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Some thoughts about the history of otorhinolaryngology, head and neck surgery (OHNS)

Albert Mudry, MD, PhD

Abstract:
The aim of this short and largely illustrated review is to give some thoughts on how to conduct historical research in otorhinolaryngology, heand and neck surgery (OHNS), to highlight some selected and relevant OHNS keys points in their context, and to encourage those interested to take time and enjoy this kind of work. As with many other specialties, OHNS is an end of the 19th century born medical specialty. It went through three chronological steps: construction in the second part of the 19th century, consolidation in the first part of 20th century and extension since the second part of the 20th century. To correctly study the history of OHNS, it is necessary to follow a constructive method based on five major steps which are presented in this paper. History forms the basis of all knowledge and it is therefore simply natural to regard the evolution and progress of OHNS as an essential background to modern medical understanding. History of OHNS went through five settings out: bedside, anatomopathological, clinico-experimental, operative and highly technological. These five settings out are also developed in this paper*.

As the history of otorhinolaryngology, head and neck surgery (OHNS) is very large and rich, it seems to be very pretentious to attempt to write, in a few pages, a short introduction to it. The aim of this short review is to give some thoughts on how to conduct historical research in OHNS, to highlight some selected and relevant OHNS keys points in their context, and to encourage those interested to take time and enjoy this kind of work. Methodologically speaking, this study is a mix of primary and secondary references especially ordered and chosen to fulfill the requested objective. Some parts of this paper have already been partially published in various articles, by the same author, and which are mentioned as references. Others are extracted from *Otorhinolaryngology: An illustrated history*, also co-signed by the same author [1]. History of medicine is certainly as old as medicine itself. This is exemplified by this statement from Hippocrates: "But all these requisites belong of old to medicine, and an origin and way have been found out, by which many and elegant discoveries have been made, during a length of time, and others will yet be found out, if a person possessed of the proper ability, and knowing those discoveries which have been made, should proceed from them to prosecute his investigations. But whoever, rejecting and despising all these, attempts to pursue another course and form of inquiry, and says he hasn't discovered anything, is deceived himself and deceives others, for the thing is impossible […] From this it will be manifest that discoveries cannot possibly be made in any other way." [2] In other words, past belongs to present even in the past.

One of the most exciting privileges of being an OHNS specialist is to be confronted with permanent questioning and accumulation of new knowledge [3]. On the other hand, one of the greatest difficulties is to be able to integrate all these new contributions to the development of the specialty in a constructive and useful perspective, and to avoid being submerged by this large amount of medical literature. Everybody is in agreement that today it is impossible to have the time to be aware of all this new information. To select the relevant points and limit the risks of misunderstanding, retrospective studies (meta-analysis, literature review), evidence-based medicine and guidelines were introduced as reference for medical practice. These concepts are not based on an analytical mode of knowing but are related to a pure historical mode and character of knowing [4]. Retrospective means to look back, evidence is based on proof of known and past facts, and guidelines are only related to prior experience. Physi-

A.Mudry
Department of Otolaryngology, Head and Neck Surgery, Stanford University School of Medicine, 801 Welch Road, Stanford, CA 94305-5739, USA
e-mail: amudry@stanford.edu

**Note : the figures are specifically selected to demonstrate the great variety of available original sources for the history of OHNS and not to illustrate all the content of this text.*

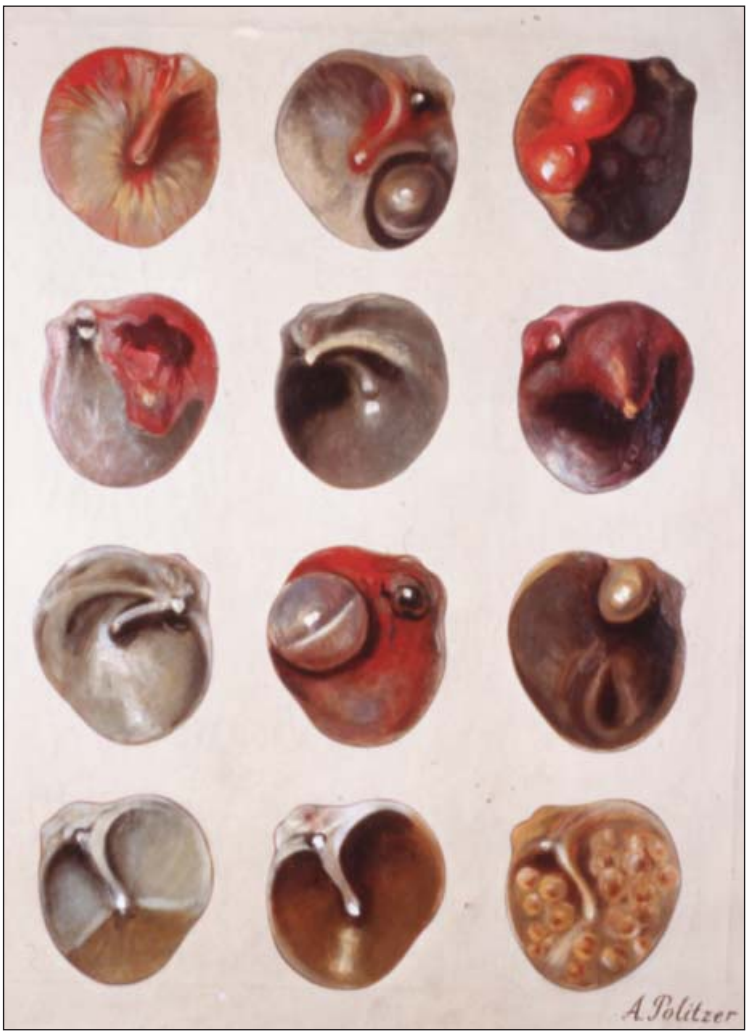
1. Unique Deleau's original books
(INJS, Paris)

cians that have used evidence to guide their decisions and actions have already been mentioned in the first medical writings. What has changed through time is how one understands and interprets what constitutes reliable evidence which can vary with circumstance and culture [5]. To study history means to look back and analyze prior facts and experience, thus meaning that without history, no retrospective studies, no evidence-based medicine and no guidelines! Even if many physicians do not agree with this paradigm, medicine is essentially a science constructed by the step by step addition and laying out of ideas and facts usually depending on each other and in a progressive level of continuity. At the same time, mistakes of the past are corrected [6] and old ideas are developed many times. History is an indisputable part of all medical research. How can someone introduce a new idea without knowing the old ones? "Progress, far from consisting in change, depends on retentiveness. When change is absolute there remains no being to improve and no direction is set for possible improvement: and when experience is not retained, as among savages, infancy is perpetual. Those who cannot remember the past are condemned to repeat it […] Unpractical repetition of the past takes the place of plasticity and fertile re-adaptation. In a moving world re-adaptation is the price of longevity." [7] Many current items presented as new, are often old, but not known and scarce within medical literature. Definitively, medicine is confirmed by its own historical development, thus meaning that the history of medicine is also a kind of medicine as already put forward for science in general by Goethe or Comte. History allows for a critical review and evaluation of the quality of information found in current medical literature. It is a convenient and rich avenue to approach the study of medicine. It has great value in today's practice because it is also a gold mine of ideas. OHNS is always in construction and the study of its past brings a lot of new trails of research. The medical profession of today lives too exclusively in the contemplation of the so-called modern discoveries, and misses the value and the work behind these modern discoveries, most of them being impossible without their pioneers and predecessors. History is an irrevocable part of medicine.

As with many other specialties, OHNS is an end of the 19th century born medical specialty [8]. At that time, the division of labor became a necessity, notably for organs needing special instrumentation, thus giving first birth to otology and laryngology. Progressively OHNS became the congruence of these two new born specialties, rapidly associated with rhinology and plastic surgery, leading to a more complete specialty. It went

through three chronological steps: construction in the second part of the 19th century [9], consolidation in the first part of 20th century and extension since the second part of the 20th century.

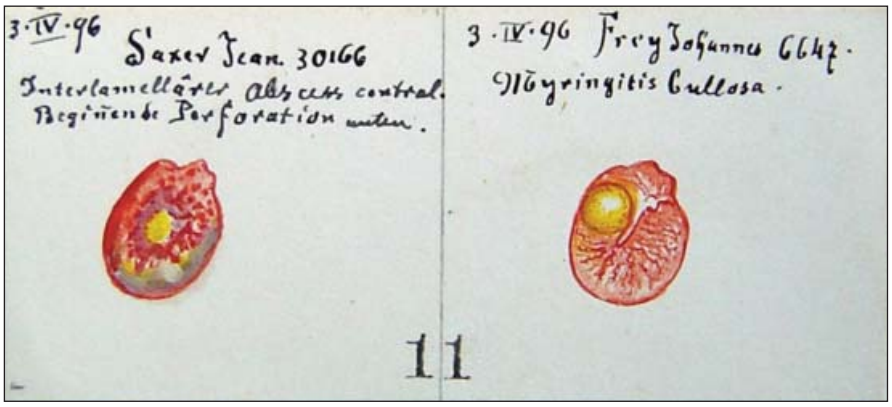
The first phase, construction, was marked by the foundation of the first OHNS hospital departments and university chairs, the organization of the first specific national and international congresses and the publication of the first OHNS journals [10] and books. In 1875, "The close anatomical and pathological relations existing between the ear, the nose and the throat often render it necessary that diseases of those organs be treated by the same hand." [11]



2. Original oil painting of the tympanic membrane by Politzer (Josephinum, Vienna)

The second phase, consolidation, was particularly marked by the recognition of OHNS as a medical specialty and its obligatory teaching during medical studies. Special training was organized to obtain the title of OHNS specialist. Already in 1887, "Hardly any individual is capable of a complete mastery of the whole range of rhino-laryngology, and if otology be superadded the ground is so extensive, that without devoting his whole time and attention to these subjects over several years, no one can hope to be a scientific expert throughout such a large territory." [12]

The third phase, extension, is marked by the introduction of highly technological improvements, and the progressive annexation of neighboring areas in the head and neck region. This extension is considered by some observers as the result of the decline of the specialty because of the introduction of effective antimicrobial therapy in most of the OHNS infections. On the other hand, OHNS knowledge development is linked with various factors, which can be schematically separated into three extrinsic factors, i.e. societal (religion, hygiene, and politics), scientific (electronics, photography, microscopes, rod lens, CT and MRI imaging, and computers), and medical (dissections, pathology, anesthesia, asepsis, antisepsis, bacteria, radiology, and antibiotics), and into intrinsic proper factors (instruments, surgical techniques, prosthesis, and implants). These contextual factors impregnated different steps of the non-linear development of OHNS. Of course the continuous development of OHNS knowledge followed the classical historical chronology. However, to better understand this evolution, it is useful to separate it into five conceptual partially layered "setting out", progressively established from antiquity to the 20th century: bedside, anatomopathological, clinicoexperimental, operative, and highly technological. The increase of knowledge becomes gradually exponential because all settings-out also concomitantly continue to progress. It conducted to a renewal of the



3. Original watercolors of the tympanic membrane by Rohrer
(author's collection)

4. Late antiquity skulls
(Latenium Museum, Neuchâtel)

subdivision of the specialty into otology, rhinology, laryngology, head and neck surgery, pediatric OHNS, otoneurology, facial plastic surgery, and phoniatry in the last decades of the 20th century. Progress undoubtedly explains medicine.

"Research workers aim to advance knowledge, but they should initially make sure they fully appreciate the present position of their subject, recognize current trends of the development, and ensure that they are not duplicating work already accomplished. This can only be done by investigating its history." [13] In everyday OHNS practice, this historical approach is very useful and can be conducted with a lot of fun, but not only. In various situations, OHNS specialists ask themselves, for instance, how did the idea to construct such an instrument come about? Who developed this surgery? Why is this remedy considered as the appropriate one? How was this discovery possible? Only history can give an answer to these questions and thus encourages the interested OHNS specialist to realize historical research. This study goes through at least five steps or levels of research, mainly following a hypothetico-deductive method. The chief source in the history of OHNS is literature composed of primary and secondary sources [14].

The first step is the study of secondary references to have an overview of what has been done and published up to present day on the chosen subject of research. It also normally results in a first list of primary original references. Nevertheless, they must be studied with some caution because they can sometimes contain incorrect data [15].

The second step is to look for original references, mostly books (*Figure 1*) and journal articles, also other available sources such as original iconographic documentation, notably oil paintings (*Figure 2*) and watercolor drawings (*Figure 3*), human remnants (*Figure 4*), instruments (*Figure 5*), anatomical preparations, natural (*Figure 6*) and in various materials (*Figure 7*), and artistic objects (*Figure 8*), the key factual documents in history, which is not always easy, and often very challenging. It can involve a lot of detective work, tracking one reference after another, and then following up, in the same spirit, the mentioned references in the original documentation.

The third step is to construct a structured chronology, being aware of original languages, number of editions, lifetimes and posthumous documentation [16].

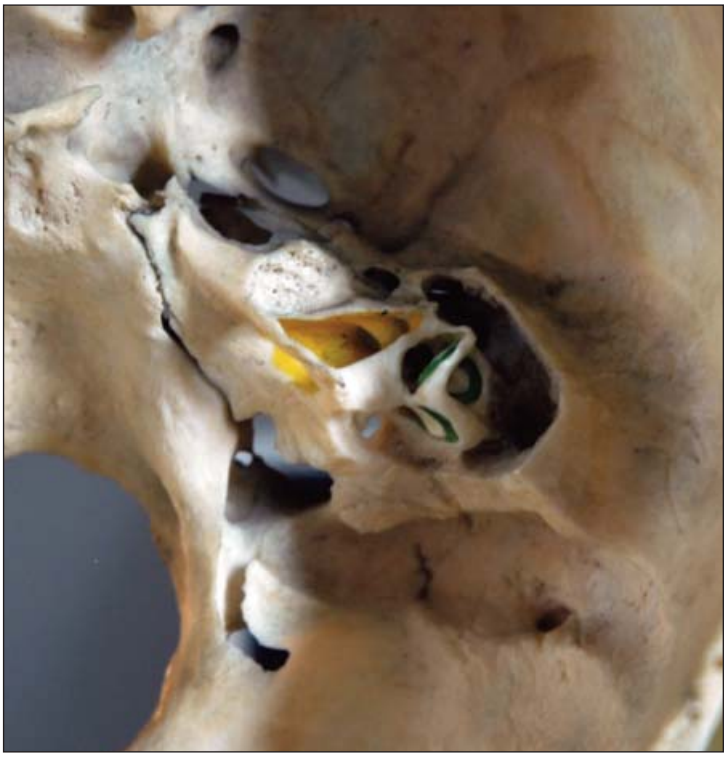
The fourth step is to study the context and be sure that the related facts belong and correspond to their epoch. Some subjects of study appear only at a given moment in history. OHNS is integrated in medicine,

medicine is integrated in science, and science is integrated in society. Their interrelation explains many progresses and developments in OHNS.

Finally, the interpretation of the results of the research must be put forward in a useful and practical way related to the everyday practice of OHNS.

5. Collection of old OHNS instruments
(Luebbers' exhibition Heidelberg, 2015)

History forms the basis of all knowledge and it is therefore simply natural to regard the evolution and progress of OHNS as an essential background to modern medical understanding. Unfortunately, very few OHNS specialists are interested in such research and today it is often conducted by historians, with the danger that medicine is no longer present in their studies. In the mid-20th century, Sigerist explained that "Medical history, without any doubt, is first of all history, a historical discipline like the history of philosophy, the history of art, or the history of music. It therefore has the general methods of historical research in common with all other historical disciplines. But it is a special history and therefore different from all others, with problems and methods of its own […] It would be a mistake to assume that medical history today is a concern of historians and philologists alone and of no interest to physicians. Medical history is medicine also today as it was in the past […] It seems to me, however, that today more than ever there is a need for medical interpretations and evaluations of the past of medicine." (17) Still today, history is a necessity for medicine.



6. Turn of the 20th century anatomical preparation of the inner ear
(Medizinhistorisches Museum der Charité, Berlin)

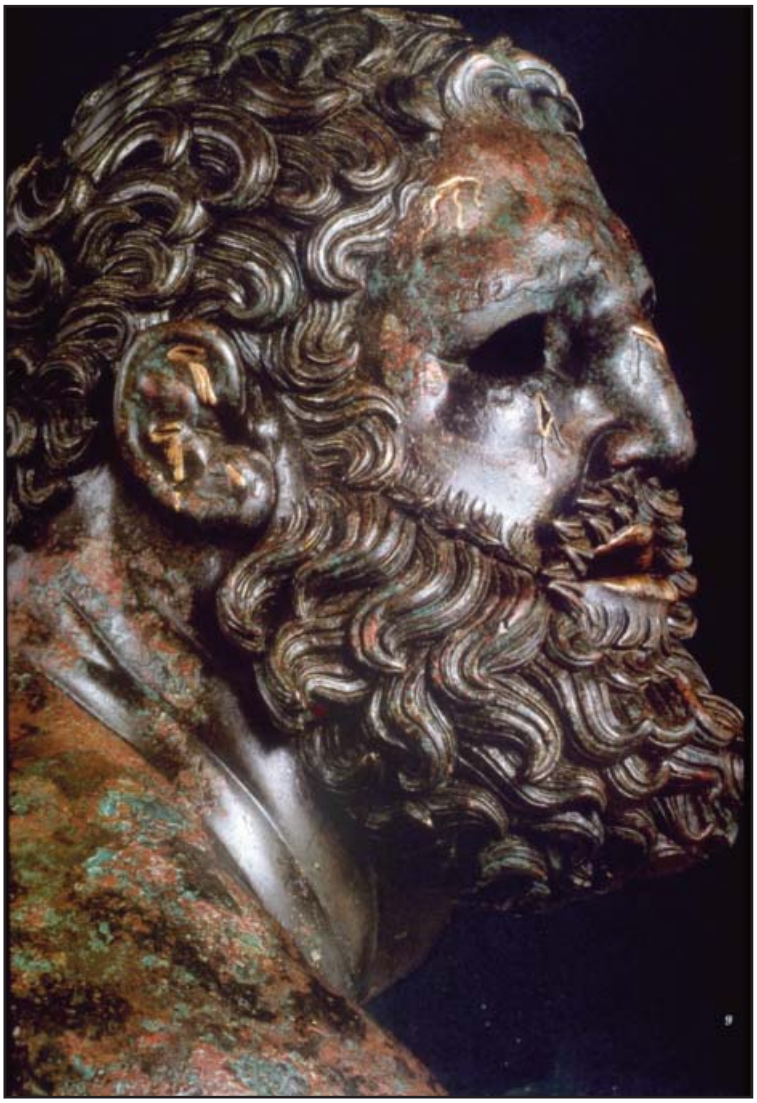
First period : bedside setting out

Bedside setting out corresponds to the antique history of medicine until the Renaissance when medical knowledge was only accessible at the patient's bedside. The first medical writings found in Ancient Egypt (*Figure 9*), Mesopotamia, Ancient India, and China demonstrated that the symptoms were the diseases, such as painful tongue, face ecchymosis, ear which heard badly, ear which give water of decomposition, tumefaction of the

7. 18th century wax models of the tongue
(Specola Museum, Firenze)

neck, swelling in the throat, fetid nose or exudate in the nose. Anamnesis, to enumerate symptoms, was a fundamental step in the comprehension of the disease. The physical examination was limited to external observation and palpation, except inside the mouth. The treatments were purely empirical, based on remedies of vegetal, mineral and animal origin, for example: oil, fat, honey, sea salt, cumin, beer foam, date wine, boiled hedgehog's thorns, rat head, fly specks, human bone, red ground ochre, mercury, copper, arsenic, and malachite. Some surgical gestures, mainly in relation with trauma, were used, such as sutures, digital reposition of the nose, reconstruction of the lobes of the ear and nose with flaps. Extraction of foreign bodies from the ear (*Figure 10*), excision of the uvula, incision of throat abscesses, and nose tamponade were also mentioned. The Ancient Greek world brought forward the concept that diseases were not supernatural but had a natural origin based on the Hippocratic theory of the four humors, each one could be insufficient or excessive. Thus, it introduced new therapies based on purgation (emetics, clysters, bloodletting, and cupping), cauterization, fumigation, modification of the ambient environment, and diet. Another important concept which influenced OHNS until Modern Times was the idea that defluxion of the ear and the nose were emunctories of the brain. The Hippocratic School knew that as long as the art of medicine was kept secret it could not make any real progress or offer any real benefit to humanity [18]. The Roman world improved the humoral theory and added the concept of "disease of the parts", i.e. organic origin of disease. Anatomy was very superficial and saw its first descriptions, mainly based on animal studies. Many new words were introduced to name different parts, notably for the auricle, the cartilage of the nose and larynx, and the muscles of the larynx. The external auditory canal ended with a "dry thin-spun web", the hidden part of the ear was simply named "labyrinth", and the wind pipe the "trachea-arteria". Some surgical techniques were clearly exposed, such as the extraction of foreign bodies in the ear with a hook, an ear-spoon, or "auricular clyster" (Celsus, 1st cent.), the ablation of nasal polyps with a special knife (Hippocratic School mentioned a sponge attached to a string passed into the nose, to forcibly draw the polyp from its attachment), the ablation of tonsils with a finger, or with a hook and a scalpel, and the section of the uvula. Since the 1st century BC, the opening of the trachea is clearly discussed under different appellations, such as "laryngotomy" (Asclepiades of Bythinia, 1st cent. BC), "cutting the larynx" (Galen, 2nd cent.), "incision of the arteria" (Aretius, 2nd cent.), or "pharyngotomy" (Antyllus, 3rd cent.). At the same time, the first pharmacopoeia was published by Dioscorides which listed more than 1000 remedies, mainly plants (*Figure 11*), but

also minerals and products of animal origin. The Middle-Ages did not bring much innovation, except some surgical instruments and the idea of Rhazes that a kind of "cold which arises during spring when roses deploy their perfume." It was only in the 20th century that allergies began to be understood. Chauliac (*Figure 12*) described the first known bivalve ear and nose speculum to extract a foreign body from the external auditory canal in 1368: "You may be able to expose him to the sunlight by tugging the ear to dilate it with a speculum" [19]. Bedside setting out, essentially represented by anamnesis and superficial physical examination, remained definitively fundamental in the first approach of OHNS diseases. It refined itself during the development of the next periods.



8. Roman bronze statue
(Museo Nazionale Romano, Roma)

Anatomopathological setting out

Renaissance and early Modern Times (16th-18th centuries) opened new fields in medicine, mainly in anatomy and pathology. Human dissections became possible, thus leading to the progressive description of all the macroscopic parts of the body with the introduction of many new terms such as "tympanic membrane", "cochlea", "maxillary antrum", or the proper use of other terms such as "cricoid cartilage". The nasal turbinates, the four sinuses of the face with their orifices, the three ear ossicles, the tympanic cavity, the vestibule, the semicircular canals, the cochlea, the detailed anatomy of the larynx, and the cranial nerves are particularly described. Then the salivary glands are nicely depicted (Malpighi 1666) (*Figure 13*) with their respective excretory canals (Warthon 1656, and Stenon 1661) (*Figure 14*). The saliva is demonstrated not to originate from the lymph, as suspected before, but from these glands. A second step is made with the introduction of the simple microscope leading to the description of most of the details of the inner ear, and the confirmation that it is filled with fluid (Cotugno 1760) and not air as supposed since Antiquity by Aristotle. Physical examination enlarged with the detailed examination of the external auditory canal and the nostrils rendered possible with the bivalve speculum clearly re-described by Hildanus (*Figure 15*). Reconstructive surgery is advanced with the improvement of flaps, notably for the nose and the ears (Tagliacozzi 1597) (*Figure 16*), and the use of prosthesis for the same parts (Paré 1585). Tracheostomy (Fienus introduced the term at the beginning of the 17th century), even if not very popular, saw different techniques, being performed

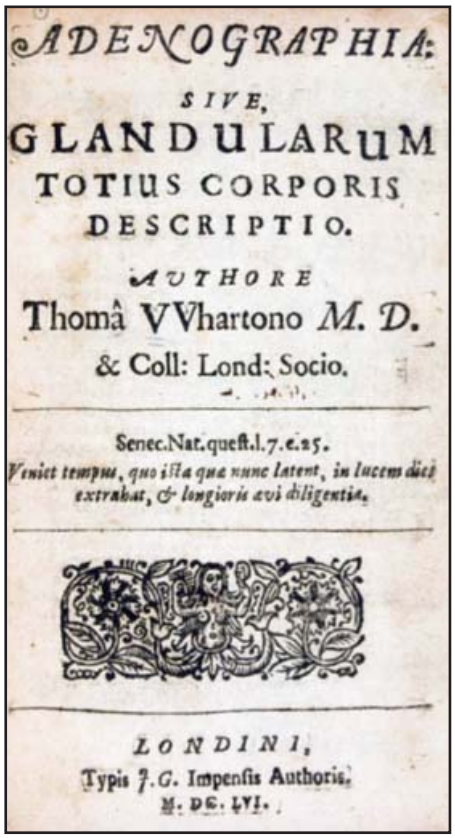
9. Edwin Smith Papyrus
(New York Academy of Medicine)

12. Chauliac's street in Brignais
(photography by Rémi Cuisinier, Brignais)

10. Roman ear spoons
(UCSF Museum, San Francisco)

13. Lifetime oil painted portrait of Malpighi by Carlo Cignani
(public domain)

11. Dioscorides' manuscript, 7th century
(public domain)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14. Title page of Warthon's treatise, 1656
(author's collection)

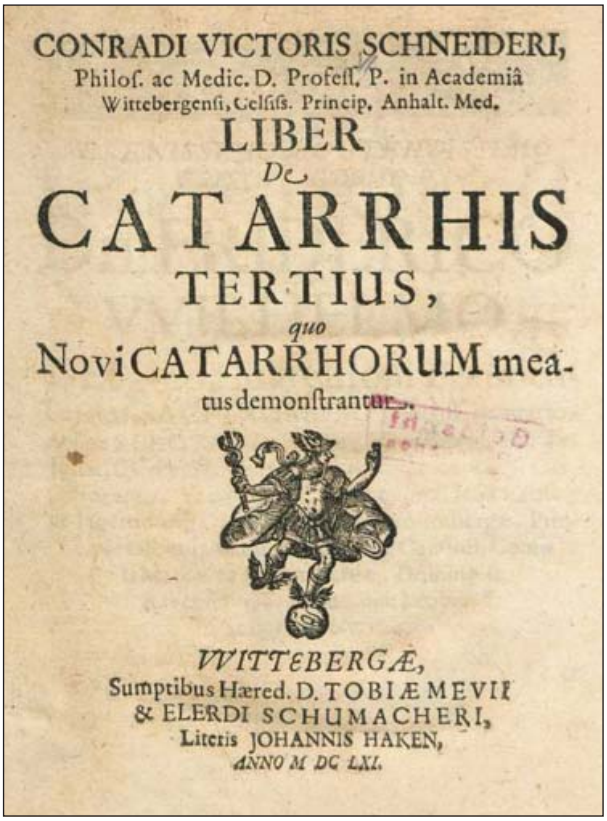
15. Hildanus's original ear speculum, 1606
(author's collection)

with a vertical, horizontal or punctiform opening, associated with the placement of a canula. The advent of pathology and the understanding of the local lesions related to the disease made clear that defluxion of the nose (Schneider 1661) (*Figure 17*) and the ears (Morgagni 1761) (*Figure 18*) came from these respective parts and not from the brain as thought since antiquity. Antique surgeries are slightly improved and new ones are introduced: the opening of the maxillary sinus in the case of infection through three different routes: the canine fossa (Molinetti 1675), the tooth (Meibomius, Cooper 1707) and the nasal wall of the maxillary sinus (Jourdain 1767); the superficial opening of the mastoid area in the case of abscess as soon as fluctuation was felt with the trephine, or gouge and mallet, rugine or a perforator (Petit since 1736); the catheterization of the Eustachian tube first through the mouth (Guyot 1724) then through the nose (Cleland 1744) with a "silver tube" in the case of obstruction of "external and internal auditory passages"; and the perforation of the tympanic membrane "with a sharp, long, but small lancet", in the case of deafness (Busson 1748, Cooper 1800). Pain, bleeding, and infection were the limiting factors of surgical investigation. The deaf-mute children were no longer considered as "burdensome pariahs", and their systematic education was of public concern and established with two main controversial approaches, i.e. oralism (Heinicke) (*Figure 19*) and manualism (De l'Epée) (*Figure 20*). In 1880, the oral method was recognized superior to the manual method. Nosologies are implemented to try to classify the different known diseases, thus introducing new terms, such as otitis and epistaxis. Otology began to be a separate topic with the publication of its own books, notably by Duverney in 1683 (*Figure 21*), Valsalva in 1704 (*Figure 22*) and Wildberg in 1795. Anatomopathological setting out progressively completed bedside setting out in the understanding of OHNS diseases and allowed the possibility to diagnose more precisely, thus rendering specific therapy more efficient.

THIRD PERIOD : CLINICO-EXPERIMENTAL SETTING OUT

The clinico-experimental setting out began at the beginning of the 19th century. It opened up a new approach in medical practice with

16. Tagliaccozzi's reconstruction of the nose, 1597
(Museo di Storia della Medicina, Roma)



CONRADI VICTORIS SCHNEIDERI,
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& ELERDI SCHUMACHERI,
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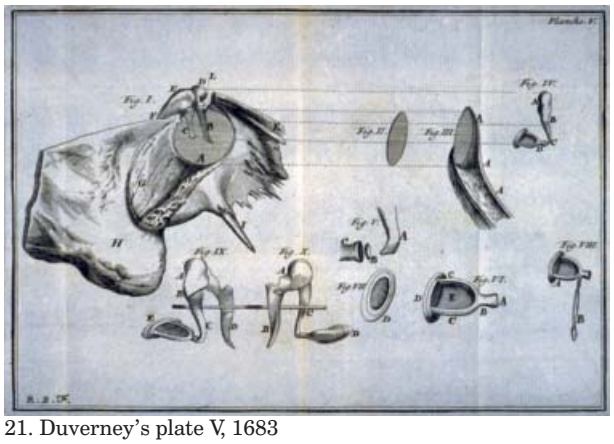
17. Title page of Schneider's treatise, 1661
(author's collection)

18. Morgagni's 1808 medal
(auction by icollector.com)

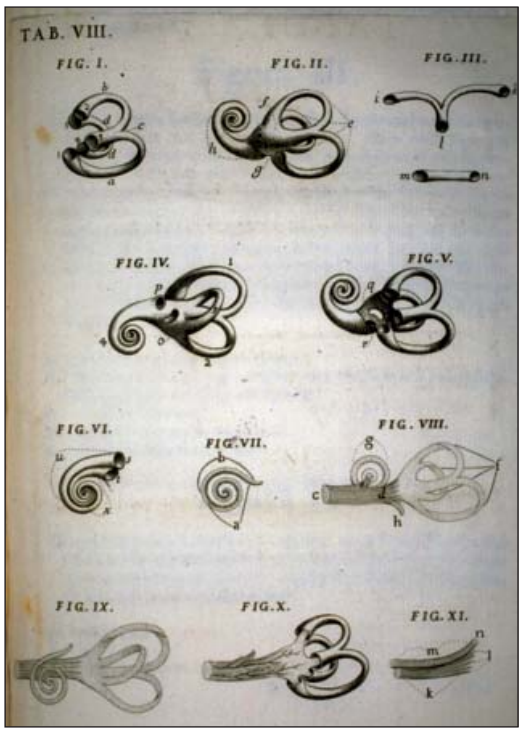
19. Bust of Heinicke
(Seelemann-Park, Hamburg)

the correlations of the bedside clinical symptoms and the lesions described during autopsy. Anamnesis became more orientated and more precise. A second, later step was added with the possibility of investigating in the laboratory the quality of the different liquids and secretions of the body, and also the microscopic structures of the tissues (biopsies). New techniques of examination with new definitive instruments were introduced to directly find these lesions. The funnel shaped speculum was definitively accepted (*Figure 23*), the laryngeal mirror first described by Garcia in 1855 and rapidly improved by Czermak and Türck (*Figure 24*), and the bivalve nasal speculum found its definitive shape rendering physical examination more objective. The main problem was the reflected illumination which having been natural became artificial in association with the hand, then mouth, and finally concave perforated frontal or head mirror. This latter mirror became the emblem of the OHNS specialist (*Figure 25*). The discovery of electricity allowed for direct light to be joined to the mirror. All the OHNS orifices were then visually and completely accessible. Despite the development of photography, these organs were not reachable, reason why the first published OHNS atlases only contained watercolor images drawn by the observer (*Figure 26*). With the development of the cell theory, anatomy was improved with the use of the compound microscope which led to the description of the ciliate cells of the organ of Corti and their supportive cells. It guided the reworking of the theories of hearing, notably by Helmholtz (*Figure 27*) and his concept that different regions of the basilar membrane act as resonators for tones of different frequency. The following demonstration that most of the diseases were linked to cellular troubles and that the ear, nose and larynx have a similar cellular covering (i.e, respiratory mucosa) in most of their parts, lead to the concept of a common insight in the development of diseases. A clear relation was demonstrated directing the physicians to join together the care of the diseases of these organs and create the OHNS specialty. At the same time, physiological experiments began to be conducted to understand the functions of the OHNS organs. Flourens demonstrated, in cutting the semicircular canals of birds, that these inner ear structures participated in the balance system. Goltz went a step further in demonstrat-

20. Abbé de l'épée with some pupils
(INJS, Paris)



21. Duverney's plate V, 1683
(author's collection)



22. Valsalva's plate VIII, 1704
(author's collection)

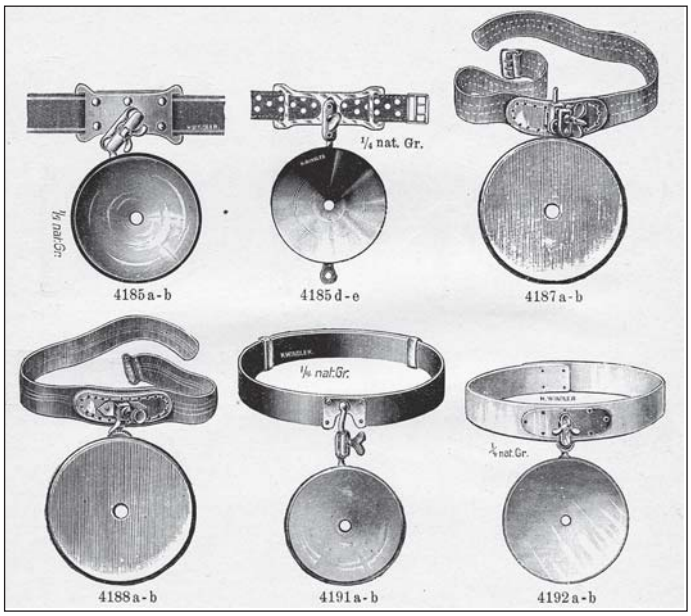
23. Ignaz Gruber's ear speculum, 1838
(Josephinum, Vienna)

24. Türck & Czermak medal, First International Congress of Laryngology, Vienna, 1908
(Luebbers's private collection, Hannover)

ing that there is the balance system, and Breuer that a relation exists between the troubles of the system with nystagmus. At the same time, Menière described his famous disease associating vertigo, hearing impairment and tinnitus (*Figure 28*). Surgery did not really progress and remained very limited. Some already described operations were demonstrated as being dangerous such as mastoidectomy. Other interventions became very popular, even if only discussed, such as catheterization of the Eustachian tube and artificial perforation of the tympanic membrane. Tracheostomy was well established and tonsillectomy saw its beginnings as a routine operation with the introduction of a kind of guillotine, the "tonsillotome", invented by Physick in 1828 by modifying an instrument developed by Bell to section the uvula (*Figure 29*). This instrument saw various modifications up until Sluder in 1911 (*Figure 30*). Clinico-experimental setting out reinforced anatomopathological setting out in the optimal quality of diagnosis. These first three periods were mandatory to allow the development of better therapies, notably in surgery, leading to growth of the two following periods.

Fourth period : operative setting out

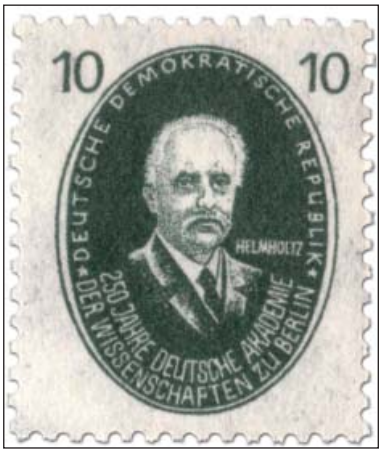
Invention of anesthesia with ether and chloroform in the 1840's and the introduction of asepsis (sterilization), antisepsis (disinfection), and arterial clamps in the 1860's, opened a completely new surgical era with the possibility to operate for more than only a few minutes with fewer surgical complications. New operating rooms were created (*Figure 31*). In parallel, medication for pain relief became synthetized (morphine, salicin), thus rendering the post-operative care more successful and affordable for the patients. The discovery of bacteria as agents responsible for the development of infection was another important event. Surgeons were now able to extirpate diseased organs such as the larynx, Billroth in 1873, creating a definitive opening of the trachea in the neck ; to completely open all the cells of the mastoid process by Schwartze with hammer, chisel and gouges (*Figure 32*) in the same year ; to endomucosally correct the deviation of the nasal septum with specially designed instruments (various surgeons, 1882) ; to practice endonasal corrective aesthetic correction of the



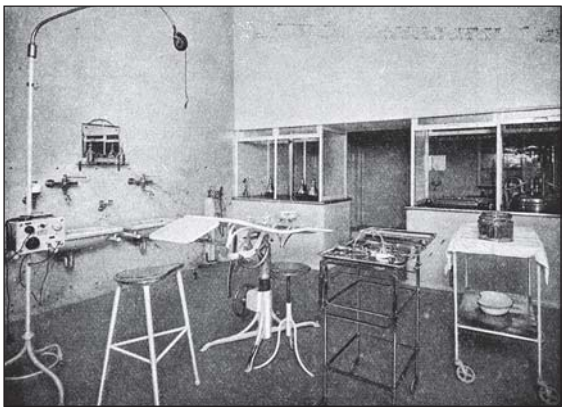
25. Some head mirrors available at the beginning of the 20th century (Windler, 1909)

26. Watercolored rhinopharynx views from Semeleder's atlas, 1862 (author's collection)

nose (Roe 1887) ; to place a tube into the glottis (O'Dwyer, 1882) (*Figure 33*) in case of infectious obstruction (diphtheria) ; to replace the guillotine technique of tonsillectomy by the "dissection technique", the patient being placed on his back with a sandbag under his shoulders and with the head well extended ; or to reconstruct the face with various flaps in the 1920's. O'Dwyer's tube precluded the development of the orotracheal tube (Kuhn 1900, Magill 1920). Another important advance in OHNS was the recognition of the importance of the adenoids described by Meyer in 1868 (*Figure 34*) in the development of middle ear infections. Removal of them quickly became a routine operation first with a kind of ring-knife and then with the curette. Concomitantly, local anesthesia with cocaine was introduced in 1884 by Jelinek (*Figure 35*). It opened a new field of "minor" operations notably in the larynx and the nose. After the remarkable development of esophageal and bronchial endoscopy during the last twenty years of the 19th century, endoscopy found its mark in the first two decades of the 20th century also becoming therapeutic. It was included in the domain of most OHNS specialists. With all these surgical possibilities OHNS very quickly became mainly a surgical specialty. New techniques were progressively depicted allowing more precise surgery, notably the different types of mastoidectomy (cortical, radical, and modified radical) (*Figure 36*) and partial conservative surgery of the larynx. Mobilization (notably of the stapes), and extraction of the ossicles was attempted, as was skin grafting ("myringoplasty") of perforations of the tympanic membrane (Berthold, 1878, Ely, 1878). With the expansion of the number of OHNS journals (31 OHNS journals were created, with more or less success in the 19th century, the first in 1864) (*Figure 37*), these new techniques were rapidly made known by the specialists. Specialized catalogues of instruments completed these texts (*Figure 38*). Laboratory work allowed the recognition and the description of many diseases such as cholesteatoma and otosclerosis. Cholesteatoma is a term coined in 1838 by Müller because he was aware of the presence of cholesterol and fat in what he believed to be a fatty tumor. Three main theories were then discussed to explain the origin of this entity: metaplasia of mesenchymal cells (Virchow 1855), heterotopia, and epithelial migration (Habermann 1889,

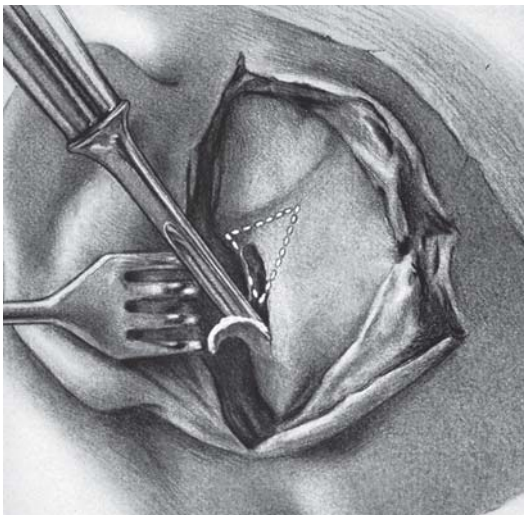


27. One of Helmholtz' stamps
(author's collection)



31. OHNS operating room at Vienna General Hospital, 1912
(author's collection)

28. Medal of the Prosper Menière Society
(www.sydney.edu.au)



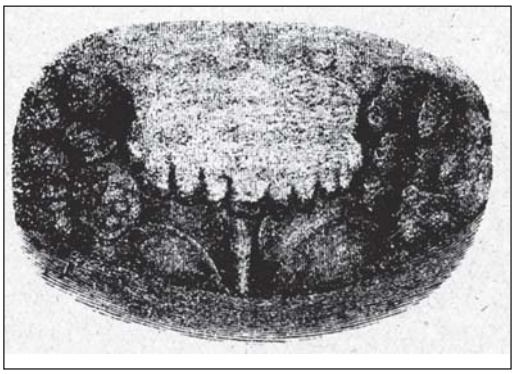
32. Mastoidectomy with hammer and cisels
(author's collection)

29. Physick's tonsillotome
(Maude Abbott Medical Museum, McGill University, Montreal)

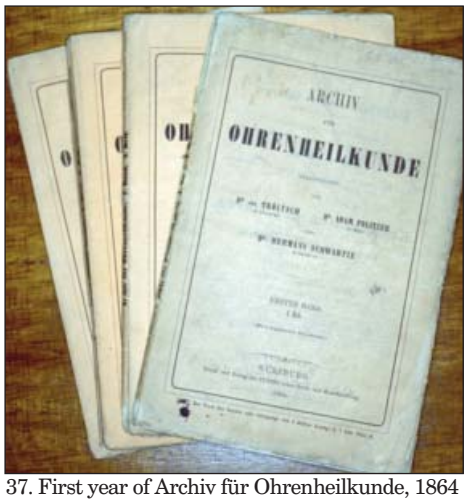
30. Sluder's tonsillotome
(Deutsches Medizinhistorisches Museum, Ingoldstadt)

33. O'Dwyer's sets of endotracheal tubes

(National Museum of Health and Medicine, Smithsonian, Washington)



34. Meyer's original drawing of the adenoids
(author's collection)



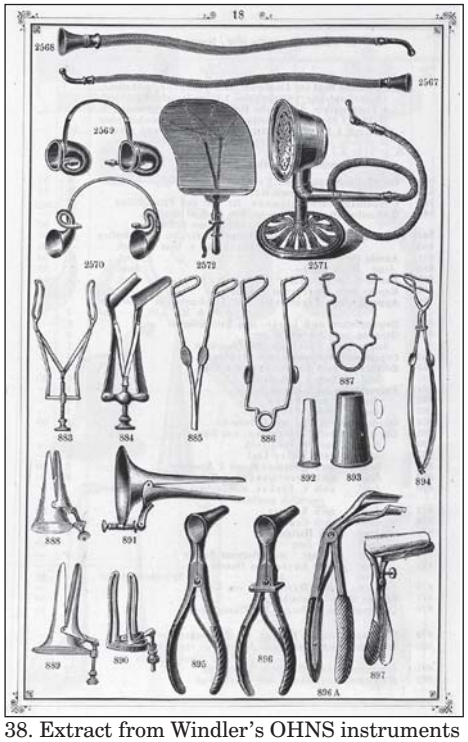
37. First year of Archiv für Ohrenheilkunde, 1864
(author's collection)

Das Cocaïn als Anästheticum und Analgeticum für den Pharynx und Larynx.

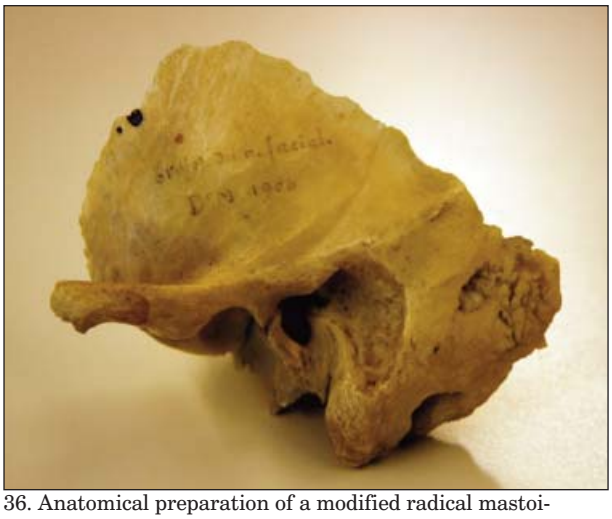
Von Dr. EDMUND JELINEK in Wien *).

Die Laryngologen waren von jeher bemüht, die der laryngo- und rhinoskopischen Untersuchung, insbesondere aber den endolaryngealen Operationen feindselig entgegentretenden Reflexbewegungen des Pharynx und Larynx zu bekämpfen. Schon Türk, der Begründer der Laryngologie, hatte ein Verfahren angegeben, durch Morphineinpinselungen den Larynx zu anästhesiren.

35. Jelinek's original publication
(author's collection)

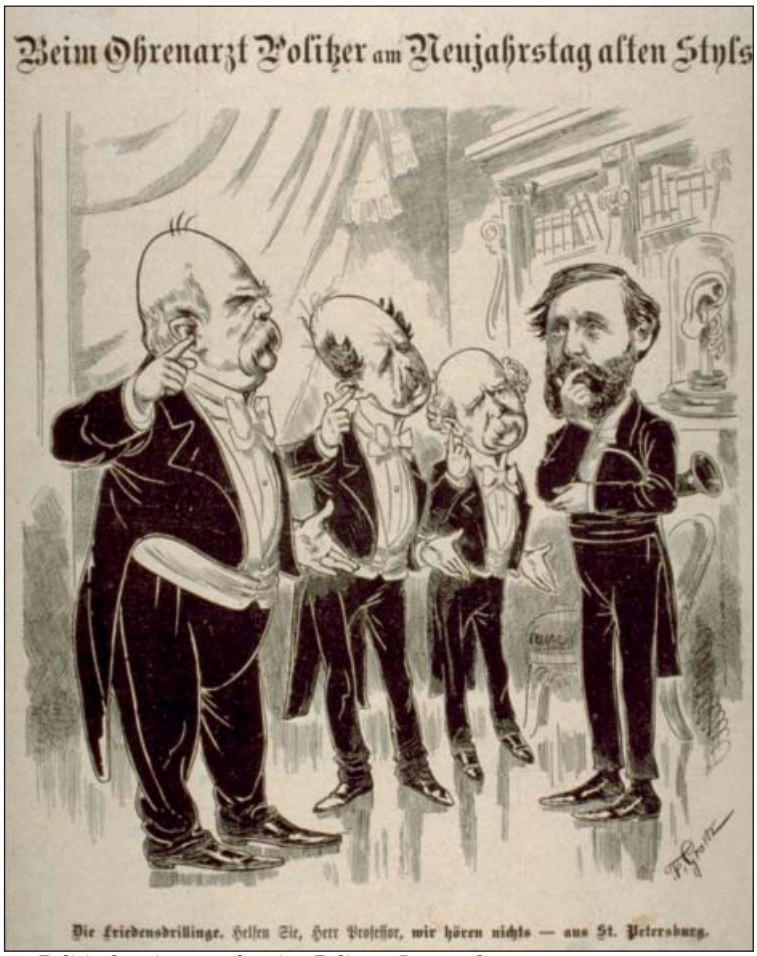


38. Extract from Windler's OHNS instruments catalogues, 1893
(author's collection)



36. Anatomical preparation of a modified radical mastoidectomy
(IUHMSP, Lausanne)

and Bezold 1890) of the external auditory canal epidermis into the tympanic cavity. In 1893, Politzer (*Figure 39*) described a "circumscribed disease of the bony labyrinth capsule, leading to new bone overgrowing to the oval window and stapes, and finally leading to complete anchylosis of the stapes", which he later named otosclerosis. The term otospongiosis was also added to name this disease (Siebenmann 1912). At the turn of the 20th century, two important discoveries modified the practice of OHNS: radiology and the carbon amplifier. Radiology allowed one finally to directly see inside the OHNS cavities of the face leading to the development of numerous different incidences (*Figure 40*) to specifically analyze the ear and the sinus. The classical projections of Schüller (1905), Caldwell (1906), Law (1913), Waters (1915), Stenvers (1917), Hirtz (1922), Mayer (1923), and Blondeau (1926) are rapidly described. Cancer development and evolution are better understood in the OHNS region, rendering the research of primary



39. Political caricature showing Politzer. It says there:
"Please help Professor, we hear nothing - from St Petersburg"
(Josephinum, Vienna)

40. 1914 radiological projection of the face
(author's collection)

metastases a full part in its diagnosis and treatment. Radiology also enabled to detect swallowed or aspirated foreign bodies in the airways and esophagus. Neck dissection was included in surgical treatment. Radiotherapy (Roentgentherapy) was introduced, such as radium therapy. Rapidly, radium therapy was stopped because of its many side effects. Thanks to the development of carbon amplifiers, the first electric hearing aids were produced. The invention of the audiometer in the 1920's opened a new era in the measurement of hearing levels (*Figure 41*). It took more than 20 years to definitively replace the voice, clock, acoumeter and different whistles used until this time. A standard method of collecting the results (audiogram) was introduced and accepted worldwide. In 1906 Barany developed the caloric reaction of the ear producing a reproducible nystagmus correlated with the temperature of the installed water. He also invented the rotatory chair (*Figure 42*) for the examination of patients suffering from vertigo and became known every OHNS specialist with the invention of the noise box. For all his work, he received the first OHNS Nobel Prize in 1914. In 1925 Frenzel developed his special glasses allowing to easily observe the nystagmus (*Figure 43*). But it was only in the 1950's that otoneurology really found its place in OHNS with the development of electronystagmography. This period is the key period of the history of OHNS because it allowed for its construction and consolidation.

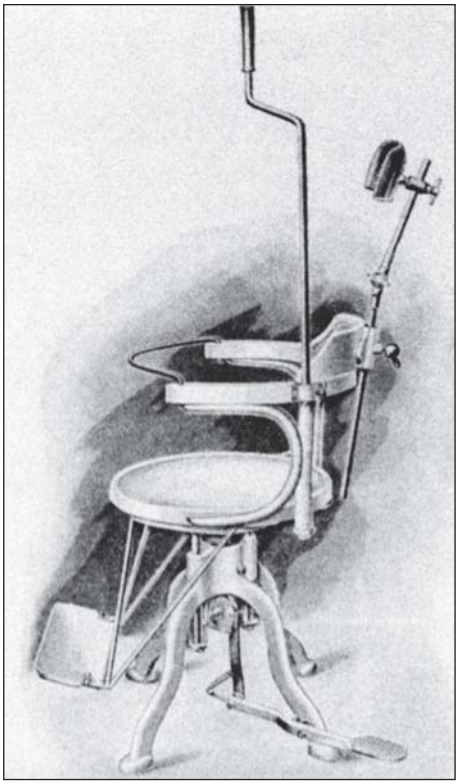
FIFTH PERIOD :
HIGHLY TECHNOLOGICAL SETTING OUT

"With the use of sulfonamides and antibiotics we need no longer fear many of the major surgical procedures in otolaryngology." [20] The discovery and progressive use of antibiotics largely modified the surgical practice

41. Western Electric 2A audiometer
(Lewis Addison's private collection)

43. Frenzel's glasses
(Luebbers's private collection, Hannover)

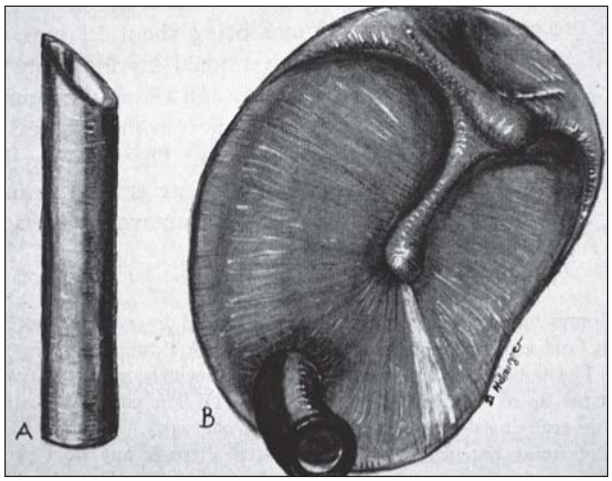
44. Penicillin original advertisement on blotting paper
(author's collection)



42. Drawing of Barany's rotatory chair
(author's collection)

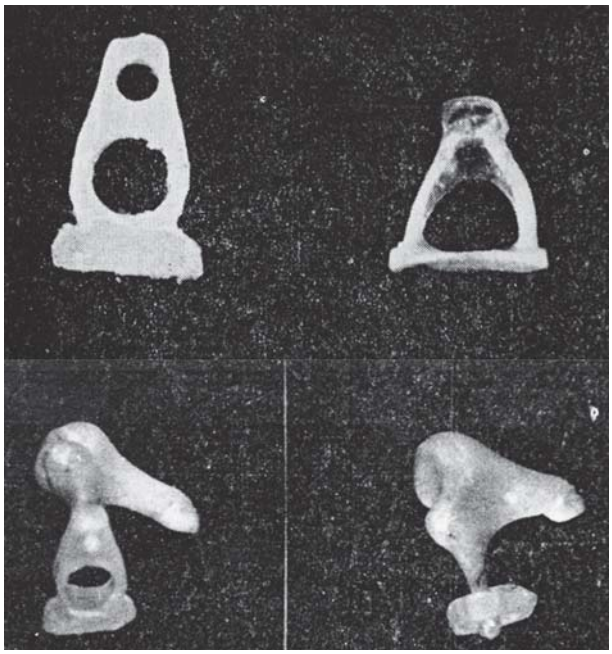
45. OPMI1 microscope
(Medizinhistorisches Museum, Zurich, exhibition 2009)

of the OHNS specialists in the 1940s and 1950's (*Figure 44*). This further holds true for tuberculosis and syphilis, the scourges of passed centuries. It also orientated research in the area of physiology and chemical understanding of the functions of organs. The number of mastoidectomies, openings of the sinus, and drainages of throat abscesses dramatically diminished. The scope of surgery became limited to the few cases not responding to antibiotic treatment and the specialty was questioned for its future. It introduced some pessimism leading to the conclusion that "Otolaryngologists have much to gain by thrashing out the problem calmly and deliberately rather than by ignoring it." Nevertheless and fortunately the invention of the binocular microscope and rod lens endoscopes opened new surgical techniques and allowed an expansion of the classical surgical field to the surrounding structures such as skull base, lacrymal ducts, face and thyroid. Otolaryngology became otolaryngology, head and neck surgery. With the binocular microscope [21] (*Figure 45*), it was then possible to reconstruct the tympanic membrane and the ossicles. Wullstein and Zöllner were the developers of these tympanoplasties from 1952. Wullstein coined the German term "Tympanoplastik" to describe his various surgical techniques of reconstruction of the tympanic membrane and the middle ear sound-conducting mechanism, the goal being "one-step reconstruction of hearing". He described five types of function in the extension of ossicular destruction. Numerous different materials were then used as grafts, and various surgical approaches were developed in function notably of the size and localization of the tympanic perforation and the extent of ossicular destruction. At the same time, an older ingenious invention, the tympanostomy tube, was reintroduced by Armstrong in 1954 (*Figure 46*). It completely modified the treatment of serous otitis media. In fact, it was developed in the mid-19th century but was unsuccessful during this time [22]. Mastoidal techniques were also modified with the systematical use of the air-driven drill associated with a suction system. With the first works of Shea in 1958, stapedectomy became possible, with the replacement of the stapes by a prosthesis (*Figure 47*) which quickly found its classical piston-like form in the 1960's. With the introduction of the first tomographies, the temporal region was more accessible to the surgeon and the internal auditory canal became a domain accessible to the ear surgeon. House and Fisch pioneered this lateral skull base surgery between the 1960's and 1970's. The microscope was also used in surgery of the larynx, associated with the development of new direct laryngeal tubes "in suspension" on the thorax of the patient. Kleinsasser played an important role in the development of this system in the 1960's (*Figure 48*). Phonosurgery rapidly found its place with the introduction of many specific instruments and techniques. A revolution in the treatment of profound deafness was the invention of the cochlear implant by House. Inspired by the



46. Armstrong's tympanostomy's tube from his original publication

(author's collection)

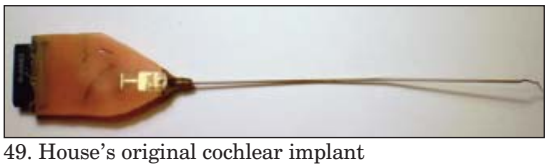


47. Shea's original prosthesis from his original publication

(author's collection)

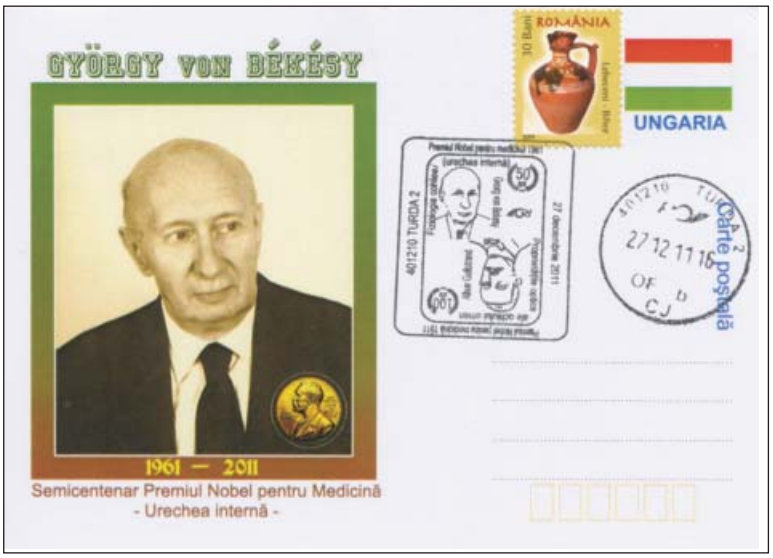
1957 works of Djouro and Eyries, in 1961 House, placed an electrode directly into the cochlea to stimulate the auditory nerve (*Figure 49*). It unlocked a completely new approach in the treatment of deaf-mutism [23]. It took more than 30 years of technical refinement by various teams before the device became efficient for speech recognition and understanding, safe, accepted and used worldwide. It certainly represents the most important development of OHNS in the 20th century. The main protagonists received the Lasker prize in 2013 and the Russ prize in 2015. After the invention of the fiber optic endoscope in 1957, the improvement of rod-lens models in the 1960's, notably by Messerklinger (*Figure 50*), also introduced new diagnostics and iconographic methods, and surgical paths and techniques in nasal surgery. Everything was visually accessible and the systematical opening of ethmoidal cells became a routine operation. It also enlarged the field of work with the improvement of transnasal hypophysectomy, dacryocystorhinostomy, and frontal skull base surgery. These latest devices brought new possibilities in esophagoscopy and bronchoscopy, notably the development of various stents. These microscopical and endoscopical surgical extensions of OHNS found a second great impulse with the invention of the CT scan and MRI in the 1970's. All the fine anatomical and pathological details were recognizable, thus rendering surgery much safer and sure. It also allowed for the development of new less traumatic approaches in skull base surgery. The treatment of OHNS cancer entered a new era with the development of surgical reconstruction of the diseased part of the neck and face with local flaps such as the myocutaneous deltopectoral technique introduced in 1965 (Bakamjian) ; transplants, such as the jejunum, and microvascular flaps such as the peroneal flap and the forearm flap. The concept of functional neck dissection was introduced. Radiotherapy became more precise, focalized, and associated with less side effects and chemotherapy found an important place in treatment. Head & neck tumor boards and concilia with all the competent physicians were progressively organized to find the best possible therapeutic solutions. An international system of classification of cancers (TNM) was agreed in 1978 and became the standard in the description of the extension of a cancer. Cutting lasers (particularly CO2)

48. Portrait of Kleinsasser
(German Society of OHNS)



49. House's original cochlear implant
(House's personal documentation)

50. Portrait of Messerklinger
(Archives, Medical University, Vienna)



51. Békésy's Nobel Prize 50th anniversary card from Romania (author's collection)

were introduced at the turn of the 1980's notably in the surgery of the vocal cords and for the ablation of superficial mucosal lesions. Other lasers (notably YAG) were used to desintegrate obstructive tumoral lesions in the bronchial tree and esophagus or to cauterize bleeding chronical lesions in the nasal cavity. Computers, in the 1990's, allowed for the development of a navigation-system of surgery, especially for endonasal surgery and lateral skull base surgery. The invention of transistors in 1948 and their progressive miniaturization allowed the production of new hearing aids placed behind and in the ear in the 1960's which became much more acceptable by the person suffering from impaired hearing. The weight of these new devices was under 5 grams. The digitalization of the treatment signals in the 1990's gave a new impetus to their development. The comprehension of the physiology of the ear has been improved by the works of Békésy who received the second OHNS Nobel Prize in 1961 (*Figure 51*). The physiology of the hearing system and neural encoding system then became a large field of research. In the 1960's better comprehension of apnea and related sleep disorders opened a new area of competence for the OHNS specialist with the development of various surgical techniques and devices to improve the quality of air flux exchange through the naso-bucco-pharyngo-laryngeal passage. OHNS fundamental research became an indispensable support of this highly technological setting out. Ear, nose and throat diseases affect almost everyone at some point in their life, often in ways most people never expect. With the expansion of the field, many new issues of interest appear, in a collaborative and comparative effectiveness. Some of the main topics of interest are inner ear hair cell regeneration, biomechanics in hearing, genetics and hearing loss, auditory and vestibular implants, immune system and cancer, infection and cancer, risk factors in cancer development, cancer specific therapies, regeneration of respiratory mucosal cells, pathophysiology of smell and taste disorders, artificial voice organ, immuno-histochemical and molecular analysis of OHNS tissues, tissue engineering (cartilage, bone, nerve, etc), computer modelling and robotics surgery. This highly technological setting out forms the period of extension of OHNS. It is in perpetual evolution, with more or less success concomitantly with the name of this specialty [24].

The future looks really bright. The danger is that only the surgical technological aspect of the OHNS specialty is credited and considered, whilst putting the ethical and human aspects of medicine to one side in the face of progress. Furthermore, and for many people, a good OHNS specialist is a surgeon! OHNS is a multifaceted fascinating specialty, and to be effective, it must have all its different aspects joined together in a respectful, collaborative and constructive spirit. OHNS specialty is definitively built on bedside ex-

amination, anatomopathological correlation, clinico-experimental explanation conducting to the final diagnosis. In possession of a good diagnosis, the OHNS specialist is able to propose and manage efficient surgical and highly technological therapies. In conclusion, OHNS past belongs to present, history is thus an irrevocable part of OHNS, which is explained by its undoubted progress and finally leading history to be a necessity for the upcoming development of OHNS.

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