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IN the fall of 1970, a request was made by the chairman of the Committee on the Mütter Museum to the members of the Section on Otolaryngology of The College of Physicians of Philadelphia for an evaluation of the Museum's otologic specimens prepared by Adam Politzer and Joseph Hyrtl. Consequently, the specimens were photographed in color and black and white. Several consultants, including Nobel Prize-winner Georg von Békésy of the University of Hawaii, Captain Vincent J. Hyams of the Armed Forces Institute of Pathology, and Juergen Tonndorf of The College of Physicians and Surgeons of Columbia University, visited the collections commenting on their value and state of preservation.

During the interim, the evolution of Politzer's temporal bone dissections has been studied as a reflection of his contribution to otology. Because modern otologists, like many nineteenth-century naturalists, are remarkably unaware of the existence of the remainder of Hyrtl's scientific materials, including microscopic injections, corrosion preparations and the crania collection found at the Museum, an extensive inquiry was conducted concerning the identity of the man who initiated a program of collection which included the ossicles and labyrinths from 174 species. As the following reports demonstrate, the otologic artifacts at the Mütter Museum present an unparalleled opportunity for otologists to observe the normal and pathological human and correlative anatomy of the ear.

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I. A Remarkable Discovery: The Adam Politzer Collection

Located among the Bohemian glass, bent wood furniture, and meerschaum pipes in the Austrian section of the main building at the Philadelphia Centennial of 1876 was the hallmark of the medical exhibits, the collection of temporal bone dissections prepared by Adam Politzer. This prize-winning display, representing the work of many months, ultimately spearheaded vast changes in American otology, for it enabled practitioners to visualize minutiae and internal structures previously undetected.

Adam Politzer, the son of a merchant and the grandson of a physician, was born on October 1, 1835, in Alberti, Hungary. He received a classical education and earned a doctorate in medicine from the University of Vienna in 1859. After subsequently studying physiology at major European universities, Politzer returned to Vienna where ultimately he was made the first professor of otology in 1870. In recognition of his clinical acumen and scientific approach, Politzer was awarded many honors; he was affectionately called "The Father of Modern Otology" by students of all nationalities.

By the 1870s, Politzer had created an acute awareness of the need for accurate otological diagnosis and improved methods of aural surgery. Thus, when his collection of otologic artifacts appeared at the exhibition, hordes of visitors, including physicians

from all parts of the country as well as curious laymen, inspected the display. Numerous charlatans congregated around the area seeking to capitalize on the interest in the collection by peddling secret nostrums and patent medicines to those individuals with aural afflictions.

In conjunction with the Centennial celebration, an international otological congress was organized by members of the American otological society. Although Politzer was unable to attend the first session held in New York, he actively participated in subsequent meetings of the congress, submitting papers on a vast range of otitic anomalies.

At the close of the Centennial, Thomas Hewson Bache, the curator of the Mütter Museum of The College of Physicians of Philadelphia, negotiated the purchase of the Politzer exhibit for eight hundred dollars. Despite Politzer's distinguished position at the university based on his international reputation, there were factions which did not view him kindly. When the news reached Vienna that the collection he had sent to America had been sold, he was depicted in cartoons appearing in local papers as a common thief snatching temporal bones for sale. To appease the public, Politzer requested a letter from The College of Physicians of Philadelphia stating that this payment was for the mounting and preparing of specimens rather than obtaining them.

The collection of temporal bone dissections currently housed at the Mütter Museum is in a wooden case with each bone mounted on a small pedestal covered by a bell jar. The methods of securing the bones and producing the dissections have been described in detail by Politzer in *Die anatomische und histologische Zergliederung des menschlichen Gehörorgans im normalen und kranken Zustande für Anatomen, Ohrenärzte und Studierende,* published in 1889, with the English version, *The Anatomical and Histological Dissection of the Human Ear in the Normal and Diseased Condition,* appearing in 1892. After attending the sessions of the first Pan-American Congress held in Washington, D. C., in 1893, Politzer visited the Mütter Museum where he noted that his specimens were in fine condition. The state of preservation after the intervening decades is still good, but proper steps should be taken to prevent decomposition.

The Politzer collection reveals a variety of chronic changes involving the tympanic membrane and other temporal bone structures. Many of his anatomical preparations demonstrate the relationship of the tympanic membrane to the middle and inner ear structures in both children and adults; the topographical relationship of the semicircular canal and the cochlea to the drumhead; the occurrence of necrosis involving destruction of the conductive and sensoryneural structures with erosion into the sigmoid sinus; and the presence of semi-lunar, kidney-shaped, and multiple perforations of the tympanic membrane. The extent to which Politzer understood and depicted the aforementioned subtleties of temporal bone structure is illustrated in the accompanying photographs (Figure 1). For the otologist, a firsthand view of this historic collection at the Mütter Museum is an educational inspiration. These specimens represent a tangible legacy which continues to be pertinent today.

II. Whatever Happened to Joseph Hyrtl?

The names of such nineteenth-century naturalists as Broca in France, Darwin in England, and Virchow in Germany are immediately identifiable as an integral part of our modern scientific heritage; yet, the name of one of their equally prominent contemporaries has by now been totally enveloped in obscurity. The biography of Joseph Hyrtl, who was acclaimed as an eminent natural scientist in Europe during the height of his career, gives testimony to the evanescence of

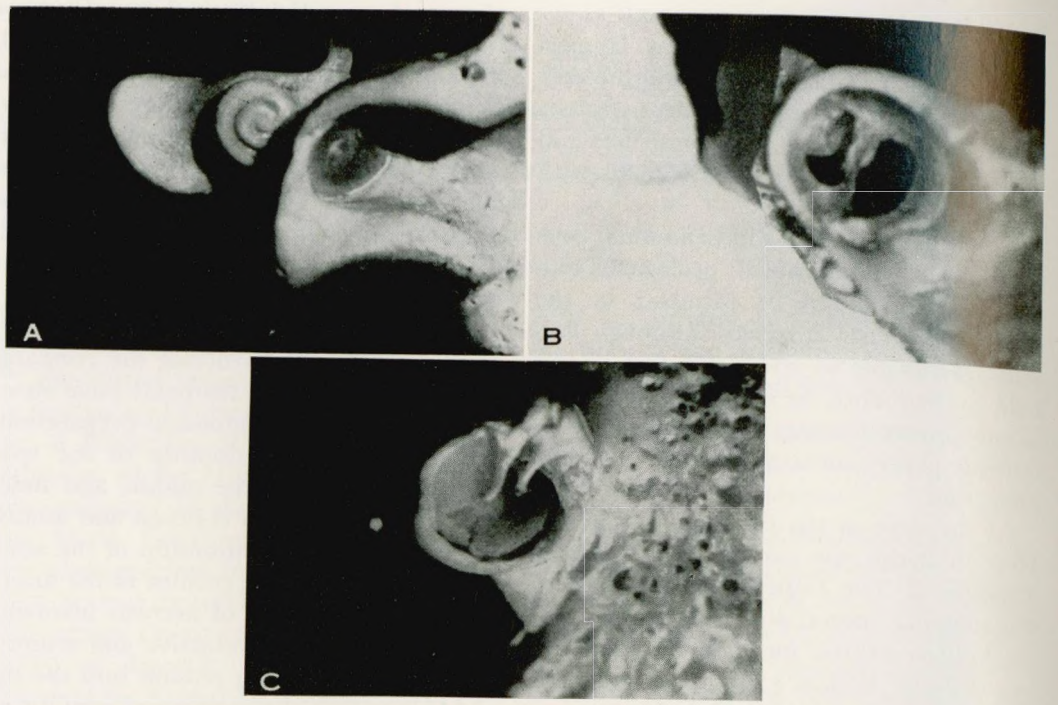

FIG. 1. (a) Normal tympanic membrane and cochlea; (b) perforation, double of the tympanic membrane; (c) normal tympanic membrane and ossicles.

greatness, for Hyrtl's notoriety has been submerged in oblivion. To account for this paradox is to address oneself to one of the most inexplicable facets of scientific history, namely, the vicissitudes involving the unrelated variables of fame and achievement (Figure 2).

Although Hyrtl was considered to be a pillar of the new Vienna school, he was summarily forced from his academic position into retirement. This action of factional pettiness further obscured his scientific genius, because less than a decade after his expulsion from the contemporary scene, historians commenting upon the state of Viennese medicine wrote that the distinguished Hyrtl was deceased.[3] On the other hand, in a rather moribund form of overcompensation, colleagues in the United States recorded Hyrtl's "present address" in the *Transctions of the American Philosophical Society* eight years after Hyrtl's death, which occurred on July 17, 1894.

Joseph Hyrtl was born in Kis Marton, Eisenstadt, Austro-Hungary on December 8, 1810/December 7, 1811.[4] Hyrtl's family was of modest circumstances, for his father, an accomplished musician, played an oboe under Haydn in Count Esterhazy's band.[5] As a student at the University of Vienna,

[3] Neuburger, Max: *British Medicine and the Vienna School: Contacts and Parallels.* London, William Heinemann Medical Books Limited, 1943, p. 108.

[4] Whereas Hyrtl's birth date was recorded in the baptismal register of Kis Marton as occurring on December 8, 1810 (Hyrtl's Baptismal Certificate, courtesy of Professor August Bangert, Beethovenstrasse 36, Perchtoldsdorf, Austria), Hyrtl claimed that the date and year of his birth were December 7, 1811 (Hyrtl to the Secretary of the Österreichische Akademie der Wissenschaften July 31, 1857, courtesy of the Österreichische Akademie der Wissenschaften, Vienna, Austria).

[5] Garrison, F. H.: *An Introduction to the History of Medicine with Medical Chronology, Suggestions for Study, and Bibliographic Data.* Philadelphia and London, W. B. Saunders Company, 1929, p. 463.

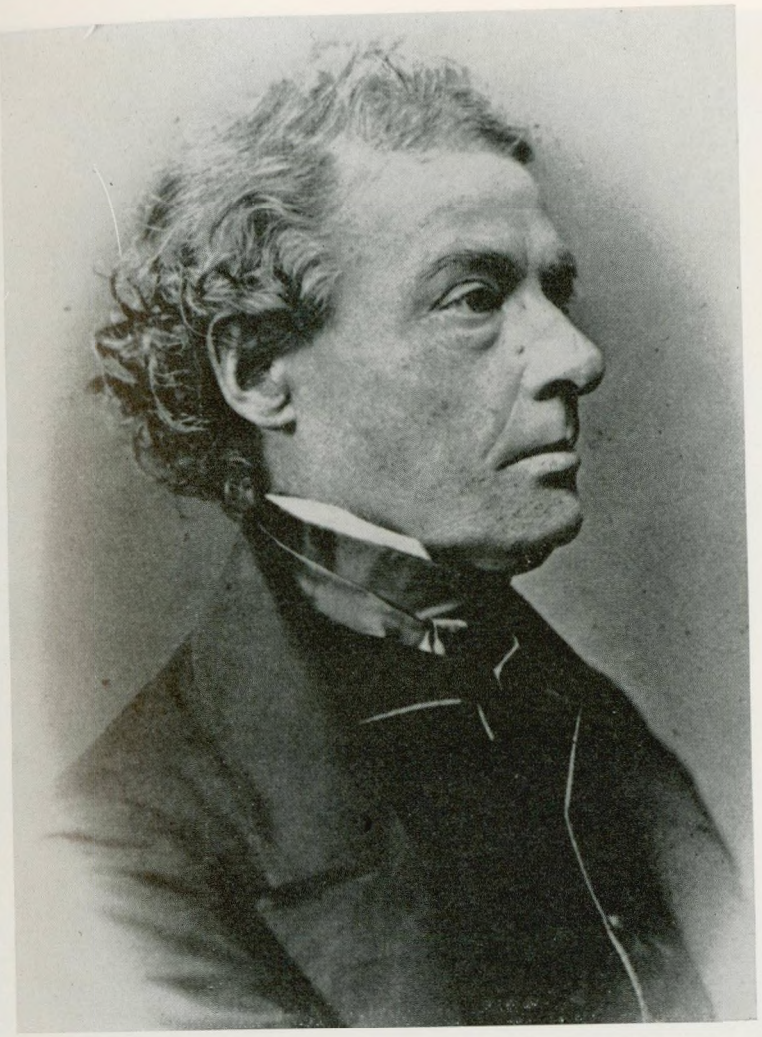

FIG. 2. Photograph of Joseph Hyrtl, courtesy of Bildarchiv d. Instituts f. Geschichte d. Medizin, Wien.

Hyrtl's main fields of investigation were the osseous and vascular systems. After his graduation in March, 1835, from the university, he studied for a year in Paris and a year in London. The years spent abroad set the tone for much of Hyrtl's later work and established the foreign relationships upon which he was to depend.

When he returned to Austro-Hungary, Hyrtl succeeded to the professorship of anatomy and surgery at Prague, a position which he held from 1837 through 1844. He subsequently came back to the University of Vienna where he taught regional and gross anatomy in the straight Vesalian tradition from 1845 until his retirement in 1874.

Hyrtl's fame rested primarily upon his abilities as an anatomic technician, lecturer and popular scientific author. He sought through comparative anatomical studies embracing the total network of organic life to clarify the nature of man and the manner in which man should be studied as a species. Insofar as Hyrtl held fast to an outmoded philosophy based on a mixture of

FIG. 3. Case of labyrinths of man and all mammalian families. The following description of the case of labyrinths was written by Hyrtl:

IT REQUIRED FOURTEEN YEARS TO BRING TOGETHER THE MATERIAL, THE ELABORATION OF WHICH WITH RESPECT TO THE ORGANS OF HEARING, MAKES UP THE CONTENTS OF THE TWO CASES BEFORE US.

Labyrinths of the ear of man and all mammalian families. The First Row *belongs to man at different periods of life. It begins with a five month old embryo, whose outer semicircular canals appear still in the condition of a simple swelling of the vestibule. It is evident from*

Legend continues on facing page.

Darwinian evolutionism and special creationism, he must be viewed as representing an endpoint rather than a beginning of scientific development. Being both scientist and theist, Hyrtl clearly demonstrated the conflict which marked the age.

Hyrtl's work was heavily impregnated with theological notions derived from the conservative tenets of German Catholicism. In his attempt to merge miraculous, metaphysical observations embedded in a traditional religious orthodoxy with concepts of ancestral type, inheritance and descent, he became engaged in a Cartesian dualism of mind and matter. While Hyrtl conceded that man's bodily organization could have originated from more primitive life forms, he simultaneously attributed man's inner, dynamic, vital, thinking essence to the spiritual soul located somewhere in the brain. Since Hyrtl believed the brain served as an intermediary link connecting the immaterial God-given soul with an earthly existence, he regarded the attempt to delineate the labyrinth of the brain with an anatomical knife as being just as worthless as the effort to split a monad with a hammer or divide a spiderweb with a carpenter's saw.[6]

Although Hyrtl initially accepted the Darwinian tenet of natural selection, he looked askance at notions concerning continuous organic change and extinction, for Darwinism, with its emphasis on the struggle for existence, glossed over the harmony and equilibrium of organic life. Hyrtl ultimately resolved the problem of the "isms" by reconciling himself to the scholasticism of the Catholic church and capitulating to the demands of Pius IX to venerate God's infallible intellect. Hyrtl, therefore, regarded man not as a flesh and blood substance but as the embodiment of an immortal thought; and he considered transformism to be a *Vorstellungsart,* or ideal proc-

[6] Hyrtl, Joseph: *Rede bei dem Antritte der Rektorswürde an der Wiener Universität. Am 1 Oktober 1864.* Reprinted in *Professor Joseph Hyrtl.* Franz Wolf and Gottfried Roth Vienna, Paul Molitoris, 1962, pp. 95–96.

this row that the labyrinth has already reached its full growth in size and shape in the new born child.

The Second Row *contains the labyrinths of the ourangoutang, of the other quadrumana and of the flying dog from Madagascar (Pteropus-Edwardsii). In the* Third and Fourth Rows *are found gymnura enplares, Latax trichecus and the prehistoric bear and hyena. The sea-lion occupies the right hand upper corner of the picture.*

In the Fifth and Sixth Rows *(Rodents), the labyrinths with cochlea wound five times are especially striking.*

The Seventh Row *closes with giant pachydermata (Tapirus), rhinoceros, hippopotamus and elephas.*

The Eighth Row. *The giraffe and the horse are distinguished for the size and the thinness of their semicircular canals.*

The three last labyrinths of the last row show the transition from the mammalian type to that of the birds. The smallest development (in comparison with the size of the body) belongs to the labyrinth of the whale and dolphin. In the lower right hand corner, the semicircular canals of a sperm whale, over 22 meters long, from the North Cape, are no longer than those of a dog.

The contents of the this one case may lay claim to morphological value alone. Whatever functional differences are conditioned by the changes in the form of the labyrinth, we cannot now even guess, and shall learn no more concerning them in all eternity. Since the labyrinth is buried in the hardest of all bones of the skull (so hard that in certain animals it gives a spark with steel) we cannot attain its representation by the usual preparations. The chisel and file produce only deformities. I have therefore resorted to the corrosion of the canals of the labyrinth. No other method procures such a correct view of the capsule of the internal ear. If there were no such thing as corrosion, we would surely know absolutely nothing of the pachydermata, of the edentata nor of the prehistoric mammals.

ess, with man representing the pinnacle of perfection.

Hyrtl's collections were illustrative of his belief in the pre-existing plan of nature. Rather than clarify processes of adaptation based on modification through descent, Hyrtl sought to define formal affinities. The nature of structural transfiguration was depicted in Hyrtl's comparative anatomical preparations exhibited in institutions

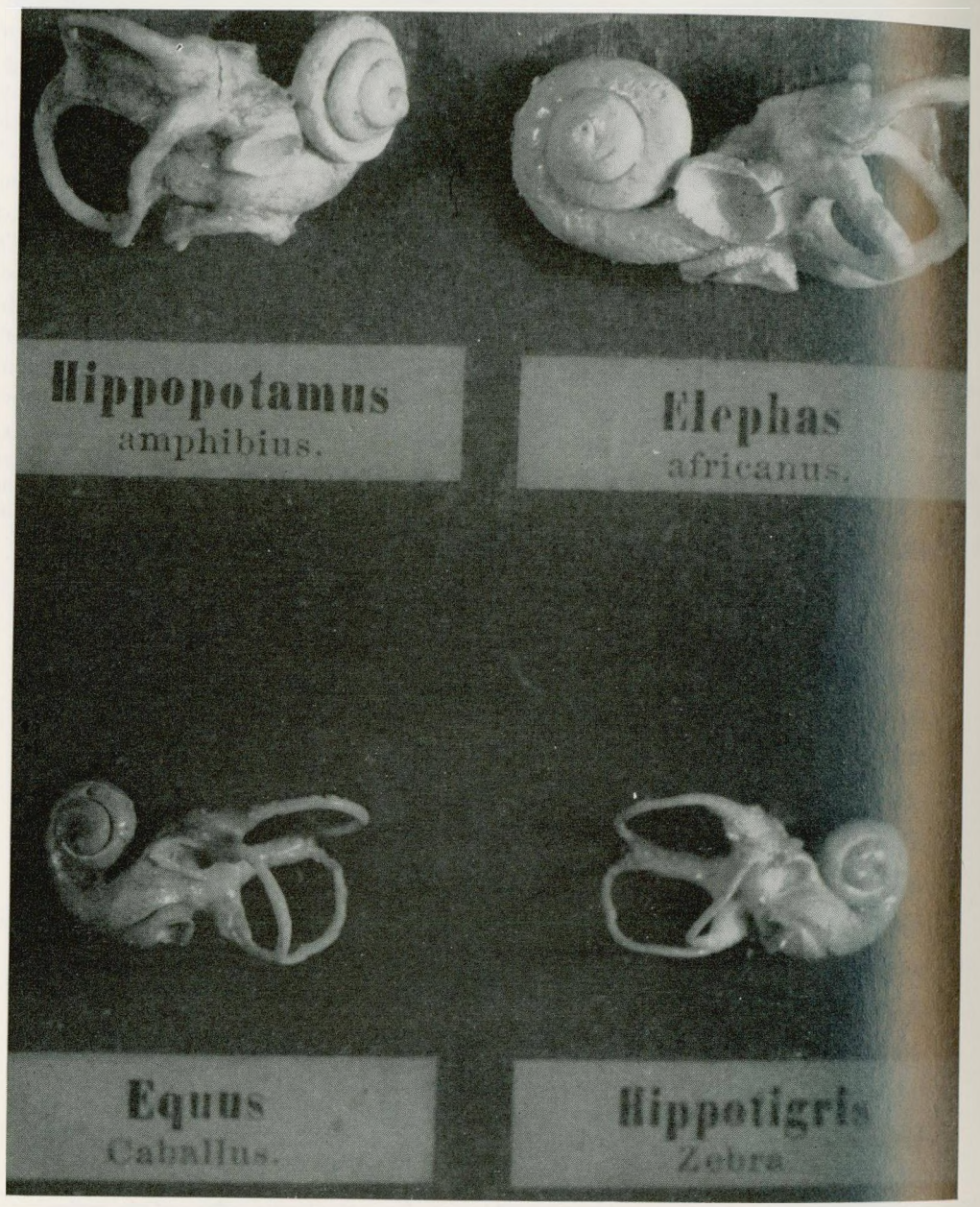

Fig. 4. Detail of labyrinths from the Hyrtl Collection.

Fig. 5. Case of ossicles of the car from all kinds of vertebrate animals (in 173 groups of three and six each). These bones have never been collected in such neatness and perfection before. The tiny ossicles of the small insectivora, rodents, and marsupials are fastened on green-edged blocks in order to bring them nearer the glass of the frame. Views of the human tympanum are placed in the upper corners of the case. Tympani of the buffalo and of the embryo of the elephant are in the lower corners.

The following description was written by Hyrtl:

The value of both cases represents a small fortune, and whoever would endeavor to bring a

Legend continues on the following page.

throughout the world and currently housed at the Mütter Museum of The College of Physicians of Philadelphia. Hyrtl's corrosion specimens on display at the Mütter Museum include preparations of the spiral vessels and spiral valve of the lacrimal duct showing variations according to age; the branches of the splenic artery of the zebra, boar, bison and camel; the pathological and normal conditions of the kidney in animals ranging from the gnu to man; the liver of the jaguar, orang-utan and man; the complete arterial system of the human embryo and placenta; and the arteries of the hand and foot. Furthermore, Hyrtl's preparations of the middle and inner ear in all classes of vertebrates demonstrate the modifications of topographical structures found in the organ of hearing. In fact, Hyrtl specified that his otologic collection (Figures 3, 4, 5 and 6) consisting of 315 objects, could not be sold individually, since the value and scientific interest of the collection was most pertinent in exhibiting changes in morphology and the relationship of the organization of animals to the higher organization of man.[7]

Subjected to the intellectual pressures emanating from a conservative and doctrinaire Catholicism, Hyrtl ultimately allowed religious maxims to dominate his universe to the almost total exclusion of post-Darwinian notions. As a consequence, Hyrtl's theology colored the value of his conclusions regarding the nature of man as a physical being and ultimately contributed to his disappearance from the ranks of the truly innovative nineteenth-century naturalists. Through Hyrtl's commentaries, the scholar is enabled to reconstruct the life of an old-fashioned anatomist capable of solving particular problems on an empirical basis but eventually capitulating to theistic revelations in postulates concerning the ultimate universal truths.

[7] Hyrtl to Mütter Museum Officials, February 26, 1866, courtesy of the Mütter Museum of The College of Physicians of Philadelphia.

Legend for Fig. 5.

similar collection into existence, must first of all fortify himself with patience. I mention, by way of example, the gorilla skull, considerably injured by a shot, and purchased for 1000 francs. My connection with anatomists in foreign lands placed me in a position to procure rare and indispensible skulls in exchange for injection preparations for the microscope. It requires a firm resolution to shatter these animal skulls and offer them to an anatomical caprice, in order that the organs of hearing of vertebrate animals should no longer remain the most imperfectly known of all the organs of special sense. There is a funny story connected with the petrous portion of the temporal bone of the hippopotamus. Since the time of the Roman emperors, no living hippopotamus had come to Europe. The anatomy of the internal organs of this animal remained, therefore, unknown. Between 1830 and 1840, the French government sent M. Arnould D'Abbadic as ambassador to the king of Seboa. The academy of Paris added to his instructions the request to transmit in a preserving fluid the body of a young hippopotamus. The undiplomatic duty was discharged by the ambassador with great tact. The king was greatly afflicted with rheumatism of the joints, and addressed to the ambassador the question of whether or not he could help him. In the Orient, all ranks are thought to be masters of the art of healing. M. D'Abbadic answered 'certainly.' Procure the medicine, I'll give my crown if I shall become well again. 'Not at all necessary. The medicine is found in your own land. It is the fat of a hippopotamus. Gently, you must not go so fast. It must be the fat of a pregnant animal.'

These captions are excerpts from correspondence between Prof. Hyrtl and the curator of the Mütter Museum of The College of Physicians. Joseph Hyrtl was a noted Viennese anatomist of the nineteenth century who had wide interests in comparative and human anatomy. Prof. Hyrtl established a museum in Vienna which contained in excess of 5,000 specimens, many of which were destroyed during World War II. The labyrinths and ossicles are displayed against green velvet backgrounds and housed in beautifully carved wooden cases.

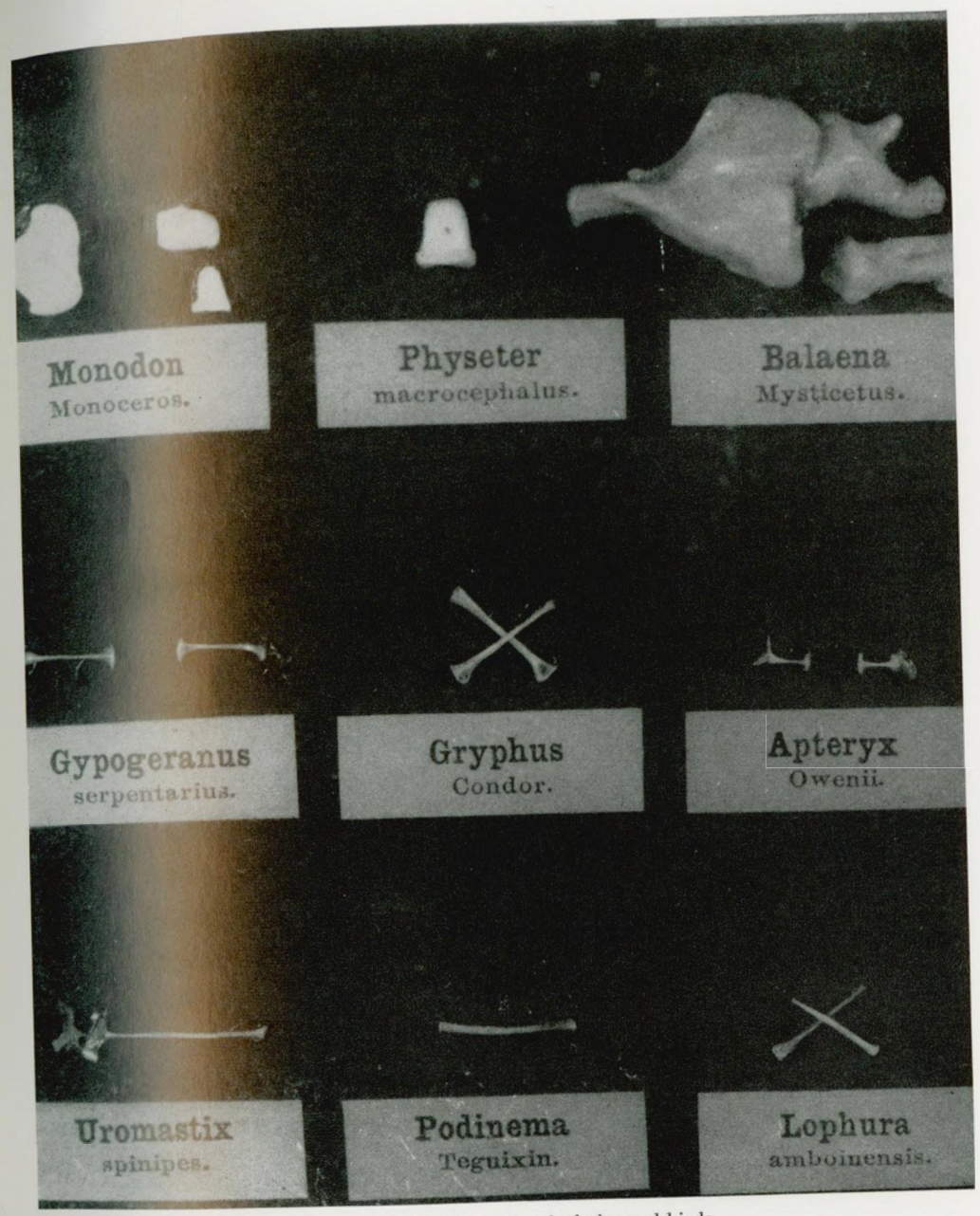

FIG. 6. Details of ossicles of whales and birds.

ACKNOWLEDGMENTS

The aid of Mrs. Elizabeth Moyer and the staff of the Library of the College has been invaluable.

The material on Hyrtl is abstracted from Mrs. Kempers' Masters' Thesis, submitted to the Department of Anthropology, Temple University. A copy is available at The College of Physicians.

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