Presidential Address

ON

THE RISE AND PROGRESS OF LARYNGOLOGY:

ITS RELATION TO GENERAL MEDICINE AND ITS
POSITION IN THE MEDICAL CURRICULUM.

DELIVERED BEFORE THE MANCHESTER MEDICAL SOCIETY

BY

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SPECIALISM in medicine or surgery is no new-fangled idea. Herodotus, the Father of History, writing more than 2,500 years ago of the highly developed state of specialism amongst the Egyptians, says:

"Physicke is so studied and practised with the Egyptians that every disease has its several physician who striveth to excel in healing that one disease and not to be expert in curing many. Whereof it cometh that every corner of that Country is full of physicians, some for the eyes, others for the head, many for the teeth, and not a few for the stomach and the inwards."

In those far-off days the human body was divided into some thirty-six regions, with specialists for each one of them, and history records that jealousy existed amongst specialists when they invaded one another's territory—a state of affairs not unknown even to-day. In the Ebers Papyrus, compiled about 1550 B.C., the anatomy and physiology of the nasal passages are described as follows: "There are four vessels in both nostrils, of which two carry blood and two mucus. Once air has entered the nose it is lost sight of; it goes to the heart and to the rectum."

Closely allied with Egyptian medicine was that of the Chaldeans and Assyrians, tainted very largely, however, with witchcraft and sorcery—for example, "gargling with the milk of a sheep helps the tonsils and the fauces, anginas are helped by a goose's gall mixed with elaterium and honey, by the brain of an owl, and by the ashes of a swallow soaked in hot water."

In *La Médecine du Talmud* we are told that a transverse incision of the trachea is fatal, whereas a longitudinal one is not.

Among the Hindu races the surgery of the throat attracted much attention and many weird forms of treatment. Wise, in his book on the Hindu system of medicine, describes a method of tonsillotomy which aimed at removing a third part only, with the knife—"if all is cut the patient will die of haemorrhage." The removal of foreign bodies from the food and air passages was not only attempted but accomplished, the method consisting in passing a hot iron through a metallic tube to dissolve or soften and so to remove it. I can find no mention of the end-results of such drastic performances—no mention of any resulting stenosis or of adhesions; evidently there were no follow-up-case committees at work in those days.

Although Homer does not mention the word "larynx," it is freely mentioned by other Greek writers. Aristotle (384–322 B.C.) describes it as the organ through which the voice and the breath pass. "It is the voice and larynx which emit vowels; it is the tongue and lips which form the consonants or the aphonic letters."

Hippocrates, who, according to Celsus, was the first medical specialist, described the epiglottis as a process in the form of an ivy leaf which prevented liquid entering the larynx and kept it in the pharynx; and of the trachea he said that it was cartilaginous, surrounded by smooth rings, and contained but little blood.

The etiology and treatment of nasal polypi has from time immemorial even up to the present day been responsible for much controversy. Cato the Censor, writing 232 B.C., says:

"If there is a polypus in the Nose rub together some wild cabbage leaves in the hand, place them in the nose and draw up the breath as much as you can. In 3 days the polypus will fall away. Nevertheless for some days do the same so that you may render the roots of the polypus entirely healthy."

Celsus used a sharp spatula-shaped instrument to separate the growth from the underlying bone and then extracted it with a hook. Hippocrates, on the other hand, recommended tying a sponge to a string, passing the string through the

nasal passages and out through the mouth, in order forcibly to draw the polypus from its attachments. For hard growths the loop of a sinew was passed round the attachment of the growth and then tightened. Subsequently cauterization was employed, a hot iron being passed through a metal tube and the raw surfaces seared. Following one or other of these methods of removal he advised the use of copperas powder and the insertion of tents smeared with oil and honey into the nostrils. He says: "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."

Curiously enough, in the Hippocratic treatises there is no mention of tonsillotomy, but in *The Prognostics*, No. 23, the operation of uvulotomy is described: "When the uvula alone is inflamed seize it with the finger, press it up against the palate and cut off the end." Other Greek writers, however, describe tonsillotomy in detail. Thus Albucasis writes:

"If they [the tonsils] are of a dark colour and of slight sensibility do not touch them with the knife, if red and the base is broad do not touch with a knife for fear of haemorrhage but delay until it has ruptured for then thou canst perforate it or it will break of itself. But if it is of a white colour, round and has a slender base this is the kind which is suitable and thou shouldst cut it."

That great bugbear of the rhino-laryngologist, atrophic rhinitis or ozaena, was not only recognized as a distinct pathological entity but was vigorously treated. Celsus says:

"If these ulcers are around the openings and have many crusts and have a foul odour which variety the Greeks call Ozaena it should be recognized that it is hardly possible to cure this disease. In the nostrils let honey be applied with a small amount of resin of turpentine which may be used on a probe wrapped with wool. By the use of this the crusts are loosened and may then be removed by the use of sternutatories."

He advised leaving pledgets of lint saturated with medicaments in the nostrils, twice a day in winter and spring, and thrice a day in summer and autumn.

The first definite description of tracheotomy is from the works of Antyllus, who lived during the reign of Hadrian (117–138 A.D.). Adams translates as follows:

"In cases of cynanche 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 inflammation about the mouth and palate, and in cases of indurated tonsils which obstruct the mouth of the windpipe, 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 windpipe 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 backwards so as to bring the windpipe 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."

Galen described twelve intralaryngeal muscles—that is, six pairs—and enumerated three cartilages of the larynx: the thyroid, the cricoid, and the arytenoid; the latter he supposed was a single cartilage. He claims to have discovered and described the ventricles of the larynx. He describes also 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. He was the first to describe the recurrent laryngeal nerves. He considered that chilling of the recurrent nerves during operations damaged the voice, and he therefore advised against operations in this region during cold weather. He recognized the dependence of diseases of the larynx upon affections of the parts above, but explained it on the assumption that the brain was the common origin of all catarrhs. Paulus Aegineta introduced the knotted-string method for the removal of polypi.

"Taking then a thread moderately thick like a cord, and having tied knots upon it at the distance of two or three fingerbreadths, 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 opening."

In the great medical school of Salerno the surgery of the throat came in for a considerable share of attention. Roger of Parma, whose *Practica Chirurgica* saw the light about the

beginning of the thirteenth century, thus describes the treatment of a tonsillar abscess:

"Seat the patient before you and press his tongue down in his open mouth with an instrument so that you can see the tonsils well. Take hold of the affected one firmly with a bronzed iron hook and incise it with a properly sharpened instrument. Leave the coverings [the pillars of the fauces] which stand next to them uninjured however."

He even anticipated the much debated present operation of complete enucleation when he says, "et a radice funditus evellantur"—plucked away entirely by the roots.

Of an elongated uvula which could not be made to contract as the result of local medication he wrote:

"It should be grasped with a forceps made for the purpose near the palate where the uvula itself is sometimes of smaller diameter and snipped off. Care should, however, be taken not to touch the root of the uvula."

His method of treating "scinancia," literally translated retro-pharyngeal abscess, would hardly, however, appeal to the modern laryngologist:

"Take a salt beef half cooked of the size and shape of a chestnut or a filbert, and having fastened it firmly by a long silken cord have the patient swallow it, and then let the physician pull it out suddenly and violently [cum violentia] in order that the abscess may be ruptured."

In 1252 Bruno of Longoburgo published his *Chirurgia Magna*, in which he describes several varieties of nasal polypi, one of them of dark colour, slight sensibility, and hard, which he regarded as malignant and advised leaving alone. He suggests that the root of the simple polyp be cauterized with a hot iron or with some cauterizing material. He seems to have anticipated Meyer's discovery of adenoids, and quotes Paul of Aegina's method of dealing with post-nasal growths—namely, that a ligature with knots at intervals be passed through a tube into the nose and brought out again through the mouth and a to-and-fro motion be used to cut off the projecting growths at the back of the nose. The originator of the term "union by first intention" ("unio per primam intentionem"), he realized that wounds should heal without pus formation, and regarded purulency as the fault of the surgeon.

Theodoric, a pioneer in plastic surgery, used strong wine as the only dressing. A bishop as well as a surgeon, he was the first writer definitely to mention anaesthetics for throat and other operations, assigning their introduction to his father, Hugh of Lucca:

"Having made a mixture of the wine extracts of opium, hemlock, mandragora, unripe mulberries, and wild lettuce a sponge should be boiled in this fluid until all is boiled away, and then wherever anaesthesia is wanted this sponge should be placed in warm water for an hour and applied to the nostrils until the patient sleeps, when the surgical operation should be performed. At its end another sponge dipped in vinegar should be frequently applied to the nostrils or some of the juice of the root of haw should be injected into the nostrils, when the patient will soon awaken."

In the Middle Ages, as now, the treatment of catarrh and coryza was the subject of much speculation, of many remedies, and of much disappointment. Gregory Horst, a prolific writer about 1660, highly extolled the medicinal properties of tobacco. He declared that the inhabitants of Florida at certain specified seasons of the year live on the smoke of this plant, which they receive into the mouth through horns prepared for the purpose, whereby, they assert, hunger and thirst are stilled and an incredible amount of phlegmatic humours are collected in the mouth.

When it (the smoke) 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.

Fabricius ab Aquapendente (1537-1619) in *Opera Chirurgica*, after criticizing the treatment of ozaena as advocated by Celsus, writes as follows (edition of 1723, cap. xxvi):

"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 ozaena. It is not intended that the Nose should suffer from this heat but only that the ulcerated part should be heated to a point short of pain 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."

He also regarded tonsillotomy as performed by Celsus and Paulus Aegineta as neither safe nor easy. 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.

The operation of tracheotomy, although described by Arabian, Greek, and pre-Renaissance writers, does not appear to have been actually performed until the middle of the sixteenth century. Its first performance has been ascribed to Beniveni, who died in 1502, but according to Casserius (1600) it was Brasavola who first opened the trachea (in 1545), his dictum being: "When there is no other possibility in angina of admitting air to the heart we must incise the larynx below the abscess" (Holmes). Casserius remarks that those who rejected bronchotomy are "inhuman, awkward, timorous, and are even, as it were, to be held as homicides." Fabricius says:

"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 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 inspiration suddenly regain consciousness and draw 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."

He regards the operation as serious. To escape the criticism of perhaps having hastened 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.

A longitudinal mark was to be made with ink down the middle line of the neck and a cross mark at the point of the tracheal incision, scarcely the breadth of a thumb below the lower border of the larynx.

Desault was the first to perform the operation of laryngotomy—or, as we would now call it, laryngo-fissure—by splitting the thyroid cartilage in an individual in whom a foreign body had become impacted in the larynx. In 1788 Pellatan recorded a case¹ in which he had performed laryngotomy for the removal of a foreign body lodged in the upper orifice of the oesophagus.

That intralaryngeal growths were diagnosed and even removed in pre-laryngoscopic days must appeal to us to-day as truly a remarkable feat, yet early in the seventeenth century we find Marcellus Donatus² referring to laryngeal growths, which he describes as warts in the throat. In 1817 Cheesman of New York published the record of a case of papilloma of the vocal cords dying without relief.³ In 1837 Trousseau and Belloc could only report from literature and from their own experience 7 cases. Ehrmann, in 1850,⁴ recorded 31 cases of laryngeal growths, including 2 cases of his own. Horace Green in 1852⁵ records the removal of a laryngeal polyp from a child of 11, which he could see by forcibly depressing the tongue—thus anticipating Kirschstein's autotomy of the larynx.

Middledorpf⁶ in 1853 removed a polyp, springing apparently from the upper part of the larynx, by means of an incandescent platinum wire loop, and cited 64 cases of laryngeal polypi previous to his own case.

To the student of laryngology the various steps leading up to the discovery of the modern laryngoscope are full of interest. In 1807 Bozzini invented a double cannula with a mirror placed at such an angle that the image of the part seen through one compartment was reflected back to the observer's eye through the other compartment, the source of illumination being a wax candle with a reflector behind.

Cagniard de la Tour in 1825, and Senn in 1827, made attempts with a double series of mirrors to practise autotomy of the larynx.

In 1829 Benj. Babington presented to the Hunterian Society an oblong piece of glass set in silver wire with a long shank. The reflecting portion of the mirror was to be held against the palate while the tongue was held down by a spatula.

Liston, in 1837, taught that a view of the larynx could often be had by introducing such a glass as is used by dentists well back into the fauces and keeping the reflecting surface, previously warmed by dipping in hot water, turned downwards.⁷

In 1838 Baumès exhibited at the Medical Society of Lyons a mirror the size of a two-franc piece, which he found useful in examining the post-nasal space and the larynx.

Avery, in 1844, was the first to employ a reflecting forehead mirror with lamp attached, employing a speculum similar to Bozzini's, except that it possessed only one compartment

By general consent, however, Manuel Garcia is considered the real father of laryngoscopy. In his original communication read before the Royal Society of London⁹ emphasizing the practical importance of studying the interior of the voice box, the following sentences occur:

"The pages which follow are intended to describe some observations made in 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 of the person experimented on against the soft palate and uvula. The party ought to turn himself towards the sun so that the luminous rays falling on the little mirror may be reflected in the larynx. If the observer experiment upon 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."

Many years later, speaking before the Subsection of Laryngology at the Seventh International Congress in London in 1881, he thus describes his epoch-making discovery:

"One September day in 1852 I was strolling in the Palais Royal preoccupied with the ever-recurring wish so often repressed as unreasonable when suddenly I saw the two mirrors of the laryngoscope in their respective positions as if actually present before my eyes. I went straight to Charrière the surgical instrument maker and asking if he happened to possess a small mirror with a long handle was informed that he had a dentist's mirror which had been one of the failures of the London Exhibition of 1851. I bought it for six francs. Having obtained also a hand-mirror I returned home at once impatient to begin my experiments. I placed against the uvula the little mirror (which I had heated in warm water and carefully dried) then flashing upon its surface with a hand-mirror a ray of sunlight I saw at once to my great joy the glottis wide open before me and so fully exposed that I could perceive a portion of the trachea. When my excitement had somewhat subsided I began to examine what was passing before my eyes. The manner in which the glottis silently opened and shut and moved in the act of phonation filled me with wonder."¹⁰

This historical and original pronouncement of Garcia's (for there is no reason to suppose that he was aware of any previous experiments) immediately attracted attention and opposition—not, however, the attention its importance demanded, nor the opposition worthy of an enlightened profession. Thus no less distinguished a scientist than Professor Merkel of Leipzig, writing in the *Anthropophoniik*, 1857, p. 608, says:

"I have not, it is true, been able to obtain Garcia's original observations, and do not know therefore how he proceeded in these alleged experiments, what he has seen and what he has not seen, but I have just grounds to doubt the reality of his observations until I am informed in what manner Garcia has prevented the mirror from becoming dimmed and how he draws forward the epiglottis, which to a great extent hides the glottis from the eye."

As Dean Swift very truly, however, observes: "When a true genius appears in the world you may know him by this sign—that all the asses are in confederacy against him."

Ludwig Türck in 1857, unaware of Garcia's observations, was working in Vienna with a small mirror investigating diseases of the larynx,¹¹ but he was anticipated in publication by Czermack, in a paper which appeared in the *Wiener medizinische Wochenschrift* in March, 1858, entitled "Über den Kehlkopfspiegel." In this paper a large perforated concave mirror was recommended for reflecting either sunlight or artificial light, which in the same year Semeleder adapted to a spectacle frame.

Both Czermack and Türck published books upon diseases of the throat in 1859 and 1860, the publications appearing in French, as both authors had journeyed to Paris—Türck to persuade the savants of the Académie de Médecine that he was the pioneer, Czermack to persuade them that Türck was an impostor, so hot and furious had the contest for priority become.

In 1863 Tobold published in Berlin his *Anleitung zur Laryngoscopie*, and in the same year Louis Elsberg his paper on the laryngoscope and laryngoscopic technique.

To our own countryman, the late Sir Morell Mackenzie, belongs much of the credit of familiarizing the profession with the importance of the laryngoscope, both as a means of accurately diagnosing disease and as a practical aid to treatment. In 1859 he visited Czermack in Vienna, and was present during the acrimonious and none too dignified controversy between Czermack and Türck on the question of priority; in 1863 he was awarded the Jacksonian prize of the Royal College of Surgeons for his essay on "The Pathology and Treatment of Laryngeal Disease." In 1880 Morell Mackenzie published his monumental work, *Diseases of the Throat and Nose*, a book renowned throughout the world for

its erudition, its extraordinary accuracy, and its breadth of knowledge.

The first intralaryngeal operation by the indirect method under the guidance of the laryngeal mirror was performed by Lewin on July 20th, 1860; the second in November, 1861. In a communication to the *Allgemeine medizinische Central Zeitung*, October 12th, 1861, he remarks that intralaryngeal growths are present in from 5 to 6 per cent. of all laryngeal cases, and describes 7 cases he had operated upon himself—3 by cutting operations, 4 by the application of caustics. He therefore anticipated Von Bruns, who, however, as a rule gets the credit, but whose first case was not published until 1862 ("Die erste Ausrottung eines Polypen in den Kehlkopfhöhle," Tübingen, 1862).

In 1866 Elsberg published the first description of the microscopic appearances of laryngeal papillomata.

In 1867 J. Solis Cohen¹² reported the intralaryngeal removal of a laryngeal polyp. So rapid were the strides in laryngological practice that in 1871 Morell Mackenzie published the records of 100 cases in his paper "On Growths in the Larynx," for the first time classifying them as papillomata, fibromata, fibro-cellular or mucous polypi, myxomata, spindle-celled sarcomata, cystic tumours, adenomata, and angiomas.

To our American confrères, past and present, much credit is due, not only for pioneer work, but also for the persistent way they have kept the laryngological flag flying.

In 1817 Dr. Cheesman of New York published a book upon *Growths and Tumours of the Throat*, followed a few years later by Horace Green's work upon the direct treatment of affections of the larynx and trachea, a work which, however, met with furious opposition and almost ridicule. Much the same kind of opposition was also meted out to Dr. O'Dwyer when he introduced his method of intubating the larynx.

The first laryngoscope imported into America was received from Vienna by Dr. Krackowizer in 1858. In 1871 Dr. Elsberg established the first clinic in America devoted exclusively to diseases of the nose and throat, and in 1873 the first laryngological society ever established was started in New York. This society, the New York Laryngological Society, was, however, gradually dissolved, and was incorporated as a section of the Academy of Medicine in 1885.

In 1878 the American Laryngological Association was established; its first meeting was held in 1879 in Buffalo, under the presidency of Dr. Louis Elsberg.

Papers dealing with laryngological subjects were first published in general medical journals and then in otological journals, more especially in the *Archiv für Ohrenheilkunde*, founded in 1864 in Vienna, and in the *Monatschrift für Ohrenheilkunde*, founded by Voltolini in Berlin in 1866.

In 1874 the *Annales des maladies de l'oreille et du larynx* were published, and in 1880 the *American Archives of Laryngology*. In 1881 the *Archivi Italiani* appeared, and in 1884 Semon's *Centralblatt für Laryngologie*. In 1887 the Spanish journal, the *Revista de Laryngología*, and in England the *Journal of Laryngology*, edited in the first instance by the late Sir Morell Mackenzie and the late Norris Wolfenden, appeared almost simultaneously. In 1890 the first number of the *Laryngoscope* saw the light of day, and in 1893 the first volume of *Fraenkel's Archives*, truly a "magnum opus."

The driving force behind laryngology was rewarded in 1895 by Kirstein's discovery of autoscapy of the air passages,¹³ which paved the way to the more elaborate and ingenious methods of Killian and Chevalier Jackson, by means of which with suitably illuminated rigid tubes practically the whole of the respiratory tree can now be brought under inspection, either by direct endoscopy or by suspension laryngoscopy.

Closely allied with laryngology, not only on historical but also on practical grounds, is the art of oesophagoscopy, which followed very shortly after the discovery of the laryngoscope.

Waldenburg was the first to succeed in introducing a short tubular mirror 14 cm. long into the mouth of the oesophagus. To this instrument Störk added a lobster-tail articulation to facilitate introduction. Following this he introduced long rigid tubes, and thus succeeded in realizing the art of direct oesophagoscopy. In the early eighties Morell Mackenzie, and after him Lowe, used a skeleton oesophagoscope with indirect illumination, but without much practical result.

The Leiter-Nietze oesophagoscope, with an internal lamp and system of prisms, followed the indirect method.

Kussmaul in 1868 described the successful examination of the normal and diseased oesophagus, using Desmoureaux's apparatus for illumination. These experiments were continued

by Müller, and yielded the practical result that a rigid tube 13 mm. in thickness may be introduced into the oesophagus of all normally constituted persons. Von Mikulicz deserves the credit of really laying oesophagoscopy upon sure foundations, the problem of illumination having been advanced by Leiter, Casper, Brünings, Kirstein, and Guisez.

That laryngology has played and is playing an important part in relation to general medicine must, I think, be obvious to any serious student of the subject. Just as a knowledge of ophthalmology is of inestimable service in interpreting the many problems associated with the diagnosis of local diseases of the eye and with unravelling the intricacies of certain affections of the central nervous system and other systemic diseases, so also is a knowledge of the clinical appearances of the interior of the larynx as revealed by laryngoscopy of equal value in the interpretation of many pathological lesions, both local and general.

To be able to bring under actual ocular inspection the commencing stages of such diseases as tuberculosis of the upper air passages, the various types of intralaryngeal paralysis originating as the result of morbid affections of the central and peripheral nervous systems, both organic and inorganic, the stenosis due to mediastinal growths, to enlargement of the lobe of the thyroid gland, or to aneurysmal dilatation of the aorta, is surely knowledge worth having.

The physician who to-day is unable to use his laryngoscope and to interpret the clinical pictures brought under his very eye is like the captain of a ship without his chart. True, he may bring his vessel into port, but how much better his chances of doing so would be were the rocks and the quicksands charted in his mind's eye. How often even to-day are the early stages of intrinsic malignant disease of the larynx missed either from a totally inadequate examination, or, what is perhaps as frequent, from no examination at all, and at a time when, literally speaking, cancer of the larynx may be regarded as a curable affection! In the light of our present knowledge the responsibility of the physician or surgeon who looks on, without looking in, at a case of persistent hoarseness is great—is, in fact, criminal. No man of any intelligence can to-day with any justice, considering the enormous strides of human knowledge, decry specialism in any walk of life. The very progress of the art of medicine, in the broadest sense of the term, is due to the fact that the great pioneers of the past have been men who have realized that it is better to thoroughly grasp a knowledge of one part of the human frame than to dabble with its entirety. Critics are fond of saying that the surgeon-specialist is prone to over-estimate the value of local treatment, to ignore those general constitutional causes which underlie disease, and to look at pathological processes merely through the mirror of his own speciality, oblivious that the fault is often with the generalist who, neglecting or ignoring the local origin of disease, quite ineffectively treats the patient by drugs for a something which might easily have been recognized and treated successfully had he possessed the knowledge and the necessary *tactus eruditus*.

Work of much scientific and clinical value has been done by the combined efforts of physicians, surgeons, and laryngologists, as will be seen by a study of the innervation of the larynx and of laryngeal paralysis. In 1890 Semon, in association with Horsley, pointed out the greater proclivity of the abductor fibrils of the vocal cords to paralysis—a fact confirmed by the experimental researches of Onodi and Risien Russell in animals, thus establishing what is now known as "Semon's law." In central and peripheral lesions of the motor laryngeal nerves the abductors only suffer, or at least do so earlier and to a greater extent than the adductors, with the important corollary that laryngeal paralysis which involves the abductors (sometimes in association with the adductors) is due to organic disease, while motor paresis of the adductors is in the great majority of cases functional. With the late Sir Henry Butlin he revived the operation of thyrotomy, now generally called laryngo-fissure, for the removal of intrinsic malignant disease of the larynx—an operation which had fallen into disrepute owing to a former unfortunate selection of cases for its performance, to-day an operation which in skilful hands gives as good, if not even better, results than operations for malignancy in almost any other region of the human body. To cite but one more instance, consider the enormous strides made by the laryngologist in the local treatment of that most painful and distressing of all laryngeal ailments—laryngeal tuberculosis—by the institution of the silence cure, galvano-caustic puncture of foci of tuberculous oedema, and the curetting of laryngeal ulcerations.

Does laryngology occupy the position in the medical curriculum which its importance and its utility demand? I say without hesitation that it does not, and that until it is made a subject of compulsory study it never will. To burden the already overburdened medical student with yet another compulsory class appears almost criminal; yet, on the other hand, it is the business of the university or the teaching school to turn out its alumni equipped and in full harness.

It is difficult to persuade the student that a course of study which is not compulsory is of real importance to him in after-life. When we realize, however, how the State is investing public bodies under its control with ever-increasing powers in relation to the treatment of ear, nose, and throat diseases, in school clinics, welfare departments, and tuberculosis centres; when we realize what a large number of children owe their physical defects and backward development to the presence of diseases of the throat and ear; and when we also realize how much can be done to relieve them of their disabilities, it is the duty of those in charge of these special clinics to urge and to continue to urge upon the powers that be the necessity of insisting that every student shall have before he quits the portals of his university at least a reasonable theoretical and practical knowledge of laryngology and otology.

The Scottish universities, ever to the fore in educational facilities, now make the study of laryngology and otology compulsory. Each student has to attend the throat and ear department of his hospital for one term, to receive both systematic and clinical instruction. Examination is not demanded in Glasgow, but is compulsory in the other three universities, while in Edinburgh the student has to obtain 50 per cent. in this special examination before he is admitted to his final professional.

The time has surely come when, in the interests of the general public, the English universities and qualifying bodies should do likewise. Much encouragement to the study of laryngology and otology would also be afforded were there more clinical appointments in the special departments of our general hospitals, and were facilities made to hold such appointments for considerably longer periods than is possible at present; also were some special degree in laryngology and otology instituted to signalize the fact that its possessor had had a thoroughly good training in the special department which was to be his life's work.

With this end in view the Council of the Laryngological Section of the Royal Society of Medicine has recently appointed a committee, of which I have the honour to be a member, to draw up a memorandum to be presented to the Royal Colleges of Physicians and Surgeons, in which memorandum there are *inter alia* the following recommendations:

1. That attendance at the hospital throat and ear clinic be compulsory.
2. That no student be allowed to proceed to his final examination unless he can produce documentary evidence that he has attended (and has been signed up) a practical course upon diseases of the throat, nose, and ear.
3. That the qualifying examination in the diagnosis and treatment of the more common diseases of the throat, nose, and ear, and in the use of the more ordinary instruments, be both practical and oral.
4. That the examination be conducted by recognized laryngologists and otologists.

I would fain see the status of the teacher of laryngology be that of a professor and not of a lecturer.

The question of emolument attached to a professorship does not need to enter the scheme at all—it is the status that is wanted, the recognition and accentuation of the importance of the subject.

The ever-widening path of human progress demands that these changes should come. As the great surgeon-ordinator, the late Sir James Paget, in speaking of the future of pathology, said, "Where, then, are we to stop? I do not know more than this, that we must not stop where we are; we must go on and on, and we may be sure that they who work to find the truth will not work in vain, sure that with true work true good will come."

That these changes, these steps to the realization of a higher standard of efficiency in the medical profession, will come I feel sure; that they may come quickly is my earnest desire, confident as I am that our path of duty lies just as much in the prevention as in the cure of disease, in the early recognition and successful handling of the many ailments which threaten our sense organs—organs very responsive to intelligent treatment, but which,

when damaged, seriously hamper individual activity and utility, and collectively tend to undermine our national vigour, prosperity, and well-being.

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THE NATURE AND SIGNIFICANCE OF HEART SYMPTOMS.

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II. THE REFLEX PROCESS AND THE HEART BEAT.

As disease is only recognized by the symptoms it produces, a knowledge of symptoms is a necessary preliminary to an intelligent investigation of disease. This knowledge of symptoms is necessary not only to the diagnosis of a patient's complaint but for a prognosis and a rational treatment. The symptoms of disease even in one sick individual may be numerous and varied, so that it is impossible to study every symptom with that care and insight which are necessary for understanding its use in the practice of medicine. The search for symptoms by new methods leads to the discovery of many, but the result is often but to add to the mass of details which obscure the problems of disease, and some other method of investigation is urgently needed.

Phenomena in nature, however numerous and varied, are subject to definite laws. Progress in every branch of knowledge which deals with these phenomena is hampered until these laws are discovered. The symptoms of disease are natural phenomena, and the vital processes concerned in their production are certain to be few in number, and the nature of symptoms will not be understood until these vital processes are discovered.

Recognizing that a knowledge of symptoms was the first step in the investigation of disease, the staff of the St. Andrews Institute for Clinical Research began their work by a search for the laws governing the production of symptoms.

In the course of this inquiry it was found that a great mass of symptoms were produced by disturbance of a single vital process—that which includes what is known as reflexes. The term "reflex" had been restricted to a few manifestations of a vital process, so that its affinity to other manifestations had not been recognized.

Though reflexes had received much attention, yet the manner in which they were modified by disease had received little attention. We therefore have devoted a good deal of study to the process as it concerns different organs, and in this article I deal with the light which the recognition of this process has thrown upon the mechanism of the heart beat.

The Nature of the Reflex Process.

We tried to look at the reflex acts from the point of view of the vital process. We analysed the parts concerned in a reflex arc. The arc consists of cells that are capable of stimulation connected in some way with cells that are capable of producing an effect. In some instances we can recognize the stimulus and the cells stimulated, but as a rule we can only recognize the effect. In the vast majority of reflexes we can only infer or guess at the nature of the stimulus, while of the manner of conduction from the cells stimulated (receptor cells) to the cells activated (effector cells) we have only the vaguest notion.

The parts concerned in a reflex act are the stimulus, the cells receiving the stimulus, the cells concerned in the conduction of the stimulus, and the cells which respond and produce an effect.

It will be seen that this process includes a great variety of responses or manifestations widely different in character and appearance, as contraction of muscle, secretion of glands, sensations, etc. For this complicated process we required a term, and we attempted to get one which would be compre-

hensive, but on consideration we found that no term could convey so much of the process as the term "reflex." To avoid confusion we tried to give a clear description of what was meant by the term. The meaning we attach to the term "reflex" is *that vital process by which a stimulus passes from one tissue or organ to another, resulting in a response.* The nature of the response depends on the function of the organ stimulated.

In this definition of the reflex process the manner in which the stimulus is conveyed from the receptor cells to the effector cells is not mentioned. Hitherto it has been assumed to be by nerves, but nerves are not necessary to the process, for other tissues may convey the stimulus, as will be realized when the evolution of the nervous system and the movements of the heart are described.

The Origin and Evolution of the Reflex Process.

The test of a new conception is the light that it throws upon obscure problems. The application of the theory of disturbed reflexes led to an examination of the mechanism of the heart beat—a mechanism which depends upon this vital process which we call reflex, and it fulfils the test of a true conception, as it presents the whole subject of the heart beat and its disorders in a new and better light. It also provides an interpretation of many facts which had either been misunderstood or overlooked, and gives a guide in which direction to look for other facts.

The nature of the process we call a reflex can be gathered by the description given in Bayliss's *Principles of General Physiology* of the evolution of the nervous system. This system begins in the conduction of a stimulus in the lowest multicellular organisms, where the communication passes from cell to cell without any intermediate mechanism. The next stage may be seen in the sea anemone, where projections of the cutaneous cell are connected with muscle fibres. The next stage may be considered to be that when a nerve cell is interposed the stimulus arising in one cell (the receptor or A part of the reflex) passes to a nerve cell (the centre or B part of the reflex) which is connected with the organ which gives the response (the effector or C part of the reflex). This stage, simple at first, as in the earthworm, becomes extremely complicated, especially in the central or B part of the reflex, which is situated in the central nervous system, where the stimuli are rearranged and guided into the paths for the production of their effects. The portion of the reflex in the central nervous system is that generally spoken of as "centres"—as the centre for vomiting, for respiration, for micturition, etc.

It will be seen that this description of the evolution of one part of the nervous system deals with the passage of a stimulus from one tissue to another, corresponding with our conception of a reflex.

The Reflex Process and the Movements of the Heart.

In the different rhythms of the heart we find variations in the reflex process, corresponding in a curious manner with Bayliss's description of the evolution of the nervous system. In certain abnormal conditions the muscle cells of the auricle and ventricle may contract independently of the control of the normal mechanism. The contraction of one cell stimulates its neighbour to contraction, and hence we get that remarkable condition called fibrillation. In this condition the muscle wall, though as a whole it stands still, is seen to be in continuous movement on account of the inharmonious contractions of the individual muscle cells. No sooner does one cell contract than it is again stimulated to contraction by its neighbour—that is to say, the stimulus evoked by one cell passes directly to another, in the manner described as the first stage in the evolution of the nervous system.

The stimulus for contraction of the ventricle passes from the auricle to the ventricle along the auriculo-ventricular bundle. (See Fig. A.) If this be cut or a portion destroyed by disease the ventricle no longer responds to the stimulus from the auricle. The ventricle, however, does contract at a slower and different rate from the auricle. There is good reason for assuming that the stimulus arises in the remains of the bundle and passes to the ventricle by the Purkinje cells. Thus we have an illustration of the reflex process where the stimulus arises in the Purkinje cells and is conveyed by them to the effector organ—that is, to the muscle cells of the ventricle.

The process is similar, though a little more complex, when the stimulus arises in the auriculo-ventricular node or in the auricle. The stimulus for contraction arises normally in the