilley: *Lancet*, September, 1896, II, p. 866.

⁴ Bryan: *Transactions American Laryngological Ass'n*, 1895, p. 76.

⁵ Myles: *Medical News*, March 28, 1896, LXVIII, p. 339; *Medical News*, August 7, 1897, LXXI, p. 161.

and enthusiastic operator on the accessory sinuses and communicated many papers to the literature of the subject. Lathrop,¹ in 1898, published a brochure on the subject of the anatomy of the frontal and ethmoid cells, which remains, with Loeb's publications, America's most important contribution to the subject. Sieur² and Jacob published in 1901 an extensive and valuable work on the embryogeny of the accessory sinuses and upon the anatomical relations, which was the foundation for much subsequent work in France and America.

Anatomy of the Sinuses.—At the meeting of the Society of Hungarian Ear and Throat Specialists in 1900 Onodi³ demonstrated his anatomical preparations of the accessory sinuses which formed the basis of his later work which has done so much to clear up many obscure points and throw light for the first time on some hitherto unknown or rather unheeded relationships of importance. His work⁴ on the relationship of the posterior ethmoidal cells and of the sphenoidal cavity to the optic nerves is especially noteworthy. The embryological studies of Killian were later supplemented by a profusely illustrated treatise⁵ on the anatomy of the sinuses which with Onodi's work have formed the sources from which most of the subsequent papers have drawn their embryological and anatomical information. In 1903 Brühl,⁶ Hansen and Pluder,⁷ and Onodi⁸ made observations on the irregularities in the anatomy of the frontal sinuses. Mosher and Ingersoll⁹ in America extended the work of Sieur and Jacob. Some attempts¹⁰ had been made to establish a reliable measurement by which one could know with the probe that the anterior or posterior wall of the sphenoid sinus was reached in intranasal operations, but it was not until the paper of Onodi,¹¹ in 1904, that the importance of the knowledge of the size, relative distances from a fixed point, etc., were fully appreciated in the surgery of the accessory sinuses. Nothing has surpassed the plates and diagrams of sections of the nose and its adnexa

¹ Lathrop: Frontal Sinus and Ethmoid Cells; Warren Triennial Prize, 1898, with addition of Part II on the Clinical and Surgical Aspects of Sinus Disease.

² Sieur: *Revue hebdomadaire de laryngologie*, No. 38, 1901, XXI, Pt. 2, p. 337; also Thierry and martel: *Annales des maladies de l'oreille*, etc., April, 1905, XXXI, Pt. 1, p. 380.

³ Onodi: *Archiv für Laryngologie und Rhinologie*, 1900, XI, 391.

⁴ Onodi: *Archiv für Laryngologie und Rhinologie*, 1904, XV, Heft 2, p. 259; 1905, XVII, p. 260.

⁵ Killian: *Die Nebenhöhle der Nase und ihre Lagebeziehungen zu den Nachbarorganen*, Jena, 1903.

⁶ Brühl: *Zeitschrift für Ohrenheilkunde*, 1902, XL, p. 343.

⁷ Hansen and Pluder: *Archiv für Laryngologie und Rhinologie*, 1903, XIV, p. 404.

⁸ Onodi: *Archiv für Laryngologie und Rhinologie*, 1904, XV, p. 363.

⁹ Mosher and Ingersoll: *Transactions American Laryngological Ass'n*, 1904, pp. 319, 270.

¹⁰ Wright: *Twentieth Century Practice of Medicine*, 1896, vol. vi, p. 79. Hajek: *Pathologie und Therapie der Nebenhöhlen der Nase*, Leipzig, 1899.

¹¹ Onodi: *Archiv für Laryngologie und Rhinologie*, 1904, xvi, p. 454.

which he furnished in this and other papers. Especially valuable is his work on the relations of the optic nerves to the walls of the posterior ethmoidal and sphenoidal sinuses (l. c.). It may be said that these contributions of Onodi with the earlier ones of Sieur and Jacob and those of Killian form by far the most valuable additions to the still earlier work of Zuckerkandl which exist in medical literature. For five years there was not much more original work attempted of this kind. Grünwald¹ contributed a valuable article in 1910 to the literature of the anatomy of the sinuses from their embryogenetic standpoint as derivatives of the hiatus semilunaris, illustrated by clinical phenomena as observed in practice, pointing out that the proximity of these cavities in the embryo to the lateral nasal furrow serves as an explanation of inflammatory and teratological processes in the maxillary sinus and in the regions lying between the eye and nose. The same subject was treated by Schaeffer² at this time. Onodi,³ in 1911, published a brochure with his usual excellence of illustration and of detail on the nasal sinuses of children. A number of cases of empyema of the sinuses in children had been observed. Canestro⁴ reported, in 1911, empyema of the maxillary sinus in a child twenty-six days old and collected other reports in literature and made some anatomical studies of the accessory sinuses in infants which made it evident that, though rarely, the sinuses may be the seat of disease before they are fully developed. Loeb at the International Laryngological Congress (1911) and elsewhere, detailed his investigations of the cubic capacity and square surface of the accessory sinuses.

These were the beginnings and the course of that anatomical and pathological inquiry, incompletely detailed here, it is true, which has been devoted to the study of sinus disease, acting at first as a stimulus and more recently as a guide to surgical procedure. Certain advances in the methods of diagnosis must now be alluded to, though it is quite impossible to find space to set forth fully the evolution of that diagnostic acumen which has become the possession of all competent rhinologists. Clinical experience has played the most important part, yet it is only possible here to refer to the chief aids in the clinical study of sinus disease which have made diagnosis more accurate.

Röntgenology in Sinus Disease.—I have already referred as fully as space allows to the early history of transillumination. In natural sequence we come to speak of röntgenology in the service of the study of sinus disease. On September 24, 1896, Max Scheier⁵ made an address before the Society of German

¹ Grünwald: *Archiv für Laryngologie und Rhinologie*, 1910, xxiii, p. 183.

² Schaeffer: *Annals of Otology, Rhinology and Laryngology*, December, 1910, xix, p. 815.

³ Onodi: *Die Nebenhöhle der Nase beim Kinde*, 1911.

⁴ Canestro: *Archiv für Laryngologie*, 1911, XXV, Heft 3, p. 492.

⁵ Scheier: *Archiv für Laryngologie und Rhinologie*, 1897, VI, p. 57.

Scientists and Physicians at Frankfort on the value of the Röntgen rays in the diagnosis of affections of the nose and throat. The outlines of the accessory sinuses can hardly be seen in his plates but sufficient was demonstrated to act as an incentive for future endeavor. It has resulted, for the diagnosis of accessory sinus disease, in the development of one of the most valuable aids we have in ascertaining the limits of purulent involvement of the sinuses. In connection with other adjuvants, in spite of much disappointment inevitable on the advent of a new device in medicine due to exaggerated claims, it seems to have established itself as a much more valuable procedure than transillumination which also had its day of exaggerated enthusiasm and is still after judicious criticism indispensable to the armamentarium of the rhinologist. It was, however, a number of years before this aid in the diagnosis reached a stage of practical value. The complicated labyrinth of cavities and their bony walls which go to make up the anatomy of the nasal chambers and their adnexa presented a problem of very great difficulty to the röntgenologist. Many efforts, most of them too technical for detail here, were made to overcome these obstacles. In 1903 Weil proposed the introduction into the maxillary sinus of substances forming a shadow with the x -rays in order to demonstrate its anatomical configuration and pathological state. This proved of little assistance and the difficulty of introduction and withdrawal of such powders has made it impracticable and unwise. Some cases were subsequently reported where such material acted as an irritating foreign substance in the cavities. The chief improvements in skiagraphy have been the technical ones of a more efficient apparatus both electric and photographic. Coakley¹ in America recognized the value of skiagraphy in the diagnosis and differentiation of separate sinus affections and was active in developing its application to sinus diagnosis. Herzfeld² in criticism of the work of Kuttner,³ an atlas published in 1908 with 20 plates, brought out a discussion in the Berlin Laryngological Society (December 11, 1908) whereby it was apparent that by this time the consensus of opinion was that röntgenology had furnished a valuable aid in the diagnosis of sinus disease, but the shortcomings and unreliability of it as an exclusive indication for operation, or even as an indication of the existence of disease, were still very great. In this and subsequent meetings Peyser, Killian, Albrecht, and others

¹ Coakley: *Annals of Otology, Rhinology and Laryngology*, March, 1905, XIV, p. 16; *Transactions American Laryngological Ass'n*, 1905, p. 222.

² Herzfeld: *Beiträge zur Anatomie, Physiologie, Pathologie und Therapie des Ohres, der Nase und des Halses*, 1909, II, p. 346.

³ Kuttner: *Die entzündlichen Nebenhöhlenerkrankungen der Nase im Roentgenbild*, Berlin, 1908. See also Spiess: *Die Roentgenuntersuchung der oberen Luftwege. Atlas und Grundriss der Roentgendiagnostik in der inneren Medicin*, herausg. v. Franz M. Groedel. (Lehmann's medizinische Atlanten, München, 1909, Band 7, p. 15.

expressed themselves to this effect. Although Albrecht's¹ reproductions mark a distinct advance over former work in Germany, his plates have been surpassed by other workers in America. Caldwell² had, in 1908, far surpassed all competitors, but the recent exhibition of stereoscopic plates, giving the perspective of relationship of the sinuses to one another, seems to have brought the art to its acme of development.³ Haike⁴ published a paper in 1910 upon the skiagraphic examination of the accessory sinuses of children whereby some light was gained in the knowledge of their development and in the diagnosis of the pathological conditions which occasionally are present in them. A number of rhinologists used the *x*-ray in the treatment of affections, other than malignant tumors, in the accessory sinuses, but without success,⁵ so far as one can judge from the reports and the fact that the procedure has been little used and has received little mention. There have been some favorable reports of the *x*-ray treatment of malignant tumors⁶ in the sinuses.

Diagnostic Irrigation.—Krause,⁷ Lichtwitz, Myles and Onodi had devised curved trocars and cannulae for perforation of the walls of the maxillary sinus above or below the middle turbinate for purposes of irrigation. As early as 1896 Killian⁸ made use of these in detecting the presence of pus in the Antrum of Highmore by washing it out of the hiatus semilunaris by the stream of fluid introduced through the canula.

Negative Pressure in Diagnosis.—Seifert⁹ and Rethi¹⁰ by using the Pollitzer bag for inflation of the ear in such a manner that on the expansion of the bulb a negative pressure is exerted in the nose, initiated a method of diagnosis of accessory sinus disease which depends on the suction of pus from the recesses to the nasal passages where its visibility furnishes a guide to the sinus contents. Sondermann¹¹ and Spiess¹² devised more effective apparatus for producing negative pressure in the nasal chambers. This procedure they claimed to have a therapeutic value in the treatment of certain

¹ Albrecht: *Archiv für Laryngologie und Rhinologie*, 1908, XX, p. 175.

² Caldwell: *The Laryngoscope*, November, 1908, XVIII, p. 853.

³ See also Turner and Porter: *The Skiagraphy of the Accessory Nasal Sinuses*, Edin., 1912.

⁴ Haike: *Archiv für Laryngologie und Rhinologie*, 1910, XXIII, p. 206.

⁵ See, for instance, Mader: *Archiv für Laryngologie und Rhinologie*, 1906, XVIII, p. 1.

⁶ Freudenthal: *Annals of Otology, Laryngology and Rhinology*, 1912.

⁷ Krause: *Monatsschrift für Ohrenheilkunde*, No. 3, 1887, XXI, p. 70.

⁸ Killian: *Münchener medizinische Wochenschrift*, No. 31, 1896, XLIII, p. 723.

⁹ Seifert: *Sitzungs-Berichte d. physikalisch medizinischen Gesellschaft zu Würzburg*, April 29, 1899, p. 80.

¹⁰ Rethi: *Wiener klin. Rundschau*, 1899, XIII, p. 745.

¹¹ Sondermann: *Münchener medizinische Wochenschrift*, 1905, LII, p. 17. *Archiv für Laryngologie und Rhinologie*, 1905, XVII, p. 425.

¹² Spiess: *Archiv für Laryngologie und Rhinologie*, 1905, XVII, p. 179.

nasal affections, but this has not been sustained. Its chief value remains the diagnostic one. By sucking the contents out of the openings of the accessory sinuses into the middle meatus where it can be seen in rhinoscopy permits the observer to detect latent supuration of the cavities. Of course it has not always proved efficacious in accomplishing its purpose, but it has often proved useful in avoiding the necessity for perforating the maxillary sinus with trocar and cannula and washing out the contents of the cavity for diagnostic purposes, a painful, at least an unpleasant, proceeding, and one not always unattended by danger.¹ Claus² reported four cases of death from puncture and washing out the maxillary sinus, one at least apparently from the introduction of air into a vein. Various contrivances of a suction pump driven by electricity or otherwise have thus become very useful additions to the rhinologist's armamentarium.

Endoscope.—As early as 1902-3³ attempts were made to invent an endoscope by means of which closer and more minute inspection might be made of the walls of the sinuses when introduced in the nose or through artificial openings in the sinuses themselves, especially the maxillary. More recently Tóvölgyi⁴ has devised an instrument by means of which the maxillary antrum is punctured and through the endoscopic cannula its walls inspected. He called it "Antroskoptrocar."

Frontal Sinus Operations.—Ogston⁵ in referring to his own attempts to do so had declared, in 1884, that there was no possibility of introducing a probe into the frontal sinus from the passages below. Subsequent work slowly but finally fully demonstrated the essential error of this assumption. I have already referred to the early proposition of Schaeffer and Lichtwitz to open the frontal sinus through the nose. This did not meet with favor at the time, though Winckler,⁶ in 1893, did much to show the surgical relations of the frontal sinus with the upper nasal passages were such as to suggest its practicability. In this he was supported by Scheier.⁷ Very early it was recognized⁸ that acute frontal sinus inflammation in the great majority of cases recover spontaneously and that it is necessary to distinguish carefully in this respect the indications for operation; but when an operation is necessary the whole drift

¹ Menzel: *Archiv für Laryngologie und Rhinologie*, 1905, XVII, p. 371.

² Claus: *Beiträge zur Anatomie, Physiologie, Pathologie und Therapie des Ohres, der Nase und des Halses*, 1910, IV, p. 88.

³ Reichert: *Berliner klin. Wochenschr.*, 1902, XXXIX, p. 401. Hirschmann: *Ibid.*, 1902, XXXIX, p. 478. *Archiv für Laryngologie und Rhinologie*, 1903, XIV, Heft 2, p. 195.

⁴ Tóvölgyi: *Archiv für Laryngologie und Rhinologie*, 1911, XXV, p. 144.

⁵ Ogston: *The Medical Chronicle*, December, 1884, I, p. 235.

⁶ Winckler: *Archiv für Laryngologie und Rhinologie*, 1893, I, p. 178; 1895, II, p. 138.

⁷ Scheier: *Wiener medizinische Presse*, No 10, 1898, XXXIX, p. 365.

⁸ Herzfeld: *Deutsche medizinische Wochenschrift*, No. 12, 1895, XXI, p. 195.

of opinion for ten years was toward gaining access to the sinus by means of an external operation. Tilley,¹ in 1896, made a study of the surgical anatomy of the frontal sinus and urged this route. In many subsequent papers and at almost every meeting of laryngologists in Great Britain and in many elsewhere this earnest worker has contributed to the literature of the subject. Cases of brain abscess complicating frontal sinus suppuration began to be frequently reported.² In France, Luc³ was active and influential in the development of knowledge of accessory sinus disease, and he also had occasion to note⁴ the occurrence of meningeal infection after an operation on a tumor of the frontal sinus. In 1884 Ogston (l. c.) had operated on the frontal sinus by an angular incision, a vertical one along the wrinkles between the eyebrows meeting a horizontal incision parallel to the wrinkles of the brow. Skin and periosteum being raised he applied a trephine to the bone and made a large enough opening to expose the contents of the sinus. This was only practised in one case. He then made an incision one and a half inches in length, commencing at the root of the nose and extending upward over the nasal eminence of the frontal bone in the central line of the brow. Luc's operation was similar and the method is sometimes referred to as the Ogston-Luc operation. He, however, employed curettage and then inserted an intranasal drain. This procedure was practised in London by Waggett⁵ and others. This operation Luc and many others abandoned for the operation of Killian. The operation of Kuhnt,⁶ removing the front wall of the sinus, produced such deformity that operators and patients alike shrank from the disfigurement. This the operation of Killian largely avoided. In 1895 he described⁷ and in 1902 he further elaborated⁸ his method of incision through the eyebrow and preservation of the upper orbital arch whereby complete exposure of the frontal sinus was obtained and less disfigurement was the result. By prolonging the incision down beyond the inner angle of the orbit a field of bone was included in a flap turned downward and outward which could be turned back into place after curettage and breaking down of carious bone and septa obstructing drainage in all the upper accessory cavities of the nose, the frontal, the

¹ Tilley: *The Lancet*, September 26, 1896, II, p. 866.

² Treitel: *Berliner klinische Wochenschrift*, No. 51, 1896, XXXIII, p. 1139.
Botey: *Revista di Ciencias Medicas de Barcelona*, Nos. 22-23, 1896, XXII, pp. 506, 535.

³ Luc: *Bullétin et Mémoires de la société française de laryngologie et d'otologie*, 1896, XII, p. 326.

⁴ Luc: *Bullétin de l'académie de médecine*, March, 2, 1897, XXXVII, p. 240.

⁵ Waggett: *Internat. Centralblatt f. Laryngologie*, 1899, XV, p. 140.

⁶ Kuhnt: *Ueber die Entzündlichen Erkrankungen der Stirnhöhle und ihre Folgezustände*, Wiesbaden, 1895.

⁷ Killian: *Heymann's Handbuch d. Laryngologie*, III, p. 1155.

⁸ Krauss and Killian: *Archiv für Laryngologie und Rhinologie*, 1902, XIII, pp. 28, 59.

anterior and posterior ethmoidal and the sphenoidal sinuses. Packing the cavities and irrigation practised through drains left in the external wound could be carried out. There can be no doubt, that for the external operation this initiated a technique far superior to any hitherto practised. In the same year (1895) Gussenbauer¹ published an account of his operation which consisted in a temporary resection of the nasal frame-work in order to expose the frontal ethmoidal or orbital cavities. A curved incision starting over each eyebrow ran down along each side of the nose and joined at the lower level of the nasal bones. The skin and nasal bones were turned up on the forehead in such manner as to expose the anterior part of the ethmoidal region and the frontal sinus. Many other external operations were suggested and performed. A résumé of some of this work may be found in Bosworth's second volume of *Diseases of the Nose and Throat* in the chapter on the External Operations on the Nose (1889), which gives a good idea of the methods prevailing at that time and will serve to indicate the advances made in the development of the most rational and conservative methods at present (1913) employed. These were the methods which the operation of Killian largely displaced.

At the meeting of the British Medical Association in 1899 much time was taken up in the laryngological section by English, American, and French authors in the discussion of frontal and ethmoidal sinus suppuration. Charters-Symonds, Moure, Luc, Tilley and Logan Turner contributed papers of value. In that of Tilley the complication of brain abscess following operation was given prominence, while Turner reported examinations by means of transillumination which revealed many apparent anomalies of the frontal sinus. While the operation of Killian has been modified in many ways, essentially his method has, until lately, been the prevailing practice. In 1911 Ritter,² Jacques,³ and Luc⁴ reported favorably on the results of operations in which the whole anterior frontal sinus wall is preserved and only the lower or orbital wall of the sinus is removed. This modification was adopted chiefly because, even with the preservation of the orbital arch, the removal of bone above it often leads to deep depressions, to fill out which many operators subsequently resorted to the injection of paraffin.

At the meeting of the American Laryngological Association in 1905, there was a long and valuable symposium and general discussion of sinus disease and the operations for its alleviation. In a separate paper, however, Ingals reported a series of cases, beginning in 1893, in which he had treated the frontal sinus through the infun-

¹ Gussenbauer: *Wiener klinische Wochenschrift*, No 21, 1895, VIII, p. 377.

² Ritter: *Verhandlungen des Vereins deutscher Laryngologen*, 1911, p. 628.

³ Jacques: *Verhandlungen d. 3. Internationalen Laryngo-Rhinologen Kongresses*, 1911, I, p. 118.

⁴ Luc: *Zeitschrift für Laryngologie*, 1911, IV, p. 273.

dibulum, leaving a gold tube in some of the cases for continual irrigation. Casselberry mentioned having employed a burr to enlarge the natural opening. These cases were selected, for, naturally, septa in the frontal sinus would defeat the drainage and in some the natural opening was not successfully entered. The use of the unguarded nasal burr being considered dangerous, in 1907 and 1908, Ingals¹ and Skillern² described a device by which a probe having first been introduced in the frontal sinus an electric trephine was introduced over it and an enlargement of the duct obtained in such a manner that neither the lateral walls nor the roof of the frontal sinus beyond the probe could be damaged. Worthington³ also made use of this method and by 1910 Ingals⁴ was able to claim a cure of the suppuration in 95 per cent. of the cases in from six weeks to six months. By 1911 this route of entering the frontal sinus had been used by many operators. Ingals had proved the position of the introduced probe by the use of the x-rays. Sieur and Rouvillois⁵ again made an anatomical study demonstrating on the cadaver the possibility of reaching the frontal sinus by the intranasal channel. Vacher⁶ who had previously advocated the treatment of the frontal sinus suppuration by intranasal methods again referred to the subject in 1911, in France, while in Germany Halle⁷ using a protected electrically driven burr reported having operated on nineteen persons in this way. A shield was held behind and internal to the burr to protect the orbital plate of the ethmoid. It was freely admitted that these internal operations on the frontal sinus were not suitable for all cases. Vacher's internal method of operating on the frontal sinus met with considerable criticism in France,⁸ as did the similar propositions of Halle in Germany, and of Ingals in America; but there is no doubt that in selected cases, it has become the operation of choice with many rhinologists.

Maxillary Sinus Operations.—It is difficult to observe any chronological sequence in a description of the operations on the maxillary sinus in the period here dealt with. We have seen, however, in the eighteenth century the antrum had been frequently opened, usually but not always through the dental alveoli. Krause, Lichtwitz, Myles, Onodi, and others had followed the lead of Mikulicz in perforating by trocar the nasal wall of the antrum above or below

¹ Ingals: *The Laryngoscope*, April, 1907, XVII, p. 284; *Journal American Medical Ass'n*, May 9, 1908, L, p. 1502.

² Skillern: *The Laryngoscope*, June, 1908, XVIII, p. 439.

³ Worthington: *The Laryngoscope*, December, 1909, XIX, p. 940.

⁴ Ingals: *The Laryngoscope*, February, 1910, XX, p. 113.

⁵ Sieur and Rouvillois: *Revue hebdomadaire de laryngologie, d'otologie et de rhinologie*, 1911, XXXI, Pt. I, p. 225.

⁶ Vacher: *Bulletin d'otologie, rhinologie, laryngologie*, April, 1911, XIV, p. 108.

⁷ Halle: *Archiv für Laryngologie und Rhinologie*, 1911, XXIV, Heft 2, p. 249.

⁸ Société française de l'oto-rhino-laryngologie, 1911. *Ref., Internat. Centr. f. Laryngologie*, 1912, XXVIII, p. 556.

the inferior turbinate, and Onodi,¹ in 1903, had devised a trocar for entering and dilating the natural opening in the middle meatus. Jansen,² after referring to the reports of Hartmann,³ who in 1899 claimed to have cured a large proportion of cases of antrum suppuration by irrigation through the hiatus semilunaris, and to the poor results obtained by methods of operations which were really only those of earlier pre-rhinoscopic authors revived, and to which I have referred in foregoing pages, described a more thorough opening of the sinus through the facial wall of the upper jaw. He did not in this paper inaugurate any absolutely new procedure, but it was the first of his publications which subsequently developed his method of attacking the ethmoidal and sphenoidal sinuses through this avenue of the maxillary sinus. It also drew attention more pressingly to the fact that pus in the antrum owed its origin often to suppuration in the frontal ethmoidal and sphenoidal cavities, and explained the reasons why so often disappointment followed operations for the relief of pus in the maxillary sinus below. His proposal to turn the mucous membrane formerly covering the excised bone into the antrum was subsequently adopted by other operators, where disease or curettage in the treatment of it had destroyed the antral mucosa. Berens,⁴ in America, practised this method in a large number of cases. In America, in 1893, Caldwell⁵ described a method of operating on the maxillary sinus which consisted in opening the antrum in the canine fossa and through this making an opening in the nose. Later this operation was practised by Spicer⁶ in England and by Luc⁷ in France, and has generally been known as the Caldwell-Luc operation. Küster had in 1889 advocated the extensive opening of the external bony walls of the antrum in conformity with the extreme doctrines for all suppurating cavities. Partsch⁸ and Scheinmann had advocated the use of a trephine. Others used the chisel. All operators used tampons for a shorter or longer time after operation. Boenninghaus⁹ followed the technique of Caldwell-Luc, but turned into the antrum, as Jansen had recommended for the mucosa of the facial wall, the mucosa of the nasal chamber covering the bone piece he removed, which was often very large. Packing the antral cavity only he thus held the mucosa in place. Luc,¹⁰ in 1900, published his

¹ Onodi: *Archiv für Larynologie und Rhinologie*, 1903, XIV, p. 154.

² Jansen: *Archiv für Larynologie und Rhinologie*, 1893, I, Heft 2, p. 135.

³ Hartmann: *Deutsche medizinische Wochenschrift*, 1889, XV, p. 190.

⁴ Berens: *The Laryngoscope*, March, 1904, XIV, p. 177.

⁵ Caldwell: *New York Medical Journal*, November 4, 1893, LVIII, p. 528.

⁶ Spicer: *Proceedings British Medical Ass'n*, 1894; *Internat. Centralblatt für Larynologie*, 1894-5, XI, p. 882.

⁷ Luc: *Archives internationales de larynologie, etc.*, No. 3, 1897, X, p. 273.

⁸ Partsch: *Ref. in Boenninghaus*.

⁹ Boenninghaus: *Archiv für Larynologie und Rhinologie*, 1897, VI, p. 213.

¹⁰ Luc: *Lectures sur les suppurations de l'oreille moyenne et des cavités accessoires du nez et sur leurs complications intracrâniennes*, Paris, 1900.

lectures on suppuration in the accessory sinuses of the nose which is a fair representation of the best work in France at the time. All operators on the maxillary sinus met defeat in their results owing to the prompt closure of any opening made through the bony walls, unless an obturator was worn as in the old Cowper operation and the later Jansen operation above referred to.¹ The perforation would not remain open until the discharge ceased. To avert this and avoid the irritation of an obturator or a metal tube drain, the Caldwell-Luc operation was extended by some operators to the complete removal of the naso-antral wall, making one large cavity out of the antrum and the inferior and middle nasal meatus. Alsen² and Gerber, in 1901, carried out this method. Denker,³ in 1905, extended the technique of Luc in such a way that the entire inner bony wall of the maxillary antrum was removed and the mucous membrane of its nasal surface preserved so that by means of a tampon it could be made to line the denuded bony floor of the antrum. He adopted some of the technique of Jansen, of Kretschmann,⁴ Boenninghaus and Friedrich.⁵ Freer⁶ and others have succeeded in removing the greater part of the inner wall of the antrum including the inferior turbinated bone by intranasal operation, thus accomplishing the object the Caldwell-Luc operation was designed to attain. While its possibility was demonstrated, this difficult operation has not found favor in competition with the procedure of Luc until recently, but in the last two or three years this method has been largely practised.⁷ Whether by the extensive operation of Denker or by that of Freer and others the whole naso-antral wall with the inferior turbinate or a large part of these structures was removed, it was soon found that the walls of this cavity became encrusted with dried secretions and continual irrigation was necessary for years. This was another reason for the use of a more rational surgical treatment of sinus disease. Gradually the object to be attained was seen to be to locate the bony cell or cells in the upper nasal labyrinth which was the origin of the pus in the lower meatus and in the antrum itself; to establish a drainage by removal of the lower bony wall or the obstructing soft parts. Jansen sought to accomplish this through the antrum by

¹ See also, Herzfeld: *Monatsschrift für Ohrenheilkunde*, No. 1, 1898, XXXII, p. 25. Port: *Münchener medizinische Wochenschrift*, No. 39, 1898, XLV, p. 1258.

² Alsen: *Archiv für Laryngologie und Rhinologie*, 1901, XII, p. 227.

³ Denker: *Archiv für Laryngologie und Rhinologie*, 1905, XVII, p. 49.

⁴ Kretschmann: *Münchener medizinische Wochenschrift*, No. 1, 1905, LII, p. 20; No. 26, 1907, LIV, p. 1275.

⁵ Friedrich: *Deutsche medizinische Wochenschrift*, No. 37, 1904, XXX, p. 1337. Börger: *Archiv für Laryngologie und Rhinologie*, 1906, XVIII, p. 524.

⁶ Freer: *The Laryngoscope*, May, 1905, XV, p. 343.

⁷ For evidence of the tendency to operate on the maxillary sinus by the intranasal route see references to articles on p. 130-131 of Semon's *Internat. Centralblatt für Laryngologie und Rhinologie*, 1910, Vol. XXVI.

scraping away the ethmoidal-cell wall at the upper part and the sphenoid-sinus wall at the upper and posterior angle of the antrum. The technical difficulties were great and the results in the hands of other operators were not brilliant. Cases were constantly being reported in which the sphenoidal sinus was opened through the nose, curetted, drainage established, and the case cured without the extensive and difficult technique of Jansen, as for instance in the report of Flatau.¹ For the ethmoidal and sphenoidal cells this, chiefly through the demonstrations of Hajek,² has finally become in more recent years the operation of choice. To obviate the drawbacks which the experience of years has demonstrated in the results of creating these large cavities they have been much limited of late. Hirsch,³ in 1911, described an operation whereby he sought to overcome the evil effects of the destruction of the inner wall of the maxillary sinus in those operations on it where the nasal chambers are made to communicate widely and permanently with it. The inferior turbinate was temporarily resected, a wide opening established beneath it, and then it was fastened again in place. Still more formidable operations grew out of the procedure of Rouge.⁴ In 1873 he had suggested an operation consisting of an incision beneath the upper lip and a separation of the septal cartilage from its articulation with the superior maxillary bones, thus gaining larger access to the interior of the nose than could be obtained through the natural opening. Later this technique was supplemented by the procedure of Partsch⁵ and Loewe,⁶ which consisted further in a severance of the whole septum and of the outer and inner, and anterior and posterior walls of each antrum from the palatal arch, so that the whole of the latter could be depressed on the tongue and a much larger access thus obtained to all the sinuses, but especially to the sphenoid region and the posterior ethmoidal cells chiefly designed to facilitate the removal of post-nasal tumors. The hemorrhages occurring in these formidable procedures prevented their general adoption, though they have occasionally been reported. Bardenhauer's modification of the Rouge operation in 1898 consisted chiefly in a very much wider separation of the soft parts from the anterior surfaces of the bones of the face and even the dislocation of the nasal bones to gain free access to the frontal sinuses as well as to the maxillary and ethmoid. Goris⁷ in France was an advocate of this technique and for a number

¹ Flatau: *Berliner klin. Wochens.*, 1894, XXXI, p. 791.

² Hajek: *Archiv für Laryngologie und Rhinologie*, 1896, IV, p. 277.

³ Hirsch: *Monatsschrift für Ohrenheilkunde*, 1911, Heft 6, XLV, p. 637.

⁴ Rouge: *Nouvelle méthode chirurgicale pour le traitement de l'ozéne*, 1873.

⁵ Partsch: *Verhandlungen der deutschen Gesellschaft für Chirurgie*, 1898, XXVII, p. 552.

⁶ Loewe: *Monatsschrift für Ohrenheilkunde*, July-October, 1900, XXXIV, pp. 259, 376.

⁷ Goris: *International Medical Congress*, 1900, Laryngological Section, p. 101.

of years was active in the performance of many serious operations about the nose and its sinuses. Moure,¹ in 1896, drew attention to purulent infections of the maxillary sinus in children as having some relation to the eruption of the teeth at a time when the sinus had become completely developed, but d'Arcy Power,² 1897, claimed to have observed maxillary sinus empyema in a child only eight weeks old. Mayer,³ 1901, reported a case in a child, aged two and a half years. Coffin⁴ in reporting four cases alluded to suppuration in the maxillary sinus operated on when the child was six months old. I have referred to the recent work of Haike, Onodi, and of Canestro on suppuration of the accessory sinuses in children (pp. 279-281), the latter reporting a case in a child twenty-six days old.

Ethmoid Cells.—The claim of Schadle⁵ that affections of the maxillary sinus are often a factor in the etiology of hay fever has received no confirmation or recognition. These reflexes had been noticed by Bosworth⁶ as due to ethmoid disease. His enthusiasm for intranasal operation in the eradication of nasal polypi and their bony attachments in the ethmoid accomplished much in arousing interest in ethmoidal disease in America, though his contention that the latter is a primal factor in the etiology of asthma and hay fever has not received the support of his colleagues as a rule. Everywhere, in intranasal operations on the ethmoid, removal of the middle turbinate, in whole or in part, and often of the lower turbinate, was a prelude to the various surgical attacks on the ethmoidal cells and the improvement in the surgical armamentarium for this purpose has been very great. Grünwald⁷ devised a number of curettes, chisels, and rongeurs by means of which access to and treatment of the accessory sinuses were greatly facilitated. These are set forth in his text-book and in many previous communications on intranasal surgery. Hajek (l. c.), publishing his first edition in 1899, has of late years (1899-1909) unquestionably been the most influential writer in developing the technique and in insisting on the intranasal route for operations on the ethmoid cells. The operations of Jansen, of Killian, of Rouge with their innumerable modifications represent the operative technique in reaching the ethmoid by the extranasal route, but involving, as they do, the preliminary invasion of the frontal or maxillary sinuses, they have

¹ Moure: *Revue hebdomadaire de laryngologie, d'otologie et de rhinologie*, No. 43, October 24, 1896, XVI, p. 1265.

² d'Arcy Power: *British Medical Journal*, September 25 and November 6, 1897, II, pp. 808, 1337.

³ Mayer: *Transactions American Laryngological Ass'n*, 1901, p. 54.

⁴ Coffin: *The Laryngoscope*, November, 1904, XIV, p. 881.

⁵ Schadle: *Medical Record*, May 25, 1907, LXXI, p. 941.

⁶ Bosworth: *Medical Record*, October 13, 1894, XLVI, p. 457.

⁷ Grünwald: *Lehre von den Naseneiterungen*, München, 1893. *Verhandl. d. Gesellschaft deutscher Naturforscher*, 1896, 2 th., 2 Hälfte, p. 406. *Centralblatt für Chirurgie*, No. 3, 1906, XXXIII, p. 84.

been for the most part practised in cases in which these cavities were themselves affected. As intranasal methods have with increasing frequency been applied to these, the ethmoid technique, as developed by Hajek and others, has come more and more into vogue. Uffenorde,¹ in 1907, wrote a monograph on the affections of the ethmoid cells, advocating the external in preference to the internal methods of operating, but the drift has been away from this advice for a number of years.

Sphenoid Sinus and the Hypophysis.—Clearing away the ethmoidal labyrinth, either by intranasal operation or by the way of the antrum or frontal sinus, is naturally followed by the exposure of the sphenoidal. We have noted the relationship which Onodi showed to exist between the posterior ethmoidal cells and the sphenoidal cavity. While this is fairly brought out in the earlier work of Zuckerkandl it was studied later much more in detail in connection with the operations on these cavities not only to evacuate their contents but to furnish a route to operations on the hypophysis cerebri recently undertaken. The very great interest excited in the phenomena presented, physiologically and pathologically, by the ductless gland inevitably led to the development of surgical attacks on the hypophysis. The way of reaching the sphenoidal sinuses through the nose had already been pointed out in the works of Zuckerkandl, Killian, Tilley, Coakley, Grünwald, Jansen, and others to whom I have referred. These are reviewed with the writings of others by Skillern.² In 1906 Horsley³ had reported his method of making externally a lateral incision and lifting the middle cerebral lobe and thereby reaching the pineal gland without entering the nasal cavities. Caton and Paul,⁴ in 1893, had first proposed this method. Moszkowitz,⁵ Schmiegelow,⁶ Hirsch,⁷ Goris,⁸ and West⁹ operated through the nose, the latter as well as Skillern giving a good bibliography of the subject. Loewe¹⁰ and Vorschütz,¹¹ operating by the Partsch method, extended it in such a way as to include "decortication of the face," *i. e.*, removing from the soft parts, after reflecting them upward, the facial and nasal wall of the antrum and the ascending ramus of the superior maxilla. Kühn¹² in 1911 proposed to reach the sphenoid sinus and through it the hypophysis by way of the mouth, chiseling some of the hard

¹ Uffenorde: Die Erkrankungen des Siebbeins, Jena, 1907.

² Skillern: Archiv für Laryngologie und Rhinologie, 1908, XX, p. 415.

³ Horsley: British Medical Journal, 1906, II, p. 411.

⁴ Caton and Paul: British Medical Journal, 1893, II, p. 1421.

⁵ Moszkowitz: Wiener klinische Wochenschrift, 1907, XX, p. 792.

⁶ Schmiegelow: Ref., Internat. Centralblatt für Laryngologie, 1911, XXVII, p. 117.

⁷ Hirsch: Wiener klinische Wochenschrift, No. 44, 1910, XXIII, p. 1578.

⁸ Goris: Ref., Centralblatt für Laryngologie, 1911, XXVII, p. 118.

⁹ West: Archiv für Laryngologie und Rhinologie, 1910, XXIII, p. 288.

¹⁰ Loewe: Berliner klinische Wochenschrift, 1908, XLV, p. 378.

¹¹ Vorschütz: Deutsche Zeitschrift für Chirurgie, 1909, XCIV, p. 616.

¹² Kühn: Berliner klin. Wochensch., 1911, XLVIII, p. 914.

palate, some of the vomer and the pterygoid process, and carrying the soft palate with them backward in the pharynx. These were to be stitched back in place after the evacuation of the sphenoid. Hypophyseal surgery was discussed in 1911 at the meeting of the American Laryngological Association, and Onodi¹ made some very interesting remarks on the subject elsewhere.

Complications of Accessory Sinus Disease.—It remains to say a few words on the complications of accessory sinus disease which were reported from time to time as they had an important influence on the development of the diagnosis and operative therapy. They were chiefly those of the contents of the neighboring cavities of the orbit and the cranium. In 1876 Hermann Knapp² reported a case of orbital abscess involving the anterior ethmoidal cells, in which apparently the trouble originated. Subsequently this author made many contributions to the same subject,³ reporting in 1880 the invasion of the orbit from an empyema of the frontal sinus. Others also noted such cases⁴ before the publication of Ziem's paper. In 1893 Ziem⁵ drew attention to the intimate connection between orbital and ocular lesions and disease of the upper accessory sinuses. These observations, though forgotten for many years, have of late been expanded by the published experiences of others, especially by the valuable anatomical work of Onodi.⁶ Shortly after the appearance of Ziem's article, Kuhnt (l. c.), from the stand-point of the ophthalmologist, studied the affections of the frontal sinus in their relation to eye disease. In France it was treated by Röhmer.⁷ Axenfeld,⁸ in 1902, wrote of the orbital complications of disease of the frontal and ethmoidal sinuses. After four or five years the number of articles and treatises on the relationship between accessory nasal sinus disease and ocular orbital and optic nerve affections was very large.⁹ A large number of reports of ocular and orbital complications was made in 1911.¹⁰

¹ Onodi: *Zeitschrift für Laryngologie*, 1911, IV, p. 1.

² Knapp: *Trans. Fifth Ophthalmological Congress*, 1876, p. 57.

³ Knapp: *Archives of Ophthalmology*, 1880, IX, No. 2, p. 185.

⁴ For instance, Peltessohn: *Centralblatt für praktische Augenheilkunde*, February, 1888, XII, p. 35.

⁵ Ziem: *Monatsschrift für Ohrenheilkunde*, etc., No. 8-9, 1893, XXVII, pp. 231, 261.

⁶ Onodi: *Die Sehnerven und die Nebenhöhlen der Nase*, Wien, 1907.

⁷ Röhmer: *Revue médicale de l'est*, July 1, 1895, XXVII, p. 385.

⁸ Axenfeld: *Deutsche medizinische Wochenschrift*, No. 40, 1902, XXVIII, p. 713.

⁹ Schmiegelow: *Archiv für Laryngologie und Rhinologie*, 1906, XVIII, Heft 3, p. 478. Posey: *Jour. of Eye, Ear and Throat Diseases*, 1905, X, p. 31. *N. Y. Medical Journal*, March 2, 1907, LXXXV, p. 404; and November 2, 1907. Onodi: *Transactions British Medical Association*, July, 1904. *Archiv für Laryngologie und Rhinologie*, 1905, XVII, p. 260. Baumgarten: *Monatsschrift für Ohrenheilkunde*, etc., No. 5, 1906, XL, p. 303. Hoffmann: *Zeitschrift für Augenheilkunde*, etc., 1906, XVI, (Kuhntfest.), p. 1. Logan Turner: *Edinburgh Medical Journal*, May, 1909, n. s., II, p. 423.

¹⁰ See: *Internat. Centralblatt für Laryngologie*, etc., 1911, XXVII, pp. 402-3-4-5.

As early as 1895 Dreyfuss¹ could collect reports of many cases of cerebral disease resulting from suppuration in the nasal sinuses, twenty-two being due to frontal sinus disease, the posterior wall of the frontal sinus being perforated in many of them by an osteitis. It has since been more fully recognized how apt the inflammation of the soft parts is to spread to the bony walls. Craig,² in 1900, published a collection of cases from literature of this nature, though he seemed to find reason to believe that maxillary antrum suppuration was more commonly the starting-point for cerebral inflammation than that of the frontal, a view which other investigators have for the most part not supported. St. Clair Thompson³ also wrote on the subject. Onodi,⁴ in 1911, collected statistics in 106 cases in which cerebral abscess had occurred as a complication of accessory sinus disease and in these 106 cases the frontal sinus was involved in 82, the ethmoid in 11, the maxillary sinus in 4 cases, and the sphenoid in 1. It was recognized that an osteitis was apt to accompany the affections of frontal sinus and the complications which experience revealed in these cases seemed an indication for operation in every case of frontal sinusitis to some authors. To others it seemed that these operations themselves were in many cases apt to precipitate rather than to avoid the dangers arising from them. In Gerber's book⁵ we find an example of the former view, while in Kuttner's review⁶ of it we find set forth the conservative opinion which seems likely to prevail in the future.

Trend to Conservatism in Operation.—Weil,⁷ in 1896, not only expressed the opinion that nearly all inflammatory affections of an acute nature tended to spontaneous recovery but that these as well as the chronic cases were due to an extension from acute inflammatory conditions of the nasal mucosa. He and many who took part in the discussion of his paper at this time in Vienna expressed a preference for treating maxillary sinus disease through the nasal orifice of the antrum, or through some enlargement of it. The difficulty and in many cases the impossibility of this technique subsequently became evident, but in Vienna operative procedures on the accessory sinuses, have always been markedly under the influence of Hajek's sane and painstaking methods. Many points in the experience hitherto gained came out in the discussion on accessory sinus disease at the International Medical

¹ Dreyfuss: *Die Krankheiten des Gehirns und seiner adnexa im Gefolge von Nasenerkrankungen*, Jena, 1896.

² Craig: *New York Medical Journal*, March 24, 1900, LXXI, p. 420.

³ St. Clair Thompson: *The Lancet*, August 12, 1905, II, p. 431.

⁴ Onodi: *Ref., Internat. Centralblatt für Laryngologie, etc.*, 1911, XXVII, p. 433.

⁵ Gerber: *Die Complicationen der Stirnhöhlenentzündungen*, Berlin, 1909.

⁶ Kuttner: *Internat. Centralblatt für Laryngologie, etc.*, 1909, p. 168.

⁷ Weil: *Wiener medizinische Wochenschrift*, Nos. 16-20, 1897, XLVII, pp. 705, 762, 814, 866, 910.

Congress at London in 1897. In the same year a similar discussion followed the presentation of a case by Bryan at the meeting of the American Laryngological Association. Killian¹ recommended in 1909 a method of treatment of acute accessory sinus disease by the application of heat and light furnished by an air-tight box supplied with electric lights of high candle power, a sort of sweat box supplemented by high intensity light, invented by Brünings. This was said to relieve the pain and promote the flow of secretion and hasten the natural process of cure. At this meeting he and others expressed opinions favorable to a more conservative attitude in questions of operative procedure, but long before this it had become evident to conservative men that the enthusiasm for extensive and destructive operations on the accessory sinuses was being carried to a dangerous extreme. In 1901 Sir Felix Semon² warned his confrères against this tendency in England. A similar protest³ in America in 1905 was the consequence of this continued lack of critical differentiation in the selection of cases for operation. Shortly after this there were signs of a more rational judgment beginning to be brought to bear on the subject. Kuttner⁴ on many occasions maintained the same conservative ground in Germany. Hajek's⁵ conservative stand in 1909 in Vienna in regard to the treatment of accessory sinus suppuration is a further instance of the rational position which has finally, after twenty years, been established among laryngologists. Taken together with Semon's early and wise words in London and Kuttner's in Berlin it is especially strengthened by the general tone of moderation which has found its way into most if not all of the recent works on the subject. At the International Congress in 1909 much of the time was taken up with the discussion of this aspect of the subject and with the significant frequency of cerebral complications in accessory sinus troubles which had been treated surgically. An interesting discussion of the subject took place at the meeting of the American Laryngological Association as early as 1903. For the ten years previous to this it had been often urged that the nasal sinus affections could be traced in their origin to inflammation within the nasal chambers. This was emphasized and the remark was made by Freeman that the sinus affection was nearly always, when unilateral, on the side of the nose presenting in the meatus the greatest amount of obstruction. It was not until the resort to intranasal operation in opening the sinuses became more common that the necessity was felt for correcting these intranasal causes

¹ Killian: International Medical Congress, 1909, Ref., Semon's Internat. Centralblatt f. Laryngologie, 1910, XXVI, p. 425.

² Semon: Journal of Laryngology, 1901, XVI, p. 199.

³ Wright: N. Y. Medical Journal, October 7, 1905, LXXXII, p. 760.

⁴ Kuttner: Berliner klinische Wochenschrift, No. 11, 1908, XLV, p. 529.

⁵ Hajek: 16 Congrès International de Médecine, Compte Rendu, 1909, XV, (Laryngologie), p. 177.

of sinus disease. This has grown into a weighty argument against the external operation, when it is possible to avoid it. While there has been reason to suppose that many of the cases with meningeal symptoms as a result of accessory sinus disease, reported occasionally as cured after operation on the nasal cavity, were really cases with cerebral symptoms of septicæmia, there are some reports in which the evidence of an actual purulent meningitis once existing yet later cured is very strong.¹ There still seems good reason to suppose that in the vast majority of the cases such a fortunate result does not obtain, except in the event of a cerebral abscess opportunely detected and drained through an opening in the walls of the sinuses. As an example of the extent to which radical operations were advocated for accessory sinus disease by some writers one may cite the brochure of Uffenorde,² published in 1907, shortly after the movement in criticism of operative radicalism had gained headway. His declaration that every conservative method was fruitless, even harmful, was promptly criticised. Since about this date there can be clearly recognized a general tendency among rhinologists to adopt those methods, the technique of which has been greatly advanced, by which openings are made from the nasal chambers not only into the Antrum of Highmore and the sphenoidal and ethmoidal cells, but into the frontal sinuses as well. Not a little of this change of method as well as the chief element in the drift toward more conservatism was due to experience with results of the more thorough of the external operations. Secretion of pus was found to persist in a very large number of cases and though other symptoms, especially pain, were often relieved, dangerous and widely mutilating operations began to seem hardly justified in a class of cases, eagerly accepted at first as suitable for operation. It was realized then that the imperfect results attendant on less radical methods at first were not always due to conservatism. With the improved intranasal technique, there was less cause for criticism as to imperfect drainage being secured. That there is still a respectable number of cases in which the Caldwell-Luc, the Killian and the Jansen operations are considered justified is almost universally recognized.

As this work goes to press, the volume of Ross Hull Skillern on "The Catarrhal and Suppurative Disease of the Accessory Sinuses of the Nose" (1913) comes to hand. The richness in details, and especially in illustration, and its fulness in historical data at once attract attention, but it came too late for careful examination.

Local Anæsthesia in Sinus Operations.—While cocaine was at first used for intranasal operations only, from time to time propositions have been made to operate externally on the accessory sinuses under local anæsthesia.

¹ For instance: Kander: *Medizinische Klinik*, No. 29, 1907, III, p. 862.

² Uffenorde: *Die Erkrankungen des Siebbeins*, Jena, 1907.

Braun,¹ in 1903, having cocainized the superior laryngeal nerve by injecting a solution of the drug in its trunk in order to obtain anæsthesia in the curettage of the larynx, a procedure which has subsequently been used to relieve the pain of laryngeal phthisis on deglutition, Munch² applied the operation to the regional anæsthesia of the trigeminus nerve in the surgery of the maxillary sinus. Braun,³ in 1911, introduced this into Germany. Killian,⁴ in 1912, spoke well of it when applied to the Gasserian ganglion. Such a radical operator as Uffenorde⁵ was a convert to this method.

Vaccines.—As in other suppurative processes the introduction of vaccines, due to the observations and therapeutic claims of Sir Almoth Wright, may be noted at this time (1910) in the therapy of the accessory sinuses.⁶

BACTERIOLOGY OF THE NOSE AND THROAT.

As in every other department of medicine, the sudden development of bacteriology had its effect upon the study of diseases of the upper air passages. Perhaps the effect was not so profound, because it soon became apparent that neither was there that urgent need nor was there a possibility of applying to the nose the rigid practises of antisepsis.

We cannot here, as we have in many other questions, so profitably pass in review the history of our knowledge of bacteria. It began in 1675 with the first improvement in magnifying glasses by Leuwenhoek. It includes the interesting story of what is called the fallacy of spontaneous generation. Attacked time and again, first by Redi in 1668, and by Vallisneri before the discovery of infusoria by Leuwenhoek, and afterward by Spallanzani in 1777, Virchow with his "*Omnis cellula e cellula*," and Pasteur and Tyndall have destroyed spontaneous generation in our day, but further discoveries, reaching back toward the great First Cause, will surely start it again, for our minds cannot be freed from the idea that there must be a time now, just as man has always believed there was once in the past time, when what we call the animate was incorporated *de novo* with the inanimate. Since the first edition of this book the question of abiogenesis, or spontaneous generation, has come more and more near the

¹ Braun: Archiv für klinische Chirurgie, 1903, LXXI, p. 179.

² Munch: Bullétins et mémoires de la société française d'oto-rhino-laryngologie, May, 1909, XXV, Pt. 2, p. 467.

³ Braun: Deutsche Zeitschrift für Chirurgie, 1911, CXI, Heft 4-6, p. 321. Lange: Beiträge zur Anatomie, Physiologie, Pathologie und Therapie des Ohres, der Nase und des Halses, 1911, V, p. 294.

⁴ Killian: Internat. Centralblatt für Laryngologie, etc., 1912, XXVIII, p. 436.

⁵ Uffenorde: Internat. Centralblatt für Laryngologie, etc., 1912, XXVIII, p. 447.

⁶ Brawly: The Laryngoscope, September, 1910, XX, p. 877.

borderland of scientific investigation as it has gradually again established a more respectable place for itself in the domains of theory.

The idea of the microbial origin of disease doubtless started as soon as the existence of infusoria was generally known, so eager has always been the search for etiology in medicine. Indeed, the following reference is in itself ample proof of it: "In 1721 the pest broke out at Marseilles and in the south of France. Antrechau attributed the contagious principle to infusorial animalcules." (Spr. V. 504.) However interesting it would be to follow the growth of the idea, we must pass directly to the account of our knowledge of bacteria of the nose and throat. The presence of fungi, visible as they are to the naked eye when grown to large masses, was naturally the first to be noted.

Mycoses Pharyngis.—In 1873 B. Fraenkel¹ drew attention to the occurrence in the tonsil and pharynx of what we know as mycosis pharyngis. In 1882 E. Fraenkel² and many others since then have elaborated the subject. Heryng,³ in 1885, described the disease fully from the point of view that the predominant organism produces the masses of white material seen protruding from the tonsillar crypts. Seifert,⁴ in 1893, in an article on the lingual tonsil refers to the literature of a large number of case reports. He also refers to cases of pharyngomycosis sarcinica, the first one being by Friedreich,⁵ in 1864, and to a much later report by Fischer,⁶ but this is a condition which has not since then found a place in laryngological literature. Chiari⁷ took the correct view as early as 1887, claiming mycosis pharyngis is not a specific disease due primarily to bacteria, but to the overgrowth of the leptothrix always present in the mouth, finding favorable conditions in certain tonsils for its appearance. Epstein⁸ and Hellat and Ucke,⁹ in 1900, contributed papers to the subject of mycosis pharyngis, the former author identifying the leptothrix and the latter writers speaking of a streptothrix as the organism forming the white tufts. Among the peculiar medicaments used in the treatment was nicotine in the form of tobacco smoke. The proper understanding of the anatomical features which always accompany and often simulate tonsillar mycosis dates back to the article by Siebenmann.¹⁰ In 1895

¹ B. Fraenkel: Berliner klinische Wochenschrift, 1873, X, p. 94.

² E. Fraenkel: Zeitschrift f. klinische Medizin, 1882, IV, p. 288.

³ Heryng: Zeitschrift f. klinische Medizin, 1885, VII, Heft 4, p. 358.

⁴ Seifert: Archiv für Laryngologie und Rhinologie, 1894, I, p. 69.

⁵ Friedreich: Virchow's Archiv f. path. Anat., 1864, XXX, p. 385.

⁶ Fischer: Deutsches Archiv für klinische Medizin, 1885, XXXVI, p. 344.

⁷ Chiari: Revue mensuelle de laryngologie, etc., No. 10, October, 1887, VII, p. 559.

⁸ Epstein: Prager medizinische Wochenschrift, No. 22, 1900, XXV, p. 253.

⁹ Hellat and Ucke: St. Petersburger medizinische Woch., No. 44, 1900, n. f., XVII, p. 421.

¹⁰ Siebenmann: Archiv für Laryngologie und Rhinologie, 1895, II, p. 365.

he showed that keratosis of the epithelium of the tonsillar crypts and of the ducts of the pharyngeal glands, causing the tufts of white material to appear as tufts of moulds, was practically always present, and, as Fraenkel had suggested, furnished a favorable nidus for the development of the leptothrix and other streptothrix forms. Under these names, as noted in the bibliography of Siebenmann, a large number of authors had written on the subject, but since then the condition has been treated of in laryngological literature as a keratosis of the faucial and lingual tonsil and of the oropharynx.

Actinomycosis of the Tonsils.—Another form of fungous growth of the tonsil on the other hand was not ascribed to an organism at first except in a tentative way. Ruge,¹ in 1896, wrote a paper on actinomyces-like bodies in the crypts of the tonsils. Many histologists had been inclined to doubt the reality of these organisms existing in the tonsillar crypts. The general advance of our knowledge of the large number of varieties of this organism,² most of them non-pathogenic, rendered it probable that these clumps not uncommonly met with, in reality belong in this class. The observation of Wright,³ in 1904, who demonstrated sections of tonsils in which the tissue was seen to be invaded by the growth, furnished further evidence in the matter. Thevenat⁴ reported another such case also in 1904 and referred to the report of another by Mikulicz. Wright also refers to the report of a case by Lesin, and suggests that usually these organisms seen in the tonsillar crypts belong to non-pathogenic varieties. According to a thesis of Lyons by Laurent Clarc, in 1904, he could find the record of seven cases. In 1905 Gappisch,⁵ owing to tinctorial reaction was inclined to believe that the bodies described by Ruge do not belong to the actinomyces group. Miodowski⁶ also took this view of it. The matter seems largely a question of bacteriological classification and nomenclature and the difficulty in settling the uncertainty is due to the impossibility of getting cultures. Goris⁷ under the title of pharyngeal actinomycosis has reported a case of which the origin of infection seems to have been the tonsil.

Bacteriology of the Nose.—Returning to the bacteriology of the nose we find that, as in the throat, Fraenkel announced the presence of bacteria in the nose in 1873. In the same year Hueter⁸ claimed that the microörganisms observed in nasal secre-

¹ Ruge: *Zeitschrift für klinische Medizin*, 1896, XXX, p. 529.

² See paper by Howard: *Journal of Medical Research*, May, 1903, IX, p. 301.

³ Wright: *American Journal of Medical Sciences*, July, 1904, CXXVIII, p. 74.

⁴ Thevenat: *Lyon Médical*, 1904, CII, p. 1166.

⁵ Gappisch: *Verhandlung der deutschen pathologischen Gesellschaft*, Jahrg., 1905, p. 130.

⁶ Miodowski: *Archiv für Laryngologie und Rhinologie*, 1907, XIX, p. 277.

⁷ Goris: *Journal de chir. et annal. de la soc., belge de chir.*, 1911, XI, p. 20.

⁸ Hueter: *Allgemeine Chirurgie*, 1873, p. 257.

tions were the cause of coryza. It was not, however, until after 1880 that the literature of the subject became abundant. Herzog¹ reported their presence in the normal nose. B. Fraenkel, in 1886,² demonstrated pathogenic cocci in the nasopharynx. In 1889 Von Besser³ and Wright⁴ were able to demonstrate their presence likewise in the nasal chambers of healthy people.⁵

Wurtz and Lermoyez⁶ published observations in 1893 which tended to invalidate these conclusions. They asserted not only that bacteria in the healthy nose are extremely rare or absent, but that the nasal mucus has bactericidal properties. In this contention they were supported by the work of Thomson and Hewlett,⁷ who claimed that practically no bacteria are present in the normal nose posterior to the vestibule. This was claimed to be incorrect by Park and Wright. They repeated the former work of Wright and that of Thomson and Hewlett, and showed that with proper technique positive results could nearly always be obtained from culture plants made from the intranasal mucous surfaces. They asserted that the drip of sterile secretions from the Bowman's serous glands tends to wash away such bacteria as are deposited from the air current and renders the surface less rich in bacterial flora than those regions which, like the vestibule, not only receive the first impact of bacteria-laden air but are not irrigated from above. They also failed to find that the nasal mucus has any bactericidal effect. Vansant⁸ and Viollet⁹ about the same time made similar observations. Hasslauer¹⁰ collected a bibliography of the subject in 1906 which was exhaustive. From the collation of more than 200 reports, more than 30 of which deal with the bacteria of the normal nose, it appeared that in the normal nose, not only many air forms were found, but frequently pathogenic organisms, such as those of diphtheria and tuberculosis, the pneumococcus and pyogenic cocci, the Friedlaender bacillus, the meningococcus intracellularis and the bacteria coli. The recent work of

¹ Herzog: Wiener medizinische Presse, No. 29, seq., 1881, XXII, p. 911.

² B. Fraenkel: Berliner klinische Wochenschrift, No. 17, 1886, XXIII, p. 265.

³ Von Besser: Beiträge zur pathologischen Anatomie, 1889, VI, p. 333.

⁴ Wright: New York Medical Journal, July 27, 1889, L, p. 92.

⁵ For an account of the discussion as to the presence of microorganisms in the healthy nose see the paper on Nasal Bacteria in Health, by Dr. W. H. Park and Dr. Jonathan Wright, N. Y. Medical Journal, February 5, 1898, LXVII, p. 178; Journal of Laryngology, March, 1898, XIII, p. 124; Annales des maladies de l'oreille, February, 1898, XXIV, Pt. I, p. 113.

⁶ Wurtz and Lermoyez: Annales des maladies de l'oreille, August, 1893, XIX, p. 961.

⁷ Thomson and Hewlett: Medico-Chirurgical Transactions, 1895, LXXVIII, p. 239.

⁸ Vansant: Journal American Medical Association, February 27, 1897, XXVIII, p. 395.

⁹ Viollet: Comptes rendus de la société de biologie, December 27, 1899, LI, p. 996.

¹⁰ Hasslauer: Centralblatt f. Bacteriologie und Rhinologie, 1 abt., Referate, 1906, XXXVII, Nos. 1-3, p. 1.

Logan Turner¹ has confirmed this earlier work, though the work of Cobb² and Nagle throws some doubt upon the technique. In making plants from the nasal chambers the avoidance of contamination in passing the vestibule was appreciated as a requisite by Thomson and Hewlett. Park and Wright believed they had successfully met this criticism with which the work of Cobb is concerned. Walter,³ in 1910, made a study of the bacterial flora of the nasal mucosa in cases of rhinitis, finding diphtheroid bacilli and the micrococcus catarrhalis. He often met with Friedlaender's pneumobacillus in chronic nasal affections. Pyogenic cocci were also found. Within the last few years it has been shown by Flexner⁴ and his assistants and by Levaditi⁵ that not only is the meningococcus intracellularis often the inhabitant of the normal nasal cavities, but that both it and the filtrate virus of poliomyelitis infect the cerebral membranes and the brain and spinal cord from the nose as a focus.

It will be more convenient to speak of the bacteriology of the other affections of the nose and throat in connection with other subjects.

ATROPHIC RHINITIS.

The diseases with which the history of our subject is concerned, which have been profoundly affected in their nosology by bacteriological ideas, are especially diphtheria and tuberculosis; but other affections have also been persistently ascribed to their influence. Atrophic rhinitis, accompanied, as it usually is, by the foul-smelling secretions, very naturally fell under suspicion. Loewenberg described,⁶ in 1885, a bacterium constantly found in the secretions of ozæna, and this has been many times confirmed by other observers since then. Klamman,⁷ Thost,⁸ Seifert,⁹ Strauch,¹⁰ Valentin,¹¹ Hajek,¹² Reimann,¹³ Abel,¹⁴ and others contributed to the bacteriology of ozæna within a few years after Loewenberg's paper, but the

¹ Turner: Archiv f. Laryngologie, 1911, XXV, p. 265.

² Cobb: Transactions American Laryngological Association, 1909, p. 73.

³ Walter: Journal American Medical Association, September 24, 1910, LV, p. 1091.

⁴ Flexner: See a summary of the subject in Science, November 22, 1912, n. s., XXXVI, p. 685.

⁵ Levaditi: Comptes rendus de la soc. de biologie, April 27, 1912, LXXII, p. 651.

⁶ Loewenberg: Deutsch. med. Woch., Nos. 1, 2, 1885, XI, pp. 5, 22.

⁷ Klamman: Allg. med. central Ztg., 67, 1885, LIV, 1069.

⁸ Thost: Deutsche med. Woch., No. 10, 1886, XII, p. 161.

⁹ Seifert: Volkmann's Samml. klin. Vorträge, 1884, No. 240 (Inn. Med., No. 84), p. 2201.

¹⁰ Strauch: Monatssch f. Ohrenheilk, 6 and 7, 1887, XXI, pp. 149, 181.

¹¹ Valentin: Correspondenzblatt f. Schweizer Aerzte, 1887, XVII, p. 141.

¹² Hajek: Berl. klin. Woch., No. 33, 1888, XXV, p. 659.

¹³ Reimann: Inaug. Dissert. Würzb, 1888.

¹⁴ Abel: Centralblatt für Bakt., 1893, XIII, p. 161.

etiological importance of a bacterium, in spite of much recent literature as to other germs, has not been accepted as preponderating in the causation of atrophic rhinitis, and it cannot be said that bacteriology so far has materially elucidated the mystery of the etiology and pathology of this disease. This is in striking contrast with the history of the diphtheria germ, the study of which has led to such astonishing results in pathology, diagnosis, and therapy, and in fact in biology in general.

Etiology and Histology.—We have noted the tendency to regard the presence of some one or more of the microorganisms often associated with it as sufficient to explain the phenomena of atrophic rhinitis. With the advent of a more critical attitude toward bacterial theories of the etiology of disease, this tendency disappeared from the discussions of the etiology of ozæna and atrophic rhinitis. We have also noted the tendency to ascribe its primary factor to accessory sinus suppuration. This has attracted the attention from time to time chiefly of clinicians, but has failed to satisfy the demands for an explanation of the pathological histology of atrophic rhinitis.

It is within a comparatively recent period, at a date long subsequent to the invention of the laryngoscope and the application of posterior rhinoscopy to the study of nasal disease, that the various forms of chronic nasal inflammation were differentiated. In 1866 Weber,¹ who had devoted himself largely to the study of the ear, contributed an article to one of the reference hand-books of surgery on nasal disease from which it is quite apparent that atrophic rhinitis as we know it—non-syphilitic—without the presence of a foreign body, was undifferentiated at this time.

Zaufal,² in 1874, claimed that the ozæna present in some cases of catarrh is associated with a congenital deficiency in the development of the inferior turbinated bone. This idea that it is connected with a congenital bone defect was many years subsequently (1896) expanded in the work of Meisser to the conception that it is due to an abnormal wideness of the nasal fossæ, which is congenital. Alexander quotes Sauvages³ as having claimed in 1763 that it is due to the nose being too narrow. Hopmann,⁴ again in 1893, had claimed the nasal fossæ are congenitally too short. As recently as 1908 he has reiterated⁵ his belief in the shortening of the septum as an indication that a congenital conformation of the nasal fossæ is the cause of ozæna. Michel⁶ as early as 1876 declared that atrophic rhinitis is

¹ Weber: v. Pitha and Billroth, *Handbuch d. allg. und spec. Chirurgie*, Band III, 1 abth., 2 Heft, p. 177, 1866.

² Zaufal: *Aerztl. Correspondenzblatt f. Böhmen*, Nos. 23-24, 1874.

³ Sauvages: *de la Croix Nosologia Methodica*, Tome III, Amst., 1763.

⁴ Hopmann: *Archiv f. Laryngologie und Rhinologie*, 1893, I, Heft 1, p. 35.

⁵ Hopmann: *Zeitschrift f. Laryngologie, Rhinologie und ihre Grenzgebiete*, 1908, I, p. 305.

⁶ Michel: *Krankheiten der Nasenhöhle und des Nasenrachenraums*, Berlin, 1876.

essentially a disease of the accessory sinuses. This is still a prominent feature of discussions on the etiology of accessory sinus disease. It rested, especially at that time, upon insufficient differentiation. As in almost every domain of medicine, history here takes account of the differentiation of phenomena in the course of the discussion of theory and the acquisition of our knowledge of facts. Hartmann,¹ in 1878, as a result of postmortem examinations, had already refuted Michel's idea as to the genesis of ozæna in the accessory sinuses. He was inclined to accept Zaufal's theory. Tissier,² in 1894, claimed it to be a bone disease of the ethmoid labyrinth in the embryo and the infant. The accessory sinuses are thus affected in his view as a continuation of a congenital condition, the secretions forming a favorable medium for the growth of bacteria. Gerber,³ in 1900, examined the question of nasal anomalies in their relation to the etiology of ozæna, and came to the conclusion that roominess of the fossæ and a depressed nasal arch (*chamæprosopia* and *platyrhinia*) often combined with syphilis are predisposing factors. In later years there has been a recrudescence of the belief that ozæna is due to a necrosing ethmoiditis,⁴ and again the ethmoid and sphenoid cavities have been vigorously attacked.

Histology.—In the early work of B. Fraenkel⁵ may be noted the first attempt to separate cases of true ozæna from those of syphilitic ozæna. While he thus erected the typical atrophic rhinitis with ozæna into a separate entity, he failed to indicate that it is dependent also upon a bone change, as is the ozæna of a syphilitic nose. His idea that it is a specific change in the secretions was a natural prelude to the belief which soon arose that this depends upon some specific form of bacterial life. Naturally this left the atrophic bone change even more completely unprovided for than did the subsequent sinus theory of Grünwald and his followers, to which I have referred as starting with Michel. Fraenkel divided nasal catarrhs into hyperplastic and atrophic, regarding the latter as a sequel of the former. He also admitted the influence of various dyscrasias as etiological factors. More than thirty years later he had the satisfaction of reminding⁶ his colleagues that this early classification is today fundamentally the basis of differentiation of intranasal inflammations. In 1879 Eugen Fraenkel⁷ studied

¹ Hartmann: *Deutsche medizinische Wochenschrift*, March 30, 1878, IV, p. 145.

² Tissier: *Annales de médecine*, January, March, 1893; *Ibid.*, November, 1893; *Annales des maladies de l'oreille*, etc., No. 10, October, 1894, XX, p. 995; *L'ozène, son unité, ses lésions génératrices, sa traitement*, 1894.

³ Gerber: *Archiv f. Laryngologie*, 1900, X, p. 119.

⁴ Lavrand: *Archives internationales de laryngologie*, 1910, XXX, No. 2, p. 400.

⁵ Fraenkel: *Ziemssen's Handbuch der spez. Pathol. und Therap.*, 1 Aufl., 1876, IV, 1. Hälfte, p. 125.

⁶ Fraenkel: *Berliner laryngologische Gesellschaft*, ref. *Semon's Internat. Centralblatt f. Laryngologie*, 1907, XXIII, p. 115.

⁷ Eugen Fraenkel: *Virchow's Archiv*, 1879, LXXV, p. 45.

sections of the atrophic nasal mucosa under the microscope and noted changes in the epithelium, though he asserted that it is destroyed and replaced by other cells. He remarked on the few acinous glands to be observed. He believed there is always an underlying dyscrasia of tuberculosis or of syphilis. He believed there are always deep lesions of the mucosa and of the bone. In the same year Gottstein,¹ though believing in its systemic nature, recognized ozæna as a constant symptom of that stage of a chronic rhinitis in which it has come to an atrophy of the mucosa and of the glands in it. The vitiation of the secretions from this cause he proposed to treat by the use of intranasal tampons of cotton left in the nose for twenty-four hours or more. Hermann Krause,² in 1881, described microscopic appearances in two cases of ozæna and noted the presence of evidences of fat and fatty acids in the secretions and in the mucosa, fibrosis of the stroma and bloodvessels, and the relative increase of lymphoid cells. The destruction of glands he believed to be due to limitation of the blood supply and the fibrosis of the bloodvessels. These ideas were many of them introduced in America by Bosworth in several excellent papers³ in 1882 and in his "Treatise of the Diseases of the Nose and Throat." He believed atrophic rhinitis with ozæna was usually the sequence of a purulent rhinitis in childhood. Brügelmann,⁴ in 1884, looked upon the nature of ozæna as a suppuration of the nasal turbinated bones. He thought the increased dimensions of the nasal chambers an anomaly of development and he believed that this and a scrofulous diathesis are predisposing factors in the etiology.

Zuckerkindl brought the discussion to its more useful channels in refuting the fallacies of the theories dependent on a congenital bone defect or abnormality and in suggesting that the changes in the bone are apparently the result of an *intra vitam* inflammatory process, but it was a number of years before this view became the prevailing one. Many papers were written in support of the view that it is due to a congenital conformation of the nasal fossæ. These are reviewed in the paper of Meisser (l. c.) and the later one of Alexander. The paper of Cholewa and Cordes⁵ is to be mentioned as claiming that the essential lesion is a bone lesion, but a peculiar one, not of an inflammatory nature. As for the changes observed in the mucous membrane itself, these have been variously described as primary and secondary to a bone lesion

¹ Gottstein: Berliner klinische Wochenschrift, No. 37, September 16, 1878, XV, p. 554; Breslauer aerztliche Zeitschrift, 1879, No. 17, I, p. 169.

² Krause: Virchow's Archiv f. path. Anat., 1881, LXXXV, p. 226.

³ Bosworth: Transactions International Medical Congress, 1881, III, p. 329; Medical Record, June 10, 1882, No. 23, XXI, p. 617; Archives of Laryngologie, 1882, III, p. 232.

⁴ Brügelmann: Monatsschrift f. Ohrenheilkunde, 1884, No. 5, XVII, p. 91.

⁵ Cholewa and Cordes: Archiv f. Laryngologie und Rhinologie, 1898, VIII, p. 18.

by numerous observers, among whom we may name Habermann,¹ in 1886, Schoenemann,² in 1902, Oppikofer,³ in 1907, as representative of opinions expressed at isolated times. The whole question is exhaustively reviewed by Alexander.⁴

John N. Mackenzie,⁵ in 1884, expressed the belief that there is always a hypertrophic stage to atrophic rhinitis. Moure⁶ declared himself a sharer in the belief of Gottstein that the essential lesion in atrophic rhinitis lies in the glands. Habermann (l. c.) also accepted this view. The involvement of the serous and mucous glands is well established in present-day nasal histology, but it has never been generally accepted as a satisfactory exposition of the whole process or of its etiology.

Luc⁷ and Bronner,⁸ in 1887-8, again drew attention to the apparent association of ozæna and accessory sinus disease. Grünwald⁹ advocated this idea in his book on nasal suppuration and that other lesions also were the cause of it, such as adenoid vegetation, etc. Luc,¹⁰ in 1888, reported three cases of tracheal ozæna and a discussion as to priority in the observation of the affection arose with Massei. Zarniko¹¹ and others asserted that tracheal ozæna may exist without a nasal lesion. Potiquet¹² contributed a number of papers to the earlier discussions of atrophic rhinitis by modern rhinologists.

I have already referred under the heading of bacteriology to the literature of the microbial theories of the etiology of ozæna. The similarity of the bacillus found by Loewenberg, Abel, and Paulsen in ozænatous cases with the bacillus of Frisch and of both with the bacillus of Friedlaender led to much discussion as to the connection of ozæna, scleroma, and pneumonia.¹³ While most observers confirmed the early reports of various bacterial forms found in the secretions of ozæna, no one was able to demonstrate the presence of any of them in the subepithelial tissue of the mucosa itself, and some of the reputed specific forms were found in normal noses

¹ Habermann: *Zeitschrift f. Heilkunde*, 1886, VII, p. 361.

² Schoenemann: *Virchow's Archiv*, 1902, Band 168, p. 22.

³ Oppikofer: *Archiv f. Laryngologie und Rhinologie*, 1906, XIX, p. 28.

⁴ Alexander: *Ibid.*, 1909, XXII, p. 260.

⁵ Mackenzie: *Medical News*, October 4, 1884, No. 14, XLV, p. 370, and April 4, 1885, XLVI, p. 372.

⁶ Moure: *Compte rendu de la société française d'otologie et de laryngologie*, 1885.

⁷ Luc: *Société de médecine pratique*, February, 1887.

⁸ Bronner: *British Medical Journal*, March 3, 1888, I, p. 471.

⁹ Grünwald: *Münchener medizinische Wochenschrift*, 1893, No. 43, XL, p. 809.

¹⁰ Luc: *Archives de larynologie*, etc., February 15, 1888, I, p. 101; April 15 1888, I, p. 177.

¹¹ Zarniko: *Münchener medizinische Wochenschrift*, 1897, No. 30, XLIV, p. 846.

¹² Potiquet: *Revue hebdomadaire de laryngologie, otologie, rhinologie*, January 1, 1890, X, p. 8.

¹³ In addition to the publications already referred to of these authors see those of Strübing: *Münchener medizinische Wochenschrift*, 1895, No. 39-40, XLII, pp. 900, 933. Abel: *Zeitschrift f. Hygiene*, 1896, XXI, p. 89.

or in noses not the site of atrophic rhinitis. Perez¹ not only discovered a cocco-bacillus as the cause of ozæna but found it also in a dog, and injected into rabbits it caused gradual atrophy of the turbinated bones. He suggests that it is acquired by man from the dog. Hajek,² who made investigations on the bacterial contents of the nose, expressed his belief that the organisms found in ozænatous cases had little or nothing to do with the etiology of the disease. He believed that atrophic rhinitis has always a preliminary stage of hypertrophy. In the discussion on his paper in 1887, in which he asserted this and that the Friedlaender bacillus often found in the nose plays a secondary part even in pneumonia, he was opposed by Weichselbaum, Paltauf, and Roth.

Siebenmann,³ who was a collaborator with Meisser in the examination of cranial form as a factor in the etiology of ozæna, made a careful study of the histology of atrophic rhinitis, but he, as many other writers, laid a stress upon the specificity of the metaplasia of the epithelium of the surface which would not have been the case if such work had been controlled sufficiently by the examination of this element in normal noses and in other pathological conditions, since in adult life there is always much of it to be noted. Cozzolino⁴ believed the lesion first begins as a keratosis of the surface epithelium and becomes secondarily a bone disease. There was a tendency with many authors, as with Rethi,⁵ for example, to consider the ozæna as something specific and aside from the anatomical lesions of atrophic rhinitis.

I have noted that from time to time authors had incidentally remarked on the connection of tuberculosis and ozæna, owing to their having a common basis in malnutrition. Theisen,⁶ in 1904, made it the subject of a paper. Broeckaert⁷ contributed to the study of its histology the expression of his opinion that the disease was due to a toxin produced by a parasyphilitic or a paratuberculous systemic infection. These terms came into use about this time and their exact pathological significance is still enshrouded in mystery. Frese⁸ was of the opinion that most of the cases are of syphilitic origin. Sobernheim,⁹ in 1909, reported that seventeen cases of typical ozæna gave a negative Wassermann reaction, adding another proof to the view that the nasal affection may exist without any syphilitic antecedent. A number of others testified

¹ Perez: *Internat. Centralblatt f. Laryngologie*, 1909, XXV, p. 98.

² Hajek: *Berliner klin. Wochenschrift*, 1888, XXV, p. 659.

³ Siebenmann: *Correspondenzblatt f. Schweizer Aerzte*, Heft 5, 1900, XXX, p. 129.

⁴ Cozzolino: *Annales des maladies de l'oreille*, etc., April, 1894, XX, p. 492.

⁵ Rethi: *Archiv f. Laryngologie und Rhinologie*, 1894, II, p. 194.

⁶ Theisen: *Transactions American Laryngological Association*, 1904, p. 130.

⁷ Broeckaert: *La Presse d'oto-laryngologique belge*, 1905, No. 7, IV, p. 317. Ref., *Internat. Centralblatt f. Laryngologie*, 1906, XXII, p. 404.

⁸ Frese: *Archiv f. Laryngologie und Rhinologie*, 1908, XX, p. 459.

⁹ Sobernheim: *Internat. Centralblatt f. Laryngologie*, 1909, XXV, p. 318. *Archiv f. Laryngologie und Rhinologie*, 1909, XXII, p. 1.

to the same effect. It was spoken of as a larval tuberculosis.¹ Schoenemann,² in 1909, traced a connection between the occurrence of eczema and that of ozæna. From time to time various authors have suggested that ozæna is a trophoneurosis.³

Treitel⁴ made an attempt to determine the age at which ozæna first shows itself and concluded that in the great majority of cases it was in the school age of children that it developed—four to fourteen years. In all treatises on the subject since the affection was first differentiated by B. Fraenkel, the preponderance of the female sex in the cases affected by it was noted.

Treatment.—The treatment of atrophic rhinitis, especially of its chief symptom, ozæna, has been varied. Going back to the time of its differentiation, we have already noted that tampons were recommended by Gottstein and in the earlier history of rhinology we have seen that this was a common form of treatment for all nasal affections, the linen or other absorbent tampon being saturated with various medicaments. Cauterization was also recommended by the ancients for what they called ozæna, and in 1884-5 it was recommended⁵ again as a therapeutic agent in its modern differentiation. In most of the writers on the subject recommendation for treatment included thorough cleansing and the application subsequently of some stimulating medicament, like thymol, aristol, turpentine, ichthyol, etc. Braun, Laker, and Demme⁶ recommended (1891) vibratory massage. This was employed by others, either by hand or by electrically driven machinery. Faradism was also used,⁷ also the electrolytic application of chloride of copper,⁸ and submucous electrolysis.⁹ Dionisio¹⁰

¹ Caboche: *Annales des maladies de l'oreille*, etc., September, 1907, XXXIII, p. 260.

² Schoenemann: *Verhandlungen des Vereins deutscher Laryngologen*, 1909, p. 168.

³ Jouty: *Archives internationales de laryngologie*, 1909, XXIX, No. 3, p. 787. Baumgarten: *Archiv f. Laryngologie und Rhinologie*, 1909, No. 22, p. 492. Lavrand: *Archives internat. de laryngologie*, etc., 1910, XXX, p. 400.

⁴ Treitel: *Archiv f. Laryngologie und Rhinologie*, 1904, XVI, p. 336.

⁵ Garrigou-Désarènes, *Du catarrhe chronique . . . des fosses nasales et de l'ozène; traitement par la galvano caustique chimique*, Paris, 1888. Abeille: *Courrier médicale*, 1885, XXXV, p. 448. Ref., *Internat. Centralblatt f. Laryngologie und Rhinologie*, 1886, III, p. 6.

⁶ Braun: *Wiener medizinische Blätter*, 1890, XIII, p. 547; *Verh. d. X Int. Med. Cong.*, 1890, IV, abt. 12, p. 112. Laker: *Die Heilerfolge der inneren Schleimhautmassage . . .* Graz, 1892. Demme: *Deutsche medizinische Wochenschrift*, 1891, No. 46, XVII, p. 1262. For mechanical devices for vibratory massage of the mucosa for this and other affections see Daae: *Archiv f. Laryngologie und Rhinologie*, 1895, II, p. 265. Jankau: *Monatsschrift f. Ohrenheilkunde*, 1897, No. 5, XXXI, p. 207.

⁷ Garrison: *Journal of Ophthalmology, Otology and Laryngology*, October, 1893, V, p. 343.

⁸ Jouslain: *Revue internationale d'électrothérapie*, 21, April, 1892, II, p. 258.

⁹ Cheval: *Revue de laryngologie*, August 1, 1895, XV, p. 695. Bayer: *Münchener medizinische Wochenschrift*, Nos. 32-33, 1896, XLIII, pp. 744, 774. *Revue hebdomadaire de laryngologie*, 1896, No. 22, XVI, p. 641.

¹⁰ Dionisio: *Giornale del R. Accademia di Medicina di Torino*, January, 1902, Anno 65, Ser. 4, VIII, p. 44; July-August, 1903, Anno 66, Ser. 4, IX, p. 506.

employed various forms of phototherapy in ozæna, and in the same year (1903) Casassa¹ reported on the therapeutic use of radium.

Brindel,² in 1902, inaugurated the treatment of ozæna by the injection of paraffin under the atrophied mucosa and this method of treatment has persisted to the present time, it being strongly recommended by Hutter³ ten years later. Broeckaert,⁴ who adopted the idea promptly, subsequently supplemented it by more vigorous measures. It was practised by Fliess⁵ and by many other rhinologists for a time after this until the report of an embolus of the retinal artery in two or three cases of the injection of paraffin in the skin of the nose discouraged for a while frequent resort to it. On the strength of his belief that atrophic rhinitis with ozæna was the result of a disease of those cavities, Broeckaert,⁶ in 1905, in addition to the use of paraffin proposed to operate radically on the ethmoidal sinuses and to curette the sphenoid. He removed the middle turbinate, allowing the inferior to remain, reinforcing it with paraffin injections and injections of it also into the septal walls and floor of the nose. He proposed also to destroy the nasosinus wall of the antrum, but not to curette the latter unless it was diseased. He claimed the injection of paraffin was efficient not only as a prothesis filling out the large spaces, but as a stimulant modifying the nutrition of the mucosa. Guyot⁷ employed suction of the nasal chambers by mechanical methods in the treatment of ozæna. A number of cases were treated with injection of anti-diphtheritic serum because diphtheroid bacilli were found in the crusts, chiefly by Italians.⁸ Skillern and Holmes⁹ used vaccines made from the pure culture of the Abel bacillus. Emulsions of the culture of the lactic acid bacillus have been used by many in the treatment of ozæna.¹⁰ Foy,¹¹ in 1911, claimed considerable benefit can be attained by the patients being taught to breathe persistently

¹ Casassa: *Archivio Ital. di Otologia, Rhinologia e Laryngologia*, August, 1903, XIV, p. 464.

² Brindel: *Presse médicale*, June 7, 1902, X, p. 546.

³ Hutter: *Archiv f. Laryngologie und Rhinologie*, 1911, XXIV, p. 189.

⁴ Broeckaert: *La Belgique Médecine*, Nos. 42-43, 1903, X, pp. 705, 723; *Annales des maladies de l'oreille, etc.*, 1903, XXIX, pt. 2, p. 59.

⁵ Fliess: *Berliner laryngologische Gesellschaft*, November 13, 1903; *Ref., Internat. Centralblatt f. Laryngologie und Rhinologie*, 1904, XX, p. 255.

⁶ Broeckaert: *La Presse oto-laryngologique belge*, 1905, No. 7, IV, p. 317; 1906, No. 5; *Belg. oto-laryngologische Gesellschaft*, December 10, 1905; *Ref., Internat. Centralblatt f. Laryngologie*, 1906, XXII, p. 273.

⁷ Guyot: *La Clinique*, (Bruxelles) 1906, No. 24, XX, p. 468.

⁸ Belfanti and della Vedova, Gradenigo, Arslan and Caterina: *Archivio Italiano di Otologia*, Nos. 2-3, 1896, IV, pp. 189, 195, 331. Compared: *Annales des maladies de l'oreille, etc.*, No. 5, 1897, XXIII, pt. 1, p. 464. Molinié: *Annales des maladies de l'oreille, etc.*, No. 4, 1899, XXV, pt. 1, p. 430.

⁹ Skillern and Holmes: *New York Medical Journal*, August 15, 1908, Vol. 88, p. 307.

¹⁰ Stepinski: *Archives internationales de laryngologie*, 1910, XXX, p. 79.

¹¹ Foy: *Annales des maladies de l'oreille*, 1911, No. 12, XXXVI, pt. 2, p. 531.

and properly through the nose. Ozaena has been treated with hot air, dry or moist.¹

In the January, 1912, number of Semon's "Centralblatt für Laryngologie," etc., there is a very valuable review of the literature of ozaena during the years 1909, 1910, 1911 by Alexander. Among the points to which he gives prominence is the inequality in the distribution of cases geographically, racially and socially, its incidence as to sex and age. He drew attention to the fact that while the Wassermann reaction in his own experience and in that of others had given negative results in cases of ozaena, he had himself seen a typical case of ozaena, the offspring of a syphilitic father, the sister of a congenitally syphilitic brother, and in her case the Wassermann reaction was also negative. He also drew attention to the fact that while ozaenatous subjects rarely contract syphilis, such cases have been reported by Fraenkel and Sobernheim (l. c.) and others, and that the question of the relationship of true ozaena to syphilis is not by any means settled. It may be remarked that the subject is much embarrassed by the confusion which still reigns as to the clinical differentiation of the cases. With syphilitic ozaena on the one hand and atrophic rhinitis on the other, without crusts or odor, it is difficult for an author to keep constantly in view the typical cases of atrophic rhinitis with ozaena. The confusion is increased by the introduction of the consideration of accessory sinus disease attended by intranasal crust formation. In this excellent review it can be plainly seen that with the exception of the therapy, which is always new, optimistic, and futile, there has been scarcely a question raised in the literature of the subject during the three-year period with which it is concerned that had not been thoroughly discussed in the former three decades in discussions of the phenomena presented by ozaena.

TUBERCULOSIS OF THE UPPER AIR PASSAGES.

We must now continue our study of the history of tuberculosis in the upper air passages. There can be no doubt that the recognition of the bacillus, as the specific agent of contagion, had very much to do with the stimulation of the hope of finding a cure for its manifestations in the upper air passages. Its recognition in the early part of this century, confused as it was with syphilis, was nevertheless enough for the formation of a hopeless prognosis. The differential diagnosis between syphilis and tuberculosis of the larynx was still very incomplete when laryngoscopy came into use. Notwithstanding the false idea of Louis, which Rheiners'

¹ Thost: Congrès International de médecine, 1909, Sec. 15, Proc. ver., p. 29. Moller: Verhandlungen des Vereins deutscher Laryngologen, 1910, p. 318.

contributions¹ had fostered, as to the frequent coincidence of catarrhal laryngeal ulcers with tubercular disease of the lungs, Türck's Atlas and his graphic descriptions² in 1866 did much to familiarize observers with the varying appearances of syphilitic and tubercular laryngitis. Five years before this Gerhardt and Roth had recorded their experiences in the observation of cases they called syphilitic disease of the larynx,³ but at that early date in laryngoscopy much confusion in the differential diagnosis is to be expected.

Mixed Infection.—In fact, we very early find the observation of what is still supposed to be the combined form of syphilitic and tubercular laryngitis. Schnitzler wrote of it in 1868,⁴ and subsequently returned to the subject with increased interest and wider experience in 1890.⁵

Virchow's remarks on tubercle threw a flood of light on the morbid processes in the lungs, and did more than anything else to dispel the confusion which reigned as to the pathogenesis of tubercle and its affinities to caseous degeneration. It seems wonderful reading now, forty years after it was written, that about the only gaps he left in the correct description of the pathogenesis of tubercle were those which later were filled by the discovery of the tubercle bacillus. He thus refers to laryngeal tubercle: "In the very frequent tuberculosis of the larynx, small, flat, clear, gray, or whitish-gray swellings are found, which hardly project beyond the surface."⁶ He rejected, with Rokitansky, the idea of Louis that laryngeal ulcers in phthisis pulmonalis are due to mechanical causes, and he declared the larynx is one of the best places in the body to study tubercle. In the matter of laryngeal ulceration he was not supported by Rindfleisch,⁷ who to some extent accepted the view of Louis. Ten years later we may note Bosworth maintaining the non-tubercular character and the curability of laryngeal ulceration in phthisis.⁸ Schech,⁹ in the following year, while admitting their occurrence, regarded it as very rarely simple catarrhal, but usually as tubercular. Krishaber, in 1881, while not reluctant to admit that laryngitis arising in a tubercular subject may become ulcerative, without the morbid process having previously existed at that point, nevertheless recognized the tubercular form to be the usual one.¹⁰ Perhaps the last important recrudescence of this attractive idea of Louis is to be noted in the

¹ Inaugural Thesis, *Die Histologie des Kehlkopfs*, 1852. Rheiner: Virchow's Archiv f. path. Anat., 1853, V, p. 534; Ueber den Ulcerationprozess im Kehlkopf.

² Türck: *Klinik der Krankheiten des Kehlkopfs*, Wien, 1866.

³ Gerhardt and Roth: Virchow's Archiv f. path. Anat., 1861, XXI, p. 7.

⁴ Schnitzler: Wiener med. Presse, 1868, No. 14, seq., IX, 321.

⁵ Virchow: International klin. Rundschau, 1890, No. 34, seq., IV, p. 1402.

⁶ *Die Krankhaften Geschwülste*, 1864-5, Band II, p. 642.

⁷ *Lehrbuch der path. Gewebelehre*, Leipzig, 1867-69.

⁸ Bosworth: Boston Med. and Surg. Journ., April 17, 1879, C, p. 544.

⁹ Schech: Aertzl. Intelligenzblatt, 1880, No. 41, XXVII, p. 443.

¹⁰ Krishaber: Trans. Internat. Med. Cong., 1881, III, p. 208.

monographs of Heryng,¹ in 1884, who insisted that he had observed ten cases. Doubtless the entertainment of this belief had much to do with the subsequent enthusiastic manner in which he sought and claimed the attainment of a cure for tubercular laryngitis.

Forms of Tuberculosis.—It early became apparent that the lesions of tuberculosis were multiform. In the early days of our knowledge of the tubercle bacillus, lupus of the skin was supposed to have nothing to do with tuberculosis of the skin, but the identification of lupus of the skin with tuberculosis soon became formally established and the identification of certain forms of tuberculosis in the throat with the lesions upon the skin, which are placed under the classification of lupus, was introduced into laryngeal nomenclature shortly before the close of the nineteenth century. Tuberculoma appears to have been noted by Tobold, Mandl, Störk, Michel, Ariza² at an earlier date, but in 1882 John N. Mackenzie³ specifically under that head described a tumor of the larynx. Many have been reported since that date, most recently by Sanderson.⁴ It was a matter of some clinical importance from a differential diagnostic stand-point that the occurrence of smooth, non-ulcerative tumors of the upper air passages should be recognized as occasionally being due to tuberculosis.

Primary.—In 1881 interest was aroused by the discussion as to the question of the occurrence of a primary tubercular laryngitis.⁵ Fraenkel declared he had seen instances of it in which pulmonary phthisis had later supervened. Voltolini doubted if this were actually the case. Krishaber declared he had never seen a case recover, but others were less skeptical, while Gerhardt thought catarrhal ulcers in pulmonary phthisis subsequently became tubercular.

Infection.—The health officer of Florence in 1754 published an edict to avoid the consequences of phthisical disease in which every physician of Tuscany was charged to report to the city tribunal every case of phthisis in such form that, in case of death, proper disinfecting methods might be adopted. They were to see that excrementitious matter was carefully removed and that spitting cups should be employed which should be frequently changed and washed. After death, clothes and linen were to be boiled twice in a solution of lye; the furniture brushed and washed twice and the wall white-washed. Doors and windows were to be freely opened, that the air might fully dissipate the infection.⁶

The contagiousness of phthisis had been asserted from time to time in the history of medicine, and Villemin had proved it

¹ Heryng: Contribution a l'étude des érosions, dites catarrhales.

² See: Trautmann, Archiv für Laryngologie, 1901, XII, p. 27.

³ Mackenzie: Archives of Medicine, N. Y., October, 1882, VIII, p. 107.

⁴ Sanderson: The British Medical Journal, April 5, 1913, I, p. 703.

⁵ Vid.: Trans. Internat. Med. Congress, 1881, III, p. 213.

⁶ Revue Scientifique, June 15, 1912, L, 1 semestre, p. 754.

experimentally in animals, but it remained for Koch, who had noted the spores of the anthrax bacillus in 1876, to demonstrate the tubercle bacillus in 1882. Immediately the diagnostic value of its identification in ulcers of the larynx was appreciated, though perhaps somewhat exaggerated, by Fraenkel, in 1883,¹ in establishing their tubercular character. Much stress was also laid on this diagnostic value of the bacillus by Hunter Mackenzie² and Voltolini.³ The latter, however, doubted the proof of its infectiousness in man.

The methods of general infection in tuberculosis is a matter of considerable interest to the laryngologist, but the history is one of general medicine, and I can only refer to it in an incomplete manner. The numerous works of Koch and Flügge seemed to demonstrate the method of infection of the lungs is by direct inhalation of bacilli floating in the air current. The work of Hildebrandt⁴ and of Wright⁵ and others seems to show that a large number, if not all, of the microorganisms in the inspired air are deposited on mucous surfaces before they reach the lungs. It was, early in the history of bacteriology, rendered very probable that once deposited on the damp surfaces of the mucosæ of the upper air passages they are not aspirated by subsequent inhalations into the pulmonary tract.⁶ Straus⁷ and Freudenthal,⁸ in 1895 and 1896, reported finding tubercle bacilli in apparently healthy noses, where they had been deposited by the air current upon the damp surfaces.

The Routes of Infection.—In 1885 Arnold⁹ had first shown the apparent origin of anthracosis in the lungs to be by way of the air current. Improbable as this seemed to be in the face of the consideration that the bacterial contents of the inspired air would be deposited upon the damp surfaces and that the residual air in the lungs extends into the bronchi, the infection directly from the air current was not at first called into question, but in 1902 Saenger¹⁰ denied this and, in 1905, Vansteenbergh and Grysez¹¹ adduced

¹ Fraenkel: *Berliner klinische Wochenschrift*, January 22, 1883, XX, p. 45; April 7, 1884, XXI, p. 214.

² Hunter Mackenzie: *Edinburgh Med. Journ.*, February, 1884, XXIX, p. 681.

³ Voltolini: *Allg. Wien. med. Ztg.*, 13, 14, 1884, XXIX, p. 137, 149; *Monatssch. f. Ohrenheilk.*, 3 and 4, 1884, XVIII, 37, 57.

⁴ Hildebrandt: *Ziegler's Beiträge zur pathologischen Anatomie*, 1888, II, p. 411.

⁵ Wright: *New York Medical Journal*, July 27, 1889, L, p. 92.

⁶ Nenninger: *Zeitschrift f. Hygiene*, 1901, XXXVIII, p. 94. Paul: *Zeitschrift f. Hygiene*, 1902, XL, p. 468. Ficker: *Archiv für Hygiene*, 1905, LIII, p. 50; LIV, p. 354. Bartel: *Wien. klinische Wochenschrift*, 1905, 1906, 1907. Beitzke: *Virchow's Archiv*, 1906, Band 184, p. 1; 1907, Band 187, p. 183; 1907, Band 190, Beiheft, p. 58; 1908, Band 194, Beiheft, p. 225. *Verhandlungen der deutschen pathologischen Gesellschaft*, 1912, XV, p. 100.

⁷ Straus: *Tuberculose et son bacille*, Paris, 1895.

⁸ Freudenthal: *Archiv für Laryngologie*, 1896, V, p. 124.

⁹ Arnold: *Untersuchungen über Staubinhalation und Staubmetastase*, 1885.

¹⁰ Saenger: *Virchow's Archiv f. path. Anat.*, 1902, Band 167, Heft 1, p. 116.

¹¹ Vansteenbergh and Grysez: *Sur l'origine intestinale de l'anthracose pulmonaire*, *Annales de l'Institut. Pasteur*, 1905, XIX, p. 787. Calmette and Guérin: *Annales de l'Institut. Pasteur*, 1906, XX, p. 353.

evidence that its origin is intestinal, carried down the gastrointestinal canal, absorbed and carried to the lungs in the lymph current, though Villard is said to have asserted this as long ago as 1862 for anthracosis. Beitzke,¹ in 1906, strongly combated this assumption and by experimental evidence, which included tying off one bronchus in a narcotized animal, showed that the dust was to be found after inhalation experiment only in the lung which had not been cut off.

Materially influencing all the ideas of infection of tuberculosis was the assertion of v. Behring,² who, in 1903, expressed the belief which has been entertained ever since by increasing numbers of medical men that the tubercle bacillus enters the system of all human beings in an early period of life, in the majority of cases in infancy and adolescence, and remains dormant there perhaps until late adult life. His assertion, however, that the infection thus contracted in childhood is of bovine origin has not been sustained, though the extent to which it is due to the bovine and the human type of bacillus respectively had not been settled.

The paper of Pflügge,³ published in 1904, attracted some attention. His idea was that the bacillus is carried in globules of sputum coughed out by phthisical patients. This led many laryngologists to take precaution to avoid infection by interposing glass screens between themselves and the patients they were examining. He denied that the tubercle bacillus was ubiquitous in spite of the statistics of Naegeli, who had asserted that practically all of the human race shows evidence of previous tuberculous infection at postmortem when they are forty years old. Much interest was excited at one time in the discussion as to the question of whether tubercle always develops at the site of the entrance of the bacillus into the tissues. Baumgarten⁴ and his school were advocates of this idea, which has not received extensive endorsement, since it would negative the idea of primary surface infection by way of the upper air passages in any but a very small proportion of those cases showing pulmonary or other tuberculous lesions. We have already spoken of the infection of the tonsils with tuberculosis and of the literature which arose concerning latent tubercle in the lymphoid tissue. Virchow as early as 1868 had surmised that a more careful examination would reveal this lesion in the tonsils, and in almost his last publication, in 1902,⁵ he reiterated also a previous statement in regard to the difference between the anatomical

¹ Beitzke: l. c.

² V. Behring: *Deutsche medizinische Wochenschrift*, September 24, 1903, XXIX, p. 689.

³ Pflügge: *Deutsche medizinische Wochenschrift*, January 28, 1904, XXX, p. 161.

⁴ Baumgarten: *Verhandlungen der deutschen pathologischen Gesellschaft*, 1905, V, p. 5; *Berliner klinische Wochenschrift*, October 8, 1906, XLIII, p. 1333.

⁵ Virchow: *Virchow's Archiv f. path. Anat.*, 1902, Band 167, Heft 1, p. 1.

tubercle of cattle and of man. Into the enormous literature, which sprang up owing to Koch's declaration that both the bacillus and the lesion were different and had little to do with one another in cattle and man, I cannot go. I may, however, refer to the recent work of Park and Krumwiede,¹ in which they demonstrate that although the tubercle bacillus of cattle rarely causes fatal lesion in adult man, it is the cause of tuberculosis affecting children in a considerable proportion of the cases.

Chiari,² in 1899, expressed the belief that not only did primary tuberculosis occur in the upper air passages, but that direct pulmonary infection by inhalation was rare, and that secondary systemic infection from primary lesions in the upper air passages by deglutition and by aspiration to the gastro-intestinal tract and to the lungs was the root of much systemic tuberculosis.

The question as to whether the tubercle bacillus can pass through the sound epithelium was discussed early and in many papers.³ Schech⁴ was an advocate of Baumgarten's contention that after the bacillus had passed there was, as a rule, formed a tuberculous lesion beneath the epithelium. Schech was also a believer in the passage of the bacillus directly through the mucosa, and Wright,⁵ as early as 1896, showed the bacilli in the surface epithelium of a tuberculous larynx distributed in such a way that there seemed no doubt that they were passing through from the surface.

Primary Laryngeal Tuberculosis.—In connection with this also the question of the occurrence of primary tuberculosis was often the subject of discussion, but the question was a matter difficult to settle, inasmuch as patients rarely died so long as the tuberculous lesion was confined to its apparent origin in the upper passages. The matter was discussed by Bernheim,⁶ Jouane,⁷ Gleitsmann,⁸ while Hedinger⁹ demonstrated the phenomenon at postmortem examination in which a tuberculous lesion was shown in the trachea and bronchi of a patient who showed no other tuberculous lesions elsewhere in the body. V. Hansemann and Schmorl had seen other cases.

On the whole, however, the evidence was insufficient to account for all cases of systemic tuberculous infection by assuming that the bacilli are absorbed from the surfaces of the upper air passages.

¹ Park and Krumwiede: *Journal of Medical Research*, 1910, XXIII, 2, p. 205.

² Chiari: *Berliner klinische Wochenschrift*, Nos. 45-47, 1899, XXXVI, pp. 984, 1007, 1035.

³ E. Fraenkel: *Virchow's Archiv f. path. Anat.*, 1890, Band 121, p. 523. Bollinger; *Münchener medizinische Wochenschrift*, 1890, No. 33, XXXVII, p. 567. Kafemann: *Behandlung der Larynxphthise*, *Deutsche medizinische Wochenschrift*, 1889, XV, p. 370.

⁴ Schech: *Heymann's Handbuch*, 1898, I, 2. Hälfte, p. 1109.

⁵ Wright: *New York Medical Journal*, September 26, 1896, LXIV, p. 412.

⁶ Bernheim: *Rev. méd. suisse romande*, 1900, XX, p. 501; ref., *Internat. Centralblatt für Laryngologie*, 1901, XVII, p. 152.

⁷ Jouane: *Thèse de Toulouse*, 1900.

⁸ Gleitsmann: *The Laryngoscope*, June, 1904, XIV, p. 431.

⁹ Hedinger: *Verhandlungen der pathologischen Gesellschaft*, 1904, VII, p. 83; *Centralblatt für allgemeine Pathologie und pathologische Anatomie*, 1904, XV, p. 538.

Nor was this materially strengthened by the contention of Thost,¹ who in 1895, asserted that infection finds entrance through solutions of continuity in the epithelium of the surface and of the gland acini and ducts. It was necessary to postulate the assumption that bacilli are carried by the food into the gastro-intestinal tract and there pass the epithelium,² many claiming they appear in the lymph glands before they set up recognizable lesions elsewhere.³

Recent ideas as to the possibility that there is a reversed action of the cilia of the gastro-intestinal and respiratory tracts under certain conditions have done much to give *à priori* plausibility to much that seemed contradictory in the experimental and clinical evidence. The idea that the bacilli are deposited on distant surfaces necessitated the assumption that they are carried to the lungs either in the lymph stream or the blood stream.⁴ Recent investigations have rather invalidated the idea of their being carried in the lymph stream accounting for the distant transport of infection, but as observers have depended largely upon anatomical investigations (among these I have referred to Beitzke's work), for this conclusion, the matter cannot be considered as settled.

Nasal Tuberculosis.—Virchow⁵ had noted the occurrence post-mortem of nasal tuberculosis. Willigk had also observed it and in 1877 Laveran had spoken of a case of a nasal lesion he had observed which he supposed was tubercular, but Riedel seems to have been the first to report⁶ well-authenticated cases. Later Tornwaldt reported⁷ a case, and Weichselbaum advanced⁸ the

¹ Thost: Monatsschrift für Ohrenheilkunde, 1895, No. 2, XXIX, p. 39.

² It is quite impossible to cite anything but a modicum of the enormous literature on this subject. In addition to those already mentioned see *For passage through the intact mucosa*: Cornet and Kossel: Kolle and Wassermann, Handbuch der pathogenen mikroorganismen, 2 Aufl., Band V, 1912, p. 391 (see his bibliography). Hilgermann: Archiv für Hygiene, 1905, LIV, p. 335. Uffenheimer: Deutsche medizinische Wochenschrift, No. 46, 1906, XXXII, p. 1851. Plate: Archiv für Wiss. u. prakt. Tierheilk., 1906, XXXII, p. 186. Orth and Rabinowitsch: Virchow's Archiv, 1908, Band 194, Beihefte, p. 305. Orth: Lehrbuch der speciellen pathologischen Anatomie, Berlin, 1887. Wesener: Kritische und experim. Beiträge zur Lehre von der Fütterungstuberkulose, Freiburg, 1885. Baumgarten: Berliner klinische Wochenschrift, 1899, XXXVI, 893; 1900, XXXVII, p. 136; 1901, XXXVIII, pp. 894, 1101, 1136, 1161; 1905, XLII, p. 1329. V. Behring: Deutsche medizinische Wochenschrift, 1903, XXIX, p. 689; 1904, XXX, p. 193. Arloing: Compt. rend. Soc. Biol. 1903, LV, p. 480. *Against passage through sound mucosa*: Takeya and Dodd: Arbeiten aus der path. Inst. Tübingen, Band 6, 710. De Vecchi: Centralblatt für allgemeine Pathologie, 1909, XX, p. 786. Klimenko: Zeitschrift für Hygiene, 1904, XLVIII, p. 67.

³ Bartel: l. c. Korvacs: Ziegler's Beiträge, 1907, XL, p. 281. Plate: l. c. Hermann: 6 Internat. Tuberculose Konferenz, Wien, 1907, Bericht, p. 103.

⁴ The literature on this subject cannot be given further here. I can only refer in addition to early laryngological papers by: Beschorner: Die locale Behandlung der Kehlkopfschindsucht, 1888. Pfeiffer: Zur Behandlung der Kehlkopf und Lungentuberkulose, Leipzig, 1890. Krieg: Medizinisches Correspondenzblatt, 1894, No. 32, LXIV, p. 249.

⁵ Virchow: Die krankhaften Geschwülste, 1864-5, II, p. 651.

⁶ Riedel: Deutsche Zeitsch. f. Chirurgie, 1878, X, p. 56.

⁷ Tornwaldt: Deutsches Arch. f. klin. Med., 1880, XXVII, p. 586.

⁸ Weichselbaum: Allg. Wien. med. Ztg., 1881, No. 27, XXVI, p. 268.

assertion, thus far unsupported, that the severe form of what he called scrofulous ozaena is dependent on miliary tubercle. He also pointed out the rarity of these cases. Cartaz,¹ Schaeffer,² and Bresgen³ reported a number of cases in 1887.

Treatment of Tuberculous Laryngitis.—In the seventeenth century Marcellus Donatus⁴ refuted the declaration of Galen that ulcers of the arteria aspera are easily cured.

In the treatment of tuberculous laryngitis it would be no exaggeration to say that almost every drug which can be volatilized or dissolved and used as a spray has been used.⁵ Applications and submucous injections of lactic acid, iodoform, and creosote were initiated by Heryng and Krause while the employment by them and others of scarifications, curettage, morcellement prevailed as routine methods until recent years. The more exceptional methods of galvanocauterization,⁶ electrolysis,⁷ tracheotomy,⁸ thyrotomy,⁹ even extirpation of the larynx¹⁰ all had their advocates, with reports of an imposing array of cures. Tuberculin was used after its efficiency in the general treatment was announced by Koch in 1890 and it has been employed ever since, though a brilliant review of results by Semon¹¹ promptly called its value into question. Intratracheal injections,¹² sunlight,¹³ and Röntgen rays¹⁴ must not be forgotten in the enumeration.

Notwithstanding this imposing array of therapeutic measures, most of them supported by results attained by the reporter which no one else could secure, the general consensus of opinion as to the

¹ Cartaz: *La France médicale*, 1887, No. 84, XXXIV, p. 1007.

² Schaeffer: *Deutsche medizin. Woch.*, 1887, No. 15, XIII, p. 307.

³ Bresgen: *Deutsche medizin. Woch.*, 1887, No. 30, XIII, p. 663.

⁴ Donatus: *De Historia Medica Mirabili Lib.*, Francofurti a. M., 1613, III, Cap. I.

⁵ For an extensive bibliography upon this and other points in the therapy of laryngeal tuberculosis see Schech: *Heymann's Handbuch*, Wien, 1898, I, 2. Hälfte, p. 1109.

⁶ Grünwald: *Münchener medizinische Wochenschrift*, 1903, No. 25, L, p. 1069. Krieg: *Archiv für Laryngologie und Rhinologie*, 1904, XVI, p. 288.

⁷ Tovolgyi: *Ref.*, *Internat. Centralblatt für Laryngologie*, 1904, XX, p. 354. Baumgarten: l. c.

⁸ Moritz Schmidt: *Die Krankheiten der oberen Luftwege*, Berlin, 1894. Gaudier: *Echo Méd. du Nord*, June 12, 1904, VIII, p. 283. Henrici: *Münchener medizinische Wochenschrift*, 1904, No. 1, LI, p. 43; *Archiv für Laryngologie und Rhinologie*, 1904, XV, p. 323; 1906, XVIII, p. 88.

⁹ Goris: *Ref.*, *Internat. Centralblatt für Laryngologie*, 1905, XXI, p. 79. Stein: *The Laryngoscope*, October, 1904, XIV, p. 777.

¹⁰ Gluck: *Extirpation of Tongue, Larynx, etc.*, *Internat. Centralblatt für Laryngologie*, 1906, XXII, p. 475; *Internat. Centralblatt für Laryngologie*, 1907, XXIII, p. 114. Barwell: *Epiglottidectomy*, *Internat. Centralblatt für Laryngologie*, 1907, XXIII, p. 76; *The Lancet*, November 10, 1906, II, p. 1277.

¹¹ Semon: *Internat. Centralblatt für Laryngologie*, 1891, VIII, p. 223.

¹² Sorgo: *Wiener medizinische Wochenschrift*, 1905, No. 5, LV, p. 246. Baer: *Wiener klinische Wochenschrift*, 1906, No. 10, XIX, p. 271.

¹³ Kramer: *Archiv für Laryngologie und Rhinologie*, 1909, XXI, Heft 3, p. 519. Nepveu: *Bulléin de l'Académie de Médecine*, October 19, 1909, 3 sér., LXII, p. 197.

¹⁴ Winkler: *Internat. Centralblatt für Laryngologie*, 1905, XXI, p. 457.

curability of laryngeal phthisis was most pessimistic. Küttner,¹ in 1902, drew attention to the evil influence of pregnancy upon the course of the affection, and his observations were quickly confirmed by many others. Although, in 1880, tuberculosis of the larynx was regarded as incurable and although for many years this was the expressed opinion of a respectable number and the tacit opinion of the majority of laryngologists, numerous *bona fide* reports of its cure may be found even in the comparatively early days of the institution of active treatment. By 1898 Schech (l. c.) cited numerous instances of it.² As a matter of fact even cases of spontaneous healing had been noted by Störk³ before 1880 and since 1898 by Némai.⁴ Bergengrün⁵ was among the first to avow the futility of local treatment alone and the frequent efficacy of modern general therapy in the cure of local lesions. It was in 1906 that Semon⁶ first emphasized in numerous papers the value of absolute silence and rest of the larynx in the treatment of laryngeal phthisis. Other communications by Luc,⁷ Lublinski,⁸ and others have confirmed it, and it may be safely said that at present every other form of local therapy combines this with it and with that of a general systemic and hygienic regime, and that this has done much to banish the pessimism and hopelessness with which laryngologists, as a rule, formerly viewed a case of tuberculous laryngitis.⁹

¹ Küttner: Archiv für Laryngologie und Rhinologie, 1902, XII, Heft 3, p. 311. Berliner klinische Wochenschrift, 1905, No. 29-30, XLII, pp. 901, 945; Monatsschrift für Ohrenheilkunde, 1901, No. 11, XXXV, p. 467. Veis: Monatsschrift für Ohrenheilkunde, 1902, No. 4, XXXVI, p. 129. Seifert: Die Heilkunde, 1903, No. 2, VII, p. 49. Löhnberg: Münchener medizinische Wochenschrift, 1903, No. 8, L, 328. Godskesen: Archiv für Laryngologie und Rhinologie, 1903, XIV, Heft 2, p. 286. Lewy: Archiv für Laryngologie und Rhinologie, 1904, XV, Heft 1, p. 114. Levinger: Münchener medizinische Wochenschrift, 1906, No. 23, LIII, p. 1110.

² M. Schmidt: l. c. Lauenberg: Münchener medizinische Wochenschrift, 1890, No. 17, XXXVII, p. 304. Przedborski: Verhandl. d. X Internationalen med. Congresses, 1890, IV, abt. 12, p. 147. Krieg: l. c. Bergengrün: Archiv für Laryngologie und Rhinologie, 1895, II, p. 153. Thost: l. c. Hajek: Centralblatt für die gesamte Therapie, No. 2, 1895.

³ Störk: Klinik der Krankheiten des Kehlkopfes, 1880.

⁴ Némai: Internat. Centralblatt für Laryngologie und Rhinologie, 1901, XVII, p. 496.

⁵ Bergengrün: St. Petersburger medizinische Wochenschrift, 1902.

⁶ Semon: British Medical Journal, 1906, II, 1623; Medical Record, December 15, 1906; Berliner klinische Wochenschrift, 1906, No. 47, XLIII, p. 1498.

⁷ Luc: Rev. gén. de Clin. et de Thér. Journal des Practiciens, February 2, 1907, XXI, p. 65.

⁸ Lublinski: Berliner klinische Wochenschrift, 1906, No. 52, XLIII, p. 1657.

⁹ The reader may be referred to some of the discussions which took place from time to time in laryngological societies in order to appreciate this, and to monographs on the subject, some of which did not partake of this somber view of the matter; British Medical Association, 1901-1905, Internat. Centralblatt für Laryngologie, 1903, XIX, p. 34; 1906, XXII, p. 194. Verein westdeutscher Hals und Ohren Aerzte, December, 1902, Internat. Centralblatt für Laryngologie, 1904, XX, p. 52. Grünwald: Die Therapie der Kehlkopftuberculose mit besonderer Rücksicht auf den galvanokaustischen Tiefenstich und äussere Eingriffe, München, 1907. Besold and Gidionsen: Pathologie und Therapie der

RHINOSCLEROMA.

There is hardly a disease of the upper air passages which presents those fascinations of the unknown to the student of medicine to the degree which is revealed by an acquaintance with the known facts of rhinoscleroma. Sharply confined in its insidious initial stages to persons residing in a limited and fairly well-defined geographical region, regularly associated with a bacillus indistinguishable from those found in other pathological lesions of an entirely different nature and from those found not infrequently in the normal upper air passages, rhinoscleroma has baffled epidemiologist, bacteriologist and histologist alike in the searching inquiry which has been made into its etiology.

In 1870 Hebra¹ first described the condition as seen in the nose, differentiating it from the tertiary and the other stages of syphilis. In attempting to classify it on a histological and clinical basis, Kaposi,² in 1872, regarded it as belonging to the granulosarcomata. In the same year, Geber³ placed it among the inflammatory granulomata. The question as to whether it belongs to the subdivision of infectious granulomata is still unsolved. It is to Mikulicz⁴ we owe the first accurate histological description in 1876 of the formation of the scar tissue and the identification of the peculiar pathognomonic foam or lace-like cells to which his name has been attached. Notwithstanding this, he conjectured it might have some connection with syphilis. This, Schmiedicke,⁵ in 1880, definitely refuted. Ganghofner,⁶ in 1881, referring to those cases in which the lesion was confined to the larynx, limited the name to the term scleroma. Frisch,⁷ in 1882, and Pellizzari,⁸ in 1883, showed that the bacillus was constantly present in the foam cells and in the lymph spaces; this was confirmed by Cornil⁹ in a memoir of the same year and subsequently in 1884 in his text-book. Chiari and Riehl,¹⁰ in 1885, more fully described its clinical aspects. In the next year and in 1887 many articles appeared on the subject and Bender¹¹ gave an historical account of it up to that time.

Kehlkopftuberculose, Berlin, 1907. Imhofer: Die Geschichte der Kehlkopftuberculose vor Erfindung des Kehlkopfspiegels: Bresgen's Sammlung zwangl. Abh. . . . Nasen, . . . 1908, IX, Heft 7-8. Lockard: Tuberculosis of the Nose and Throat, St. Louis, 1909.

¹ Hebra: Wiener medizinische Wochenschrift, 1870, XX, p. 1.

² Kaposi: Virchow's spec. Path. und Therap., 1872, III, 2, p. 288.

³ Geber: Archiv für Dermatologie, 1872, IV, p. 493.

⁴ Mikulicz: Langenbeck's Archiv für klinische Chirurgie, 1876, XX, p. 485.

⁵ Schmiedicke: Vierteljahresschrift für Dermatologie und Syphilis, 1880, VII, p. 257.

⁶ Ganghofner: Zeitschrift für Heilkunde, 1881, II, p. 400.

⁷ Frisch: Wiener medizinische Wochenschrift, 1882, No. 32, XXXII, 969.

⁸ Pellizzari: Ref., Vierteljahresschrift für Dermatol. und Syph., 1883, X, p. 676.

⁹ Cornil: Bull. Soc. Anatomie de Paris, Progrès Méd., 1883, XI, p. 587.

¹⁰ Chiari and Riehl: Zeitschrift für Heilkunde, 1885, VI, p. 305.

¹¹ Bender: Centralblatt für Bakteriologie, 1887, I, p. 563.

Paltauf and Eiselsberg,¹ Cornil,² Babes,³ and Doutrelepon⁴ made more elaborate bacteriological studies whereby the bacillus, now called the Frisch bacillus, was perceived to be closely related if not identical with the Friedländer bacillus, and the discussion as to the nature of the hyaline bodies was initiated by these authors, Dittrich⁵ and Mibelli⁶ also describing them in 1889. Abel,⁷ in 1893, in bacteriological investigations of ozæna drew attention to the similarity of a bacillus found by him in that disease with the bacilli of Frisch and Friedlaender. Dittrich and Babes both doubted the specificity of the rhinoscleroma bacillus. De Simoni,⁸ in 1889, inoculated the nasal mucosa of a phthisical patient with the bacillus without producing the lesion, and found the bacillus in normal air passages. V. Schroetter,⁹ in 1901, inoculated himself in the arm with a piece cut from a scleromatous lesion with no result but the production of a tedious abscess. Hence Streit,¹⁰ who in 1907 furnished a good history of the literature, concluded from these and his own investigations that the specificity of the bacillus was not proved. In spite of elaborate work by Streit and others since then neither morphologically nor by culture, nor by various serological tests, has it been differentiated from the bacilli mentioned above. Its geographical limitation was at first a matter of secondary interest, but in 1900, Gerber¹¹ showed its peculiar distribution in Prussia, discussed also by Streit¹² in 1903. Mayer¹³ described foci of the disease in Austria and Hungary in 1906. All spoke of it as existing in Russia. These foci were in proximity to and lying around and between the Baltic and Black Seas. Cases have been described as originating in Switzerland and in Egypt by Mermod¹⁴ and Kornfeld.¹⁵

In the references given above, copious remarks may be found as to the treatment of the affection. In addition it may be said

¹ Paltauf and Eiselsberg: Fortschritte der Medizin, 1886, IV, p. 617. Paltauf: Centralblatt für Bakt., 1887, No. 8, I, p. 236.

² Cornil: Progrès Méd., 1883, XI, p. 587.

³ Babes: Centralblatt für Bakteriologie, 1887, No. 21, II, p. 617.

⁴ Doutrelepon: Deutsche medizinische Wochenschrift, 1887, XIII, p. 85.

⁵ Dittrich: Zeits. für Heilkunde, 1887, VIII, p. 251; ref., Centralblatt für Bakteriologie, 1887, No. 14, II, p. 88.

⁶ Mibelli: Centralblatt für Bakteriologie, January 25, 1889, No. 5, V, p. 177.

⁷ Abel: Centralblatt für Bakteriologie, 1893, XIII, p. 161.

⁸ De Simoni: Centralblatt für Bakteriologie, 1899, I Abt., XXV, p. 625.

⁹ V. Schroetter: Bemerkungen über die Bedeutung eines systematischen Studiums des Skleroms, Klinisches Jahrb., 1901, VIII, p. 297.

¹⁰ Streit: Archiv für Laryngologie, 1907, XIX, p. 408.

¹¹ Gerber: Archiv für Laryngologie, 1900, X, p. 347; 1904, XVI, p. 176. Baurowicz: Archiv für Laryngologie, 1900, X, p. 363, described 100 cases.

¹² Streit: Archiv für Laryngologie, 1903, XIV, p. 257; 1904, XVI, p. 407.

¹³ Mayer: Archiv für Laryngologie, 1906, XVIII, p. 428.

¹⁴ Mermod: Rondaef. Contribution à l'étude du rhinosclerome en Suisse, Thèse de Lausanne, 1905.

¹⁵ Kornfeld: Monatsschrift für Ohrenheilkunde, Berl., 1905, XXXIX, p. 404.

that Fittig,¹ Schein,² and Mayer³ have treated the disease with the x-rays and Güntzer⁴ with vaccines. Notwithstanding the usual optimism displayed in all therapeutical literature there is nothing to convince the skeptical that any curative results have been attained. In 1911 Wright and Strong⁵ reported the presence in great abundance of particles reacting to the soap stain in the foam cells and the degenerated areas of the lesion and upon the distribution in general of fats and lipoids. They also reported some work done with complement fixation in criticism of previous work by Goldzieher and Neuber⁶ who believed by this method they were able to distinguish the Frisch from the Friedlaender bacilli.

Autoscopy.—Kussmaul, in 1868, is said⁷ to have been the first to make a direct *intra vitam* examination of the œsophagus. He employed an urethroscope which had been invented by Desormeaux. This was practised by several others before Kirstein and Killian applied it to the larynx. Kussmaul was enabled to do this with greater ease because he had as a means of demonstration the services of a sword swallower. In 1895 Kirstein⁸ demonstrated a technique by which, with the head extended and the epiglottis and tongue depressed, it was possible to make a direct inspection of the larynx, which procedure he designated under the name of autoscopy. Mikulicz,⁹ Killian, Cowl,¹⁰ and others quickly took the matter up. Killian is said¹¹ to have been the first to have removed a bone from the larynx by the Kirstein method. Although von Hacker¹² seems to have been the first, in 1902, to insert a rigid tube into the trachea and thus to have practised tracheoscopy, Killian and Chevalier Jackson¹³ and many others since have developed the technique of introducing

¹ Fittig: Beiträge zur klin. Chirurg., Tübingen, 1903, XXXIX, pp. 155–161.

² Schein: Ungar med. Presse, 1905, X, p. 101; Pest. med. chir. Presse, Budapest, 1905, XLI, p. 638.

³ Mayer: Berl. klinische Wochenschrift, 1906, XLIII, pp. 1464, 1638.

⁴ Güntzer: Medical Record, July 24, 1909, LXXVI, p. 129. See this last reference for the best account of the disease in the English language and for a full bibliography. For further information as to the more recent work upon rhinoscleroma see Babes, Kolle, and Wassermann: Hand. d. path. Mikroorg., zweite Aufl., 1913, Band V, p. 1237.

⁵ Wright and Strong: New York Medical Journal, March 18, 1911, XCIII, p. 517.

⁶ Goldzieher and Neuber: Centralblatt für Bakteriologie, 1909, Orig., LI, p. 121.

⁷ Killian: Geschichte der Oesophago- und Gastroskopie, Deutsche Zeitschrift für Chirurgie, 1900–01, LVIII, p. 499.

⁸ Kirstein: Archiv f. Laryngologie und Rhinologie, 1895, III, p. 156; 1897, VI, p. 482.

⁹ Mikulicz: Die Autoskopie des Kehlkopfes und der Luftwege, 1896.

¹⁰ Cowl: Archiv f. Laryngologie und Rhinologie, 1898, VII, p. 478.

¹¹ Kollofrath: Münchener medizinische Wochenschrift, September 21, 1897, No. 38, XLIV, p. 1038.

¹² Von Hacker: Deutsche medizinische Wochenschrift, 1905, No. 39, XXXI, p. 1535.

¹³ Jackson: Tracheobronchoscopy, The Laryngoscope, 1907, XVII, pp. 492, 785. Von Eicken: Archiv f. Laryngologie und Rhinologie, 1904, XV, p. 375. Von Brünings: Die directe Laryngoskopie und Oesophagoskopie, 1910.

tracheal and bronchial tubes into the air passages for diagnostic and operative purposes. Most recently Killian¹ has published a method in which, by ingenious adaptations and inventions, he has succeeded in supporting the tube while in place in the air passages in such a manner that both hands of the operator are free to use in manipulations upon those parts exposed in the field of vision. To this technique he has given the name of "Schwebelaryngoskopie."

These methods of direct inspection and operation upon the larynx and lower air tubes by means of it are epoch-making advances in laryngology and have rendered possible the execution of procedures which before could not have been accomplished by any possible means. In combination with the achievements of röntgenology many lives have been saved in this way that were hitherto lost.

LARYNGEAL PARALYSIS AND THE INNERVATION OF THE LARYNX.

The First Reports.—While the literature of the innervation of the larynx goes back to Galen, and of this we have given some account, the history of laryngeal paralysis can hardly be pursued with much profit in the prelaryngoscopic era. According to Semon,² Traube was the first to give an account³ of the laryngoscopic image in a case of laryngeal paralysis. The condition was due to pressure of a thoracic aneurysm on the recurrens, but the diagnosis of the lesion in the chest was not made at such an early date as this by means of the laryngoscope, which in later years has become so valuable an adjuvant to other methods of physical diagnosis in the differentiation of the condition.

Türk declared⁴ that in 1859 he had already reported a case, but the interpretation of his reference leaves the matter in some doubt, though in the next year he described⁵ immobility of the left vocal cord in a case of right hemiplegia. Lewin in the same year gave a good description⁶ of paresis of the muscle of the right arytenoid cartilage, "which narrows the glottis, and does not produce hoarseness," in a patient suffering from constitutional syphilis, evidently a case of posticus paralysis. Mandl gave an early but

¹ Killian: *Archiv f. Laryngologie und Rhinologie*, 1912, XXVI, p. 277.

² Semon: *The Study of Laryngeal Paralysis since the Introduction of the Laryngoscope*. For a fuller account of the subject see this exhaustive bibliography. See also the review of the subject by Wright, *Two Cases of Laryngeal Paralysis*, *N. Y. Med. Jour.*, September 28, 1889, L, p. 345. The literature of the subject may be also studied in a monograph by Burger: *The Laryngeal troubles of Tabes Dorsalis*, 1891.

³ Munk: *Laryngoskopischer Befund in einem Fall von Aneurysma des Arcus Aortae*, *Deutsche Klinik*, 1861, No. 27, XIII, p. 263.

⁴ Türk: *Klinik der Krankheiten des Kehlkopfes*, etc., 1866, p. 443.

⁵ *Allg. Wien. med. Ztg.*, 1860, No. 9, V, p. 67.

⁶ Lewin: *Ref.*, *Schmidt's Jahrb.*, 1860, CVIII, p. 99.

rather confused account of the subject in France,¹ and reported a number of poorly differentiated cases, including, however, some of functional disturbances.

Differentiation.—We find him using the term laryngeal epilepsy, but not in the sense subsequently employed by Charcot. Türk,² we may note, interpreted a case of what was apparently hysterical aphonia as spasm of the cricothyroid muscles. Gerhardt³ was the first to begin the intelligent differentiation of laryngeal paralysis according to the lesions. Bäumlér⁴ and Johnson⁵ showed that a unilateral affection of the vagus may, under certain circumstances, produce a bilateral paralysis of the vocal cords, or paralysis on one side and spasm, as he believed, on the other. In America, in 1869, F. I. Knight reported⁶ three cases of laryngeal paralysis. At first cases of functional paralysis, chiefly hysterical, were confounded with those of an essential lesion, as we have noted in the reports of Mandl and Türk, and there is consequently much confusion in the earlier papers on the subject, as for instance those of Mackenzie⁷ and Cohen.⁸

"Cadaveric Position."—In 1870 Gerhardt contributed another valuable paper⁹ to the literature of the subject, in which he introduced the term "cadaveric" position of the vocal cord, to indicate its situation in total laryngeal paralysis, a term to which of late there has justly been made objection as being inaccurate. This paper much advanced the clinical knowledge of the subject. In the same year appeared another important paper¹⁰ by Riegel, who pointed out the distinction between respiratory and phonatory paralysis.

Schech¹¹ and Schmidt¹² did much to formulate the arrangement of laryngeal innervation and muscular movements given by the text-books, and accepted up to the date of the Rosenbach-Semon "law" and the Krause controversy as to the nature of the cases of median position of the cord. W. W. Keen,¹³ in 1875, performed

¹ Mandl: *Des Neuroses Chroniques du Larynx*: *Gaz. des Hôpitaux*, 1861, No. 4, XXXIV, p. 13.

² Türk: *Allg. Wien. medicin. Ztg.*, 1862, No. 8, VII, p. 70.

³ Gerhardt: *Virchow's Archiv f. path. Anat.*, 1863, XXVII, pp. 68, 296.

⁴ Bäumlér: *Deutsches Archiv f. klin. Med.*, 1867, No. 6, II, p. 550; *Trans. Path. Soc. London*, 1872, XXIII, p. 66.

⁵ Johnson: *Trans. Path. Soc. London*, 1873, XXIV, p. 42.

⁶ Knight: *Boston Medical and Surgical Journal*, February 25, 1869, LXXX, p. 49.

⁷ Mackenzie: *Hoarseness, Loss of Voice and Stridulous Breathing in Relation to Nerve and Muscle Affections of the Larynx*, 1868.

⁸ Cohen: *Diseases of the Throat and Nasal Passages*, 2d Edit., 1879.

⁹ Gerhardt: *Ueber Diagnose und Behandlung der Stimmbandlähmung*, *Volkmann's Sammlung klin. Vorträge*, No. 36 (*Inn. Medizin*, No. 13), 1872.

¹⁰ Riegel: *Ueber respiratorische Paralysen*, *Volkmann's Vorträge*, No. 95 (*Inn. Medizin*, No. 33), 1875.

¹¹ Schech: *Berl. klin. Woch.*, 1873, No. 20, X, p. 234.

¹² Schmidt: *Ibid.*, 1873, No. 3, X, p. 32.

¹³ Keen: *Trans. Coll. of Phys. of Philadelphia*, 1875, 3 ser., I, p. 97.

some experiments by faradization of the recurrent laryngeal nerves in a recently hanged man. Notwithstanding the attention which had been given to the matter, our knowledge of the subject was still in a very unsatisfactory state for many years after the laryngoscope had made observers familiar with the local appearances.

Greater Proclivity of Abductors to Paralysis.—Such an eminent authority as Störk had, as late as 1880,¹ declared that paralysis of the postici muscles was one of the rarest of laryngeal neuroses. Some cases had been reported previously by von Ziemssen, Bosworth, and others, but the subject of bilateral paralysis of the abductors was more carefully described in 1878 by Semon.² He pointed out in the German edition of Morell Mackenzie's book (1880), in a footnote, the greater proclivity of the abductor filaments of the recurrent nerve to injury from disease or trauma. This was further elaborated by him in a paper published³ in 1881. About the same time Rosenbach⁴ drew attention to the same phenomenon. They established the fact, which has been occasionally known as Semon's "law," that when one laryngeal muscle alone is affected it is usually the abductor, the crico-arytenoideus posticus. The experimental results of Onodi and Risien Russell later confirmed this in animals.

About this time Elsberg⁵ noted that, although other muscular groups may recover with varying rapidity and completeness from paralysis, the power of the laryngeal muscles rarely returns.

The Contracture Theory.—Krause⁶ attempted to invalidate the conclusions of Semon by advancing his theory of contracture. Many subsequent writers accepted the views of Krause. They claimed the contracture either with or without paralysis of the abductors was due to stimuli of various kinds, irritating either the nerve trunks or their cerebral centres. This idea had been advanced by Jeleneffy⁷ in 1872, and was further elaborated by him in 1888. In 1875 Johnson⁸ had advanced an explanation to account for bilateral paralysis, due to pressure on one recurrent alone, which he believed was due to ascending degeneration and involvement of the chiasm in the brain.

A vast amount of experimentation upon animals revealed variations in the effects produced by different strengths of the electric current applied to the recurrent nerve. These effects varied also according to the degree of anesthesia produced. These observations

¹ Störk: *Klinik der Krankheiten des Kehlkopfes*, Stuttgart, 1880, p. 380.

² Semon: *Trans. of the Clin. Soc. of London*, 1878, XI, p. 141 ff.

³ Semon: *Archives of Laryngology*, 1881, No. 3, II, p. 197.

⁴ Rosenbach: *Breslauer Aerzt. Zeitschrift*, 1880, 2, 3, II, pp. 14, 27.

⁵ Elsberg: *Philadelphia Med. Times*, July 30, 1881, XI, p. 693.

⁶ Krause: *Virchow's Arch. f. path. Anat.*, 1884, XCVIII, p. 294. *Ibid.*, 1885, CII, p. 301. *Archiv f. Anat. und Physiol., Physiol. Abth.*, 1884, p. 566.

⁷ Jeleneffy: *Berl. klin. Woch.*, 1888, No. 26, 34 seq., XXV, pp. 522, 680, 708, 728.

⁸ *Trans. Med Chir. Soc., London*, 1875, Vol. LVIII, p. 29.

were brought out chiefly in the papers of Donaldson¹ and Hooper.² The literature of the subject at this time grew to great proportions. The most important of the contributions which combated the views of Krause were perhaps those of Semon and Horsley³ and of Risien Russell.⁴ The latter showed that the abductor and adductor filaments existed in the recurrent nerves each as separate bundles of fibers. This was also announced by Onodi.

The Central Innervation of the Larynx.—The central innervation of the larynx was also developed, *pari passu*, with the controversy in regard to the phenomenon of posticus paralysis. While Ferrier⁵ had in 1876 made some allusion to the phonatory movements of the larynx on cerebral excitation, and while Duret⁶ had noted that the destruction of a convolution in front of and below the sigmoid gyrus abolished the power of barking in a dog, Krause's paper,⁷ in 1884, was really the first of a series of many others, among them especially that of Semon and Horsley (*l. c.*), which has developed our knowledge of the cerebral centre of laryngeal innervation.

Magendie and Longet had described the action of the cricothyroid muscle as the tensor of the vocal cords by virtue of it pulling the thyroid cartilage downward and forward, the base of the arytenoid cartilages or the vocal processes resting on the cricoid and remaining stationary. In 1873 Jeleneffy⁸ showed that the cricoid cartilage was drawn up and backward carrying the vocal processes with it, thus reversing the work of Magendie. In this, Jeleneffy has been supported by practically all investigators since then. Exner⁹ described in the dog and rabbit a median laryngeal nerve supplying the cricothyroid muscle given off by the pharyngeal branch of the vagus nerve and attempted to trace out its analogue in man, but while there are communications between the pharyngeal plexus and the laryngeal nerves, this application to human anatomy has not received support. Until the year 1850 both laryngeal nerves were looked upon as mixed nerves, but their physiology has been more accurately worked out, and the details of it may be found in Onodi¹⁰ (1901), who describes exhaustively the modern view. This, as entertained by the

¹ Donaldson: Am. Jour. Med. Sc., July, 1886, XCII, p. 93.

² Hooper: New York Med. Jour., July 4, 1885, XLII, p. 2.

³ Semon and Horsley: Brit. Med. Jour., December 21, 1889, II, p. 1383. Phil. Trans. Royal Soc. London, Vol. V, 181.

⁴ Russell: Proceedings of Royal Soc., 1892, LI, p. 102.

⁵ Ferrier: The Functions of the Brain, N. Y., 1876.

⁶ Duret: Études Expérimentales et Cliniques sur les Traumatismes Cérébraux, Paris, 1878.

⁷ Krause: Ueber die Beziehung der Grosshirnrinde zum Kehlkopf und Rachen, Arch. f. Anatomie und Physiologie, Physiol. Abth., 1884, p. 203.

⁸ Jeleneffy: Pflüger's Archiv für d. ges. Physiologie, 1873, VII, p. 77.

⁹ Exner: Die Innervation des Kehlkopfes, Sitzungsberichte der K. K. Akad. der Wissensch., 1884, LXXXIX, p. 63.

¹⁰ Onodi: Die Anatomie und Physiologie der Kehlkopfnerve, Berlin, 1902.

great majority of investigators, is to the effect that the recurrent nerve is entirely a motor nerve containing no centripetal fibers.

With the observation and discussion of numerous cases of the immobility of the cords, it became evident that the lesion was not always due to nervous causes, but to a local lesion, cancer, ankylosis of the crico-arytenoid joint, while the nerve lesion may have its situation anywhere from the terminal twigs to the cortex of the brain. An early clinical account of the trouble may be found in Türck's first edition¹ in 1866 where numerous more or less unclassified cases are reported. Differentiation proceeded rapidly until, twenty years later, we find in Semon's voluminous account² a summary of the work in which he had been preëminent, where the neuroses of the larynx have received their most authoritative modern exposition and classification. In a later publication³ he has brought the matter up to date, but the question as to the origin of the recurrent nerve fibers has even yet (1913) been by no means settled in spite of the work of Grabower⁴ and others, the former declaring that it arises not originally from the spinal accessory by its communication with it in the skull but really from the nucleus ambiguus of the vagus. He showed⁵ that the results of paralysis of the larynx, attained by Bernard and his numerous imitators, on tearing out of their origin the roots of the accessory, were due to wounding of the neighboring vagus centre. Cutting of the accessory roots produced no paralysis, but when the lower vagus roots were severed, laryngeal immobility intervened; cutting off the upper vagus roots caused no loss of motility. Further experiments of a different kind by Grossmann and later by Onodi led to the same result.

Krause, Semon, and Horsley (l. c.) had declared as the result of experimentation that the cortical center of the brain is a bilateral one, so that a unilateral cortical lesion can never cause aphasia, but clinical observation⁶ has not clearly supported this view as to man. The experimental evidence as obtained from animals is so decisively and so universally accepted as against this view and the clinical evidence in man is open to such serious criticism, it seems very probable the fact has been definitely established that a unilateral cortical lesion cannot cause in man either a bilateral or unilateral laryngeal paralysis. Less satisfactory is the evidence of a bilateral representation of laryngeal movement in the floor

¹ Türck: *Klinik der Krankheiten des Kehlkopfes und der Luftröhre*, Wien, 1860.

² Semon: *Heymann's Handbuch der Laryngologie und Rhinologie*, Wien, 1898, 1ster Band, 1ste Hälfte, p. 587.

³ Semon: *A system of Medicine*, by many writers; edited by Allbutt and Rolleston, Vol. IV, Part II, London, 1908, p. 259.

⁴ Grabower: *Archiv für Laryngologie und Rhinologie*, 1895, II, p. 143.

⁵ Grabower: *Centralblatt für Physiologie*, 1890, III, p. 505.

⁶ Garel and Dor: *Annales des maladies de l'oreille, du larynx, etc.*, 1890, XVI, pp. 209, 310.

of the fourth ventricle in man. The clinical evidence, furnished by numerous cases of the association of paralysis of nerves, having their origin in this locality, is so strong that it seriously militates against the experimental evidence from which we would infer that here also a unilateral lesion cannot produce a laryngeal paralysis. This also throws a shadow on the conclusions accepted for the cortical problem, and it must be allowed that to some extent the whole question is still in court.

The Rosenbach-Semon law as to the universality of the occurrence of posticus paralysis first, when the domain of the recurrent laryngeal is involved by a lesion in pons, nerve or nerve periphery, has been invalidated by the report of one case as acknowledged by Semon. As a matter of fact these authors had properly pointed out there was no "law" about it. It was simply an observation that all cases for many years had conformed to the statement that the posticus is the muscle affected when one laryngeal muscle only is paralyzed, but no claim was made that more careful and critical future analysis of clinical and pathological phenomena would continue to support the universality of its application. As yet such critical analysis has not, with one exception, clearly invalidated it. The case reported by Saundby and Hewetson¹ has been accepted by Semon² as free from the criticism of mistaken observation and fully justifies his cautious reserve in refusing to claim his rule to be a law.

With the advent of the toxic explanation of the peripheral paralyses of diphtheria, the pareses of the pharynx and larynx often following them, have fallen into line with those ascribed to the poisons of lead, arsenic, atropine, and even of influenza³ and gonorrhœa.⁴ It is questionable whether these will all, in the future, continue to stand as possible causes of peripheral laryngeal paralyses. Like some of the cases ascribed to the toxins of rheumatism, it is safe to predict that it will be found that some of the so-called paralyses ascribed to toxic origins are due to something else or indeed that they are not paralyses at all but ankyloses of the crico-arytenoid joint.

In the text-books which have appeared in large numbers, separate consideration is given to paralyses of other sets of muscles than the postici, in accordance with the laws of differentiation as involved by the advance of knowledge. There has been a tendency to include immobilities of the larynx which properly have nothing to do with the innervation in these categories such as ankylosis, myopathic immobility, etc. The observations of the laryngeal crises of tabes, of syringomyelia, of hyperæsthesia and anæsthesia,

¹ Saundby and Hewetson: *British Medical Journal*, 1904, I, p. 589.

² Semon: *l. c.*

³ Heymann: *Archiv für Laryngologie*, 1896 (Fraenkel's Festschrift), V, p. 256.

⁴ Lazarus: *Ibid.*, p. 232.

of nervous cough or chorea of the larynx, of hysterical spasms and paralysis, of laryngeal vertigo, have all found their place in the text-books of laryngology, but they belong more properly in categories appertaining to the general history of modern medicine than to those of a specialty. To this perhaps may be excepted the curious cases of ictus laryngis narrated by Schadowaldt¹ and others, this disease having been first noted by Charcot² in 1876.

A few cases of double posticus paralysis have been reported from time to time as a condition which is apt to cause sudden death, due to closure of the small remaining airway when acute inflammation supervenes. A similar condition is said to be the case of roaring in horses, and the operation having been successfully done in these animals, it occurred to Hope to perform it in man, but O'Dwyer,³ having previously tried it in 1886 without avail, urged his procedure of intubation instead. He pointed out that the cause of the failure was that the extirpated bands are soon replaced by other tissue. The operation, however, has not been tried often enough for passing judgment upon it.

In 1897 Grossmann attempted to invalidate the interpretation of the median position of the cord which attributed it to an involvement of the postici muscles or their nerve supply. This criticism was strongly combated by Semon and the discussion of the points involved as viewed by Grossmann led to no serious impeachment of the commonly accepted opinion of Semon and others.⁴ In the course of these discussions the assertion had been repeatedly made that the cadaveric position of the cords is rather a misnomer as applied to the position occupied by them in total laryngeal paralysis. The measurements were so difficult and so varying in their results, in anything except the phonatory position and that of extreme abduction of the vocal cords, that much difference of opinion, especially in animal experimentation, arose from this cause.

In connection with posticus paralysis, it may be of interest to add that a similar greater vulnerability has been claimed for the extensors of the lower limb and for the eyelids.⁵

Doubt still remains even after the lapse of ten years in this matter of the innervation of the human larynx. The later work of Katzenstein⁶ may be referred to as embodying some of the

¹ Schadowaldt: *Archiv für Laryngologie*, 1896 (Fraenkel's Festschrift), V, p. 246.

² Charcot: *Gazette médicale de Paris*, 1876, Sér. 4, V, pp. 588, 602.

³ O'Dwyer: *New York Medical Journal*, December 28, 1895, LXII, p. 833.

⁴ Grossmann: *Fraenkel's Archiv für Laryngologie*, 1897, VI, p. 282. Semon: *Ibid.*, 1897, VI, p. 492. Rosenbach: *Ibid.*, 1897, VI, p. 588. Fraenkel: *Ibid.*, 1897, VI, p. 598. Grabower: *Ibid.*, 1897, VII, p. 128. Burger: *Ibid.*, 1899, IX, p. 203.

⁵ Körner: *Verein süddeutscher Laryngologen*, 1908, in Semon's *Internat. Centralblatt für Laryngologie und Rhinologie*, 1908, XXIV, p. 515.

⁶ Katzenstein: *Verhandlungen der physiologischen Gesellschaft zu Berlin*, Jahrgang, 1901-1902, vid., *Archiv für Anatomie und Physiologie*, *Physiol. Abth.*, 1902, Supplement, p. 430.

criticism of the now commonly accepted views of Semon, while the publications¹ of Möller and of Kuttner further complicate it.

Throughout this period of discussion, a set of cases was repeatedly described, exhibiting involvement of the posterior cranial nerves supplying the palate and pharynx, the tongue, the larynx, and the sternocleidomastoid muscle. Though Gleitsmann² credits Avellis³ with being the first to emphasize it, and it is sometimes spoken of in late years as the Jackson-Avellis complex or syndrome, it was as long ago as 1864 that Hughlings Jackson⁴ drew attention to the subject. In Türck's book,⁵ which was published in 1866, there is a full account of such a case. Pel⁶ reported a case in 1887, and Wright⁷ reported one in 1889.

Dr. J. Shelton Horsley⁸ has reported a case in which after a gunshot wound of the recurrent nerve, followed by laryngeal paralysis, the nerve was sutured with restoration of function on that side, but it is not entirely clear that there was in the first place an entire solution of continuity of the nerve fibers. The case, however, deserves mention as it may encourage further attempts of a surgical nature in proper though necessarily rare cases, even of a pathological nature.

LARYNGEAL CANCER AND ITS EXTIRPATION.

I have already traced with some care the history of laryngeal growths and the operations for their removal up to the time of the perfection of the technique of the intralaryngeal operation. It soon became apparent that the latter could not be extended with satisfactory results to malignant growths, especially at a time when their differentiation at an early stage was still undeveloped. We find, therefore, that at an early period in the development of laryngoscopic diagnosis, intralaryngeal procedures for their removal did little more than aggravate the local condition, and very soon such attempts were, for the time at least, all but abandoned.

Laryngotomy.—We have noted records of the opening of the wind-pipe for a foreign body a hundred years before, and although

¹ Möller: *Archiv für Laryngologie*, etc., 1901-1902, XII, pp. 289, 461. Kuttner: *Archiv für Laryngologie*, etc., 1902, XIII, pp. 159, 161.

² Gleitsmann: *Transactions of the American Laryngological Association*, 1908, p. 197.

³ Avellis: *Berliner Klinik*, October, 1891, Vol. XL.

⁴ Jackson: *London Hospital Clinical Lectures and Reports*, 1864, Vol. I, p. 361.

⁵ Türck: *Klinik der Krankheiten des Kehlkopfes und der Luftröhre*, Wien, 1866 (Vid. Case 185, p. 446).

⁶ Pel: *Berliner klinische Wochenschrift*, 1887, No. 29, XXIV, p. 521.

⁷ Wright: *New York Medical Journal*, September 28, 1889, L, p. 345.

⁸ Horsley: *Trans. South. Surg. and Gyn. Assoc.*, 1909, XXII, p. 161; *Ref.*, *Medical Record*, January 22, 1910, LXXVII, p. 170.

this had been occasionally repeated, it was not until 1834 that the operation was first done by Brauers¹ for a laryngeal polyp. Ten years later, Ehrmann (l. c.) again operated, supposing that it was the first time the operation had been performed for relief from a polyp. A preliminary tracheotomy had been performed; aphonia resulted, but the operation was otherwise a success, the patient dying subsequently from typhoid fever without recurrence of the polyp.

Boerhaave is said to have included "cancerous" inflammations in his category of laryngeal affections, and Morgagni reported finding the condition postmortem. Scarcely less definite was the classification of Trousseau and Belloc to which I have referred (page 197). In 1865 H. B. Sands reported² an external operation as having been done in 1863 for laryngeal cancer which had been diagnosed by laryngoscopy. The patient died within a year. Sands was at that time able to collect reports of eleven thyrotomies and thirty-nine intralaryngeal operations for growths in the larynx. In the following year Cabot³ reported an external operation for a laryngeal polyp. Balassa⁴ in 1868 reported three cases, one each of papilloma, carcinoma, sarcoma, operated on by laryngotomy. He demonstrated that this could be done without necessarily a loss of voice.

Thus far operations for laryngeal cancer, external as well as internal, had been uniformly disastrous, some of the patients surviving the operation, but none being freed for any length of time from recurrence. It appears, from reference to a French thesis,⁵ that A. M. Koeberle had suggested the possibility of total extirpation of the larynx in 1856. According to Foulis this was actually carried out successfully ten years later by Dr. Heron Watson for syphilitic disease. These facts, however, only came out later. Czerny,⁶ stimulated to experimentation by the report⁷ of a case of laryngeal tumor extirpated externally by Schrötter, who expressed a wish that laryngectomy were a feasible operation, demonstrated on dogs its practicability in 1870. On the twenty-seventh of November, 1873, Billroth performed the operation on a man⁸ with success. Heine⁹ and Maas¹⁰ repeated the operation in the

¹ The case is referred to by Albers in Graefe und Walther's *Journal der Chirurgie und Augen-Heilkunde*, 1834, XXI, p. 534.

² Sands: *New York Med. Jour.*, May, 1865, I, p. 110.

³ Cabot: *Boston Medical and Surgical Jour.*, 1866, LXXIV, p. 32.

⁴ Balassa: *Wien. med. Woch.*, 1868, Nos. 91, 92, 93, XVII, pp. 1469, 1485, 1501.

⁵ Hermantier: *Ref., Rev. des sc. médicales*, 1877, IX, p. 298.

⁶ Czerny: *Versuche über Kehlkopf Extirpation*, *Wiener med. Woch.*, 1870, 27, 28, XX, pp. 557, 591.

⁷ Schrötter: *Weitere Beiträge zur laryngoskopischer Chirurgie: Med. Jahrb.*, 1869, XVII, p. 81.

⁸ Reported by Gussenbauer, *Archiv f. klin. Chirurgie.*, 1874, XVII, p. 343.

⁹ Heine: *Ibid.*, 1876, XIX, p. 514.

¹⁰ Maas: *Ibid.*, p. 507.

following year. At this time Gussenbauer constructed his artificial larynx. Foulis reported¹ his first case in 1877. Lange performed the operation in America in 1879,² and by 1881 Foulis had collected the reports of thirty-two cases of total and six cases of partial laryngectomy. He reported these statistics at the International Congress in that year.³ The operation met there with sharp criticism. Two years later Butlin wrote a very complete treatise on laryngeal cancer,⁴ and in the same year Cohen, in a careful analysis,⁵ collected and analyzed the reports of sixty-five cases of the disease, and at that time arrived at the conclusion that extirpation of the larynx did not prolong life in these cases.

After these, papers on the subject became very numerous. In the year 1886 alone, those of Newman,⁶ Lublinski,⁷ Hahn,⁸ Baratoux,⁹ Fraenkel,¹⁰ Gerster,¹¹ Lange,¹² Park,¹³ Semon and Butlin,¹⁴ do not by any means exhaust the list.

Fraenkel (l. c.) in that year reported the first successful intralaryngeal extirpation of a malignant growth and became a partisan of that procedure in selected cases. Semon and Butlin warmly advocated the preference of partial laryngectomy over total excision, rejecting the latter as unjustifiable.

The Emperor Frederick.—In January, 1887, the Crown Prince of Germany, afterward the Emperor Frederick, began to suffer from the symptoms of laryngeal cancer. The unfortunate quarrels between his physicians are a part of the reminiscences of many comparatively young men. As yet the rancor cannot have all died out. It is therefore unwise here to more than refer to an incident, from which no one emerged with credit¹⁵ except the unfortunate and illustrious patient.

While in the published accounts of the microscopic findings¹⁶ the impression received by many was that the growth was of a benign nature, the subsequent course was one of malignancy to which this very estimable prince succumbed shortly after he became emperor.

¹ Foulis: *The Lancet*, October 13, 1877, II, p. 530.

² Lange: *Archives of Laryngology*, 1880, I, p. 36.

³ Foulis: *Transactions of the Internat. Med. Cong.*, 1881, III, p. 251.

⁴ Butlin: *On Malignant Disease of the Larynx*, London, 1883.

⁵ *Trans. Coll. of Phys. of Phil.*, 1883, Ser. 3, VI, p. 353.

⁶ Newman: *Glasgow Med. Journal*, February, 1886, XXV, p. 236.

⁷ Lublinski: *Berliner klinische Wochenschrift*, 1886, XXIII, pp. 122; 142, 154.

⁸ Hahn: *Ibid.*, 1887, XXIV, p. 918.

⁹ Baratoux: *Progrès Médicale*, 1886, Sér. 2, III, pp. 263, 308.

¹⁰ Fraenkel: *Archiv für klinische Chirurgie*, 1887, XXXIV, p. 281.

¹¹ Gerster: *Annals of Surgery*, 1886, III, p. 20.

¹² Lange: *Ibid.*, p. 38.

¹³ Park: *Ibid.*, p. 28.

¹⁴ Semon and Butlin: *Brit. Med. Jour.*, 1886, II, p. 975.

¹⁵ Mackenzie: *The Fatal Illness of Frederick the Noble*, London, 1888. *Die Krankheit Kaiser Friedrich des Dritten*, dargestellt nach amtlichen Quellen, 1888.

¹⁶ *Berliner klinische Wochenschrift*, 1887, XXIV, p. 445.

Malignant Transformations of Benign Laryngeal Neoplasms.—The eyes of all the civilized world for months searched the daily papers for the distorted and unreliable news of the progress of the fatal malady. Patients suffering not from cancer of the larynx, but from "cancrophobia," filled the waiting-rooms of the laryngologist. Not only the lay mind in morbid horror had its attention fixed on the malady, but the scientific interest of medical men was absorbed in the study of many of the problems of the subject. The relative merits of the intra- and the extralaryngeal operation for laryngeal cancer were warmly discussed in the society meetings and in the medical journals. The question of the pathogenesis of cancer was universally discussed. Its evolution from benign forms of growth was strongly urged. At the International Congress in 1881 Solis Cohen said: "I am afraid that laryngologists sometimes convert innocent papillomata into epithelioma by protracted manipulation continued too long." Lennox Browne entertained the same opinion. Semon warmly denied such a result. He immediately recognized the fact that if this belief were generally entertained, and it had been suggested by several others, a death-blow had been dealt to all intralaryngeal surgery. He therefore, by the patient collection of an enormous number of reports¹ from clinical observers all over the world, thoroughly negated the idea and thus rendered a great service to Laryngology.

Pachydermia Laryngis.—Of scarcely less importance was the information as to the histology of epithelial growths brought out in the discussion aroused by this melancholy case. Virchow before the Berlin Medical Society in 1860 first showed a case which he called pachydermia laryngis. In 1887² he reported on the pieces first removed from the larynx of the German prince that they presented no evidence of malignancy. Later he wrote³ on pachydermia laryngis, in which he described the condition as a simple hyperplasia of the epithelium over the vocal processes. He laid down the dictum that there is a sharp line of demarcation between the benign epithelial hyperplasia and the stroma, and anything of an epithelial nature below this line and unconnected with it is at least of a suspicious nature.⁴

In addition to the one which Semon's collective investigation settled, the questions brought into prominence by this case were:

1. The unreliability of a negative microscopic diagnosis in a case of suspected cancer.

¹ Semon: Internat. Centralblatt für Laryngologie, 1888, V, No. 3.

² Berlin. klin. Woch., 1887, No. 25, XXIV, p. 445; 1887, No. 28, XXIV, p. 519.

³ Virchow: Berliner klin. Woch., 1887, No. 32, XXIV, p. 585.

⁴ See Berl. klin. Woch., 1887, No. 47, XXIV, p. 876. Virchow insisted that he had only reported on the character of the pieces submitted to him for diagnosis, when he reported the first pieces removed from the Prince's larynx to present no evidence of malignancy.

2. The preference in the great majority of the cases of an external over an internal laryngeal operation.

3. The question quickly answered was, the necessity in all cases of an early diagnosis and a prompt operation in incipient cases.

Laryngectomy.—Extirpation of the larynx rapidly became more common, and by 1890 Kraus¹ was able to cite 219 cases of extirpation of the larynx, 160 of which were total exsection and 142 of these were for cancer.

J. Solis Cohen, notwithstanding his former condemnation of the operation, at first suggested the removal of the soft parts within the larynx, leaving the cartilaginous frame-work, but subsequently reported² a case in which the whole larynx and two rings of the trachea were removed, and the stump of the latter stitched to the episternal notch. The man survived and, though there was no communication between the pharynx and the larynx, he was able to articulate with distinctness by means of pharyngeal speech. The other alternative in these cases has been the insertion of a Gussenbauer prothesis.³ Of late years total extirpation of the larynx for malignant disease has found favor in Germany and America, while a more or less incomplete laryngectomy has been the favorite operation of Semon and Butlin and the English operators. At least Semon has of late (1908), owing to the advance in the technique of the operation of total laryngectomy, admitted that in certain cases, where there is no other alternative except allowing the case to go to a final issue, laryngectomy is admissible, provided the whole situation is laid before the patient and his consent is obtained.⁴ This question led to a great deal of very animated discussion in which John N. Mackenzie in this country expressed rather extreme views⁵ while Semon⁶ actively championed a more conservative opinion. A fuller expression of this view Semon gave⁷ in 1904. Glück⁸ in Germany, Chevalier Jackson⁹ and Brewer¹⁰ in America with great boldness have attacked the problem of extirpation of the larynx, but while their results have been brilliant so far as the operation and its immediate sequelæ are concerned, there can be no doubt the general consensus of opinion of laryngologists is that, so far as the patient is concerned, between allowing the disease to

¹ Kraus: *Allg. Wien. med. Ztg.*, 1890, No. 15, XXXV, p. 169.

² Cohen: *New York Med. Jour.*, November 12, 1892, LVI, p. 533; *Jour. of Laryngology*, July, 1892, VI, p. 285.

³ J. Wolf: *Deutsche med. Woch.*, 1892, Nos. 3 and 33, XVIII, pp. 56, 754. *Berl. klin. Woch.*, 1892, No. 21, XXIX, p. 501.

⁴ *System of Medicine*: Albutt and Rolleston, Vol. IV, Part II, 1908.

⁵ Mackenzie: *Transactions of the American Laryngological Association*, 1900, p. 56.

⁶ Semon: *The Lancet*, August 11, 1900, II, p. 393.

⁷ Semon: *Lancet*, November 5, 1904, II, p. 1263.

⁸ Glück: *Congrès internat. de méd.*, Budapest, 1909, *Compte rendu*, sec. 15, *Laryng.*, p. 349.

⁹ Chevalier Jackson: *Laryngoscope*, August, 1904, XIV, p. 590.

¹⁰ Brewer: *Annals of Surgery*, November, 1909, L, p. 820.

take its course and the fate of dragging out a few miserable years of life without a larynx there is little to choose and the decision must rest with the patient. His medical adviser should be guided solely by the patient's attitude and by his temperament. The chief hope in malignant disease of the larynx centres about the cases in which early diagnosis is made. On the other hand Glück¹ and others have not hesitated to remove the larynx and with it the œsophageal or pharyngeal wall. Even the tongue and hyoid bone have been removed with the larynx. To these radical operators the existence of enlarged extralaryngeal lymph nodes is not always a contra-indication. The question was fully discussed at the International Medical Congress in Budapest by Semon, Glück, Chiari, Finder, and others, and the points recorded above received much attention, but no material advance in or change of views can be noted in the reports of the discussion. While the operation of total laryngectomy at present finds few advocates in Great Britain, while there is a tendency in America to restrict the number in which it is advised, a very large number of cases are being reported from the continent of Europe, and if we are to judge from these the operation has grown in favor, largely under the influence of the advocacy of Glück. He has probably done many more of these appalling operations than any other one operator. His statistics have never been published in anything like complete form, so far as I know. Sendziak, in 1907, collected² the records of 982 cases, in which total resection of the larynx was done 404 times.

Owing to encouragement derived from the results of operative procedures in selected cases in which thyrotomy and partial removal of the larynx was done, more attention was devoted to the early diagnosis of intrinsic cancer of the larynx. It was noted that situated within the cartilaginous box of the larynx, metastasis occurs late. It was realized that cancer at a very early stage produces hoarseness, which should attract the notice not only of the patient but should, after middle life in the patient, arouse the suspicion of the medical attendant. Fraenkel, Semon, and others in 1900 at the laryngological section of the International Medical Congress, and Mackenzie and others in America³ inaugurated the consideration of the finer differential diagnostic points. There was much expression of opinion in criticism of the tendency to depend too exclusively on the microscopic findings. This of late years

¹ Glück: *Berliner klinische Wochenschrift*, 1906, No. 13, XLIII, p. 399, and 1908, XLV, p. 1870. *Internat. laryng-rhinolog. congrès, Vienna. Congrès internat. méd., Budapest, 1909, Compte rendu, lar. sec.*, p. 349.

² Ref., Semon's *Internat. Centralblatt für Laryngologie*, 1908, XXIV, p. 197. See also *Rev. hébd. de Laryngologie*, etc., 1907, XXVII, Part 2, p. 481; *New York Medical Journal*, November 30, 1907, LXXXVI, p. 1042; *Monatsschrift für Ohrenheilkunde*, 1908, Heft 4, XLII, p. 179.

³ *l. c.*

has resulted, I think, in the latter finding its proper position as an adjuvant to the clinical symptoms¹ in diagnosis.

Delavan² spoke of a case of advanced carcinoma of the larynx having been treated in 1902 with *x*-rays. It seems to have been the first so treated. Some cases have been reported since, but the results have been nil and it is now rarely resorted to. An attempt was also made to use radium, but these measures, whatever may have been their success or failure in malignant disease in other parts of the body, found no favor with laryngologists. The same may be said of trypsin injections. It is no more than common frankness demands to acknowledge that this attitude was due less to lack of credulity than to lack of facilities for applying these remedies to the larynx. They have been profusely used in the nose and nasopharynx with no success worthy of comment.

Fulguration, the induction of a spark from intralaryngeal electrode to a laryngeal growth, is a variation of a method of electro-cauterization which has received some attention³ of late years. It has been applied with reported success to malignant growths of the larynx, and the remark has been made that its action resembles that of radium. It is too early to positively pass judgment upon the place it is likely to take in the therapy of the nose and throat.

And now having followed the story of our art over its period of three thousand years and more; from the dim and misty past of incantations and exorcisms; from the early days of Grecian civilization when Hippocrates made a specialty of medical science, separating it from the other sciences; to the days of the microscope, and the spectroscope, and the stethoscope, and the laryngoscope; when the space of one man's life is insufficient for him to know anything but the rudiments of our art in many branches, and be, at the same time, in a position to advance in any degree the boundaries of even its smallest province; we may pause with, I trust, a just consideration and appreciation of the labor of our predecessors. Our knowledge has been built up, we have seen, not by the mushroom activity of any one period, or of any one school of medicine, or by the premature birth of an idea or theory, but by the patient, painstaking, laborious exertions of many generations of earnest men, working, for the most part, without expectation or perhaps desire, certainly without the attainment of those rewards by which not only the layman, but alas, even the average member of our own art, measures what he calls success. To him who knows the joy of work, this phenomenon needs no explanation. To the rest of mankind no explanation would suffice.

¹ Wright: New York Medical Journal, July 17, 1909, XC, p. 97.

² Delavan: Transactions American Laryngological Association, 1902, p. 188.

³ V. Eichborn: Verein deutscher Laryngologen, 1908, p. 3. Ref., Semon's Internationales Centralblatt für Laryngologie, 1909, XXV, p. 86.

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