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On the Rise of Modern Ophthalmology

AN ADDRESS

DELIVERED AT A JOINT MEETING OF THE MEDICAL SOCIETY OF ST. MUNGO'S COLLEGE AND THE MEDICO-CHIRURGICAL SOCIETY ANDERSON'S COLLEGE

BY

A. MAITLAND RAMSAY, M.D.

ON THE RISE OF

MODERN OPHTHALMOLOGY

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BY

A. MAITLAND RAMSAY, M.D.

OPHTHALMIC SURGEON TO THE GLASGOW ROYAL INFIRMARY, PROFESSOR OF OPHTHALMOLOGY IN ST. MUNGO'S COLLEGE, ETC.

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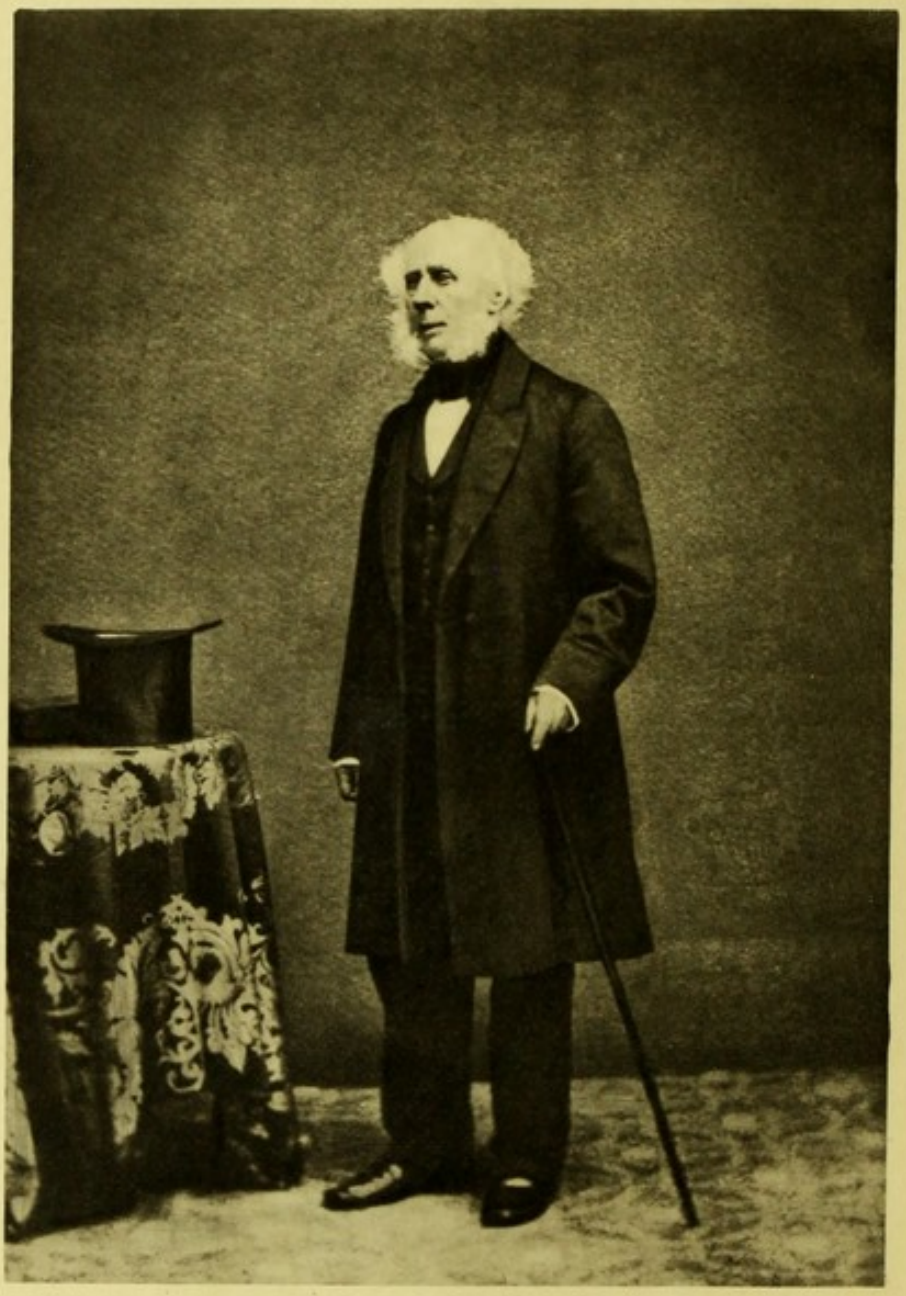
PREFATORY NOTE

THIS address was not written with a view to publication, and it is now printed for private circulation only, by the desire of those who heard it delivered.

A. M. R.

15 WOODSIDE PLACE, GLASGOW,
2nd February 1900.



William Mackenzie, M.D.

1791–1868.

ON THE RISE OF MODERN OPHTHALMOLOGY

GENTLEMEN,

I am very conscious of the honour you conferred upon me in inviting me to address you this evening; and, since I accepted your kind invitation, I have often asked myself, with much anxiety and much perplexity, how it would be possible for me, while confining myself to my own special department of medicine, to deal with what might prove of interest to you all—seniors and juniors alike. Careful consideration at last suggested that I might succeed were I to try to place before you some slender portrait sketches of a few of the giant teachers of the past—of the great men who laid the foundations of the science of modern ophthalmology. I must ask you, however, first of all to accompany me in a necessarily brief survey of the progress of the knowledge of diseases of the eye from early times, as in that way we shall be better able to follow the rise of ophthalmology from haphazard speculation to a science firmly based upon observation and experiment.

As far back as our knowledge extends we seem to find the study of eye diseases recognised as a distinct department of medicine and practised by specialists. In Egypt, five centuries before the Christian era, some of the priests devoted themselves solely to the treatment of the ailments to which the eyes are

subject. The knowledge they possessed was, however, regarded as the private property of certain families, and was, by the members of these, transmitted in secret from one generation to another. The practitioners were, for the most part, ignorant of anatomy and pathology, and though, consequently, they made but few original discoveries, yet their reputation was in those days so great that the name and fame of the Egyptian eye-specialists extended far beyond their own land; and it is recorded that Cyrus, king of the Persians, sent to Egypt for an oculist, and that students travelled to that country for the sole purpose of acquiring a knowledge of eye diseases. The Greek, Roman, and Arabian surgeons considered the study of ophthalmic affections an important part of medical education, and we cannot but be struck by the extensive and thorough knowledge they possessed, as well as by the accuracy of their descriptions and by their methods of treatment, which were, in many instances, identical with those of the present day. From the time of Galen, however, until the fifteenth, or even the sixteenth, century there was a dark age of medicine, during which no progress was made in medical knowledge. With the revival of learning in the middle of the fifteenth century there came a spirit of criticism, which in time invaded every department of human thought and action. Men began to turn aside from imperfect records and looked at things for themselves, asking why Nature should have given them sight and other senses, except that they might themselves search for, or verify, truth. The Renaissance produced as great a revolution in medicine as in every other branch of learning: the requirements of the great artists, Leonardo da Vinci, Raphael, Michael Angelo, demanded a more perfect knowledge of the structure of the human body than could be gathered from the descriptions of Galen. Á fresh beginning was thus given to the study of anatomy. Foremost among the leaders of the new school of inquiry was Andrew Vesalius, born at

Brussels in 1514, who when only twenty-nine years of age published his immortal work *On the Structure of the Human Body*, the issue of which gave such an impetus to this great branch of knowledge that within a few years the professorial chairs of the universities of Italy were filled by men whose names are daily repeated in every dissecting-room. The progress of anatomy brought with it a new surgery, one of the most typical representatives of which was Ambrose Paré, so justly called the father of French surgery. Three years younger than Vesalius, he was a warm admirer of that great master, and, from the first, founded his practice on nature and experience, recognising how the fuller knowledge of anatomy was gradually undermining the infallibility of Galen. Though a great reformer he was no revolutionist, and, while he invented new methods of treatment, he held steadfastly to all that he believed to be good in the old. "A tried remedy is better than one newly invented" is a saying of his that may still be remembered with advantage. In his published works Paré devotes a chapter to the treatment of wounds of the eye, and one of his pupils, Guillemeau, wrote a complete treatise on ocular affections.

Want of time unfortunately prevents my referring to more than one other of the great surgeons of this period, Fabricius Hildanus, who lived from 1560 to 1634. He was to a certain extent self-taught, for he had not the advantages of a University education. He had, however, acquired an intimate knowledge both of Latin and of Greek, and was a most earnest student of anatomy, which he described as "the key, compass, and foundation of medicine." He was especially skilful in inventing new instruments, such as aural specula, splints for fractures, and forceps for removing foreign bodies, and he even made an artificial eye, which he seems to have offered as a prize to his pupils to encourage them in their anatomical studies. It is to-night specially interesting to us to

learn from one of his letters that he used a magnet for the extraction of pieces of metal from the eye. Here is his own account of the case: "A countryman, Benedict Barguin, bought some iron, and was striking two pieces together to prove its quality, when a splinter flew into his eye and stuck in the cornea, causing him great pain. The local surgeons tried everything for many days to no purpose, and the pain and inflammation so increased that he came to me at Bern on the 5th March [1624]. I used all means I could think of for some days, but the splinter was so small that it could not be removed by instruments. When behold! my wife hit on the very thing. I kept the eye open with both hands while she held a magnet as close as possible to it, and after several trials (for he could not stand the necessary light long), we saw the iron leap from the eye to the stone."

It must, however, be admitted that although great advances were now being made in general surgery, the study of eye diseases seems to have been very sadly neglected, and their treatment was almost entirely in the hands of quacks, who travelled up and down the country, visiting fairs and other places of popular resort, to trumpet forth their own fame, and to extol the virtues of some supposed specific, which they and only they possessed. One of the most remarkable of those itinerant oculists was "the Chevalier John Taylor," who practised during the first half of the eighteenth century. Taylor was a gentleman and a scholar. He had studied at Leyden and other universities, was ophthalmic surgeon to King George II., and had treated several of the most illustrious personages in Europe. He was, however, a very prince of charlatans, and during his excursions over the Continent he published works in English, French, Russian, and Danish, in which he claimed the high-sounding titles of papal, ducal, and court, oculist, &c., and set forth his

professional distinctions in the most exaggerated terms. Like every other quack he was able to produce numerous testimonials from many distinguished professors of the time. Here is one of his advertisements which appeared in the *Mercury* of France in June 1737: "Dr. Taylor, oculist to the King of Great Britain, has just arrived in Paris at the London Hotel, Rue Dauphiné, where he proposes remaining till the beginning of July, after which he will leave for Spain. He requests us to publish the discoveries he has made for straightening squint eyes by a slight and almost painless operation, and without fear of accident." His mode of procedure has been thus graphically described by Lecat: "This refined and amiable man came to Rouen and within a few days became the object of general admiration. He had an arsenal of superb instruments and handled them with great dexterity. He showed portfolios filled with authentic and highly commendatory credentials. The door to his hotel was guarded by soldiers, and it was necessary for me to have an introduction in order to visit him. His operations were done in the midst of a brilliant circle of select persons. The great operation, the most marvellous of all, was that by means of which he proposed to straighten squinting eyes. His method was as follows: With a needle of silk he caught a portion of the conjunctiva of the squinting eye at the inferior part of the globe, and having made a loop of this silk, he used it to draw towards him that portion of the conjunctiva which it included, which he cut with the scissors; then he applied a plaster to the sound eye; the squinting eye at once righted itself, and every one cried out, 'A miracle!'" The story of Taylor is interesting, for if he really corrected squint by tenotomy of the internal rectus muscle he would have acquired enduring fame had he made his discovery known by an exact and honest description of his methods. He, however, seems

to have been more intent upon spreading his own fame and filling his own pockets than upon contributing to the advancement of medical science. He probably obtained his desire, but his action ruined his reputation.

After the middle of the eighteenth century a new and brilliant era in the history of ophthalmology began, and men of genius in France, in Germany, in Italy, and in our own country, were attracted to the study of this department of medicine. The one great characteristic which distinguished the workers of this period from all those who had preceded them was that they endeavoured to found their practice on a more exact knowledge of the anatomy and physiology of the eye. Able works dealing with these subjects were published in Germany by Zinn, Haller, and Richter; and in England Thomas Young was carrying on those researches which have laid the foundation of our knowledge of physiological optics. It was at this time also that Daviel published his description of his operation for the removal of cataract by extraction of the lens, an operation which entirely took the place of the old and dangerous method of couching. It is true that Daviel was not the first to extract a cataractous lens, for the operation was practised by the Greeks; but it was he who first clearly described its surgical technique, and the curette in use at the present day is exactly after the pattern of that invented by him.

In 1773 Barth established the Vienna school of ophthalmology, and inaugurated a course of systematic lectures accompanied by clinical instruction. He was succeeded by his more famous pupils Beer and Schmidt, and from their time onward students were drawn in large numbers to the Austrian capital, whence, after having completed their studies, they returned to their respective countries, and, becoming attached to medical schools, not only acquired eminence for themselves but quickly raised

ophthalmology to its proper position among the branches of medical knowledge.

In Italy Scarpa had made a great reputation for himself, and his classical work, published in 1801, was soon translated into English and French, and continued for many years to be the recognised text-book on diseases of the eye. In England Mr. Saunders was the first to open a dispensary for the treatment of eye diseases, and in 1804 there was founded by him what is now known as the Royal London Ophthalmic Hospital—the largest, or almost the largest, ophthalmic institution in the world. Similar hospitals were soon established in Birmingham by Middlemore, and in Glasgow by Mackenzie, and lectures on the diagnosis and treatment of eye diseases were delivered in connection with the various medical schools.

Of all the ophthalmologists of the beginning of the nineteenth century there is probably none whose reputation is greater, and whose work is likely to be more lasting in value, than Mackenzie's. He was born at Glasgow in April 1791, and died there in July 1868. His father, a manufacturer possessed of considerable means, was very keenly desirous that his son should become a clergyman of the Church of Scotland, consequently young Mackenzie, after finishing his school education, went to the University and passed through the curriculum of arts. Thereafter he entered the Divinity Hall, but his religious views becoming unsettled, he gave up the study of theology and applied himself to medicine. He became a resident clerk in the Royal Infirmary in 1813, and two years later, having obtained the diploma of the Faculty of Physicians and Surgeons of Glasgow, he went to London, and afterwards to the Continent, for the further prosecution of his studies. While he was a student, Mackenzie interested himself greatly in the anatomy and physiology of the eye, and his attention was directed to the practical departments of ophthalmology

after his visit to Paris, where he seems to have been greatly impressed by the successful eye operations performed by Roux. Leaving Paris he proceeded to Vienna to study under Beer, who had at this time attained a world-wide reputation. He remained abroad for nearly two years, and before returning home made a short tour through Italy. There he visited Scarpa, who seems to have impressed him greatly. Reaching London about the beginning of the year 1818 he commenced practice, but seems not to have met with much success. He was anxious to teach anatomy, and was so much disappointed when he failed to obtain a lectureship on that subject that he left the metropolis, and returning to Glasgow entered upon general practice. He soon became connected with Anderson's College, where in the earlier years of his career he lectured on Anatomy and Surgery, and on Materia Medica and Medical Jurisprudence, besides delivering several courses of lectures on the structure, functions, and diseases of the eye. Even at the time when he was a resident clerk in the Infirmary, Mackenzie was remarkable for his power of expressing himself clearly and vigorously in English, and for his knowledge of the classics, consequently his lectures were always characterised by great lucidity of style and elegance of expression. He was most indefatigable, and although he had to prepare lectures on so many different subjects while busily engaged in general practice, yet he found time to carry out his idea of establishing an Eye Infirmary in Glasgow. In this enterprise he was joined by Dr. George Monteath, and in May 1824 they opened the institution. From this time onwards Mackenzie identified himself more and more with the subject of eye diseases, and did everything he could to promote the study of the eye, and the successful practice of ophthalmic surgery. He concentrated his efforts on the development of the hospital, being most assiduous in his attendance, and taking a personal interest

in, and the direction of, every detail of its management. He made it a rule not only to examine every case thoroughly, but at the same time to make careful notes of the symptoms and treatment. In all he did he was most methodical, consequently he was able to overtake an immense amount of work. He read widely, and, although he possessed a most astonishing memory, he always made careful jottings of everything that he thought might be of value.

Such marvellous powers of application and untiring industry could not be barren of results, and before he was forty years of age he had published the first edition of the book which made his name famous throughout Europe—his *Practical Treatise on Diseases of the Eye.* This work, first published in 1830, at once attracted the attention of the medical profession at home and abroad, and was recognised as the standard work on the subject. It is indeed a veritable cyclopædia of ophthalmic knowledge, and in it Mackenzie has, with unrivalled critical acumen, gathered together all that was of value in the learning of the past, and supplemented it by the sagacity and wealth of his personal experience. In clear and correct language he described eye diseases as he saw them, and he has thus presented us with word-portraits which are faithful reproductions of nature. His powers as a clinician were most extraordinary. His keen intelligence seized and recorded every characteristic outward sign of a disease, while his vigorous intellect enabled him to penetrate deeply into the secrets of Nature, and so, gifted with a prophet's insight, he was able to make original observations and commentaries on such diseases as sympathetic ophthalmia and glaucoma, which were far in advance of the age in which he wrote, and which further knowledge and experience only confirmed and amplified. The publication of the *Practical Treatise* must therefore be regarded as a great epoch

in the history of ophthalmology. The book was translated into French, German, and Italian, and passed through four English editions. On the Continent, more especially in Vienna, Mackenzie was regarded as the leading oculist in the world.

It was just about this time, however, that the study of eye diseases was about to be revolutionised by the invention of the ophthalmoscope. Till then, notwithstanding the careful and elaborate descriptions of the symptomatology of diseases affecting the deeper structures of the eye published by Mackenzie and others, nothing definite was known regarding the diseases themselves, except the scanty facts obtained from the occasional dissection of enucleated eyes. Men had tried, but had tried unsuccessfully, to penetrate the darkness of the pupil and see what existed beyond, but, with the exception of a few isolated observations, which at the time did not admit of a satisfactory explanation, the structures at the bottom of the living eye remained shrouded in obscurity and mystery. Towards the end of the first half of the nineteenth century, however, physical science was making giant strides, and was beginning to exercise an important influence in the progress of medicine and surgery. In 1846 Cumming published a paper on a "Luminous Appearance in the Human Eye," in which he says that the phenomenon appears "chiefly important in its adoption as a mode of examining the posterior part of the eye." A year later Brucke showed that all eyes could be made to glisten when the beam of a lantern was cast upon them in a darkened room. Rarely have observers approached closer to an important discovery without actually reaching it; but there is all the difference in the world between doing a thing and nearly doing it, and so it was reserved for Helmholtz in 1851 to succeed where so many others had failed, and to render his name immortal by the invention of the ophthalmoscope. The story of the discovery of this little instrument is best told in his

own words: "I was endeavouring to explain to my pupils the emission of reflected light from the eye, a discovery made by Brucke, who would have invented the ophthalmoscope had he only asked himself how an optical image is formed by the light returning from the eye. In his research it was not necessary to ask it, but had he asked it, he was just the man to answer it as quickly as I did, and to invent the instrument. I turned the problem over and over to ascertain the simplest way in which I could demonstrate the phenomenon to my students. It was also a reminiscence of my days of medical study, that ophthalmologists had great trouble in dealing with certain cases of eye disease, then known as black cataract. The first model was constructed of pasteboard, eye-lenses, and cover-glasses used in the microscopic work. It was at first so difficult to use, that I doubt if I should have persevered, unless I had felt that it must succeed; but in eight days I had the great joy of being the first who saw before him a living human retina." The last English edition of Mackenzie's *Practical Treatise* appeared in 1854. It is somewhat unfortunate that it followed so closely upon the introduction of the ophthalmoscope, because its author had not time to assimilate and appraise at their proper value the many new facts that were brought to light as a result of Helmholtz's important discovery. Like all practitioners of his time, Mackenzie had witnessed the rise and fall of many vaunted professional novelties, and was exceedingly cautious in his adoption of new methods. Consequently at first he was inclined rather to undervalue the ophthalmoscope, and, in common with many other oculists of the period, expressed his fear that its use might prove injurious to eyes suffering from deep-seated diseases. Always ready to learn, however, he began to work with the instrument, and thoroughly mastered its difficulties; and, as is shown by the private case-books of his later years, he made careful notes of the results

of his ophthalmoscopic examinations. In spite of his great age he was always ready to be instructed as well as to instruct, and only two years before his death he carefully revised the proofs of a supplement to the last French translation of his book by means of which his friend Warlomont sought to bring it *au courant* with the science of the day. It is not, however, possible satisfactorily to alter another man's work. That must just be taken as far as it goes, and accepted for what it is worth. In that way only can his successors do him honour, for, by taking their stand upon what he has accomplished, they can themselves rise to things higher than would have been possible had they not possessed those firm foundations on which to build their own superstructure of knowledge.

From this point onwards ophthalmology was to advance with very great strides, and from among the many earnest workers in this department, the names of von Græfe, Donders, and Bowman stand out pre-eminent. These three Masters of Medicine, each possessing such a well-marked personality, were instinctively drawn to each other by common aims and common interests. They met for the first time in London during the Great Exhibition of 1851. It was a memorable meeting for them all, for it was the beginning of a lifelong friendship, and of a series of discussions all ending in that mutual helpfulness which enabled them to lay the foundations of modern ophthalmology.

At the time when Helmholtz invented the ophthalmoscope Albert von Græfe was in practice at Berlin, and it is said that when he first saw the fundus of the living eye his face flushed with excitement, and he exclaimed, "Helmholtz has unfolded to us a new world! What remains to be discovered?" He was then twenty-three years of age, having been born in 1828. His father, a distinguished surgeon in Berlin, died while this his youngest son was yet a boy, so his upbringing and education

fell entirely to the care of his accomplished mother, Augusta von Alten. After a thorough training in mathematics, in physics, and in chemistry, von Græfe entered upon the study of medicine, and when only twenty years old graduated with the highest honours. Thereafter he visited Prague, when Arlt strongly advised him to devote himself to ophthalmology. From Prague he went to Vienna, and he afterwards visited Paris where he studied under Desmarres and Sichel. He then paid a brief visit to London, Edinburgh, and Dublin, and subsequently returned home to begin practice as an ophthalmic surgeon. He immediately started a clinique of his own, and as at first "human patients were not forthcoming, he availed himself of rabbits, in which he induced various forms of eye disease artificially. Each animal had its number inscribed on a leaden label, fastened to an ear-ring, and a corresponding number was entered in his clinical journal, in which a daily record of symptoms was duly made, till the account of the post-mortem formed a fitting finale to the diary of disease." He soon became famous and his success in practice was something phenomenal. His father had left him ample means, which enabled him to erect an eye hospital of his own, and patients flocked to his clinique from far and near, and students and practitioners attended it to learn from the young surgeon. Every day served to increase his reputation, and such was the spirit in which he worked and taught, that he founded a school of his own, which has sent out many of the most distinguished oculists of the present day. In 1856 he directed the attention of the profession to iridectomy as a cure in recurrent inflammation of the iris, and so successful did this prove that he was led to its employment in glaucoma, a disease which had been, up to that time, regarded as incurable, and which usually ended in total blindness. Although, however, the cure of glaucoma stands foremost among the achievements of von Græfe it is far from being his only

one. He threw light on almost every point in the more abstruse departments of ophthalmic science, and the extraordinary development of ophthalmology at that time was brought about in great part by the magnetism of his personality and the immensity of his labours. It appears almost inconceivable how he found time to do so much valuable scientific work, when he was so fully occupied by his practice. "He generally sat down to his work-table at 7 A.M. and devoted himself to scientific work exclusively till 9 A.M. Then he delivered his lectures, which were attended not by students merely, but by surgeons practising at home and abroad. Clinical teaching and attention to his patients at the Polyclinik, which was daily attended by from one hundred to one hundred and fifty eye-patients, occupied him till 3 P.M. Rapidly despatching some minor operations, he then entered his carriage to visit his patients in town. By 5 P.M. at the earliest he regained his home, exhausted, to get his dinner. Not infrequently he lacked the needful time for this, and took a frugal dinner in his carriage. At 6 P.M. he saw private patients at his own house, and this lasted some hours, as there were generally fifty to seventy such. When they had all gone he returned to his forsaken scientific labours, which often occupied him till the early morning hours." As he was never very robust, we do not wonder that his health began to give way under this incessant labour. His jet-black hair rapidly became grey, his noble and finely-cut features showed lines which marked the progress of disease, and before he had completed his forty-third year von Græfe died. The end was sudden and somewhat unexpected. He had been suffering more than usual from the pulmonary affection to which he had been for years a martyr, and to promote his comfort a bed had been erected in a summer-house in the midst of his beautiful garden. There, on the night of the 20th July 1870, Albert von Græfe passed away. When,

next morning, the news of his death spread abroad, not only Berlin but the whole of Germany was moved so deeply that for the moment the noise and tumult incident to the outbreak of a fearful war was silenced. Well indeed might his countrymen mourn, for they are not likely to look upon his like again. Among most of his contemporaries, and among his students, his profound interpretations of nature had caused him to be looked upon as more than a teacher—he was reverenced as a prophet. The trust reposed in him was implicit. Has not von Græfe said it! Is that not enough? It is hardly possible to exaggerate the services which such a life as his rendered to his patients. To thousands he had been more than a doctor, he was the true and helpful friend who found his highest, and oftentimes his only, reward in the gratitude that gleamed back to him from the eyes to which his skilful hand had restored sight. His whole life was a ministry of love—love for his profession and love for humanity.

While Helmholtz in his little room in the anatomical department of the University of Königsberg was inventing instruments such as the ophthalmoscope and the ophthalmometer, and so creating the new science of physiological optics, Donders at Utrecht was working at the same subjects from the pathological standpoint. At this period all that was known as to this might be summarised thus: concave glasses improve myopia, convex ones presbyopia—and the selection of the one or the other for any given case was only arrived at as a result of rude empiricism. It is true that Thomas Young had discovered astigmatism in his own eye, and that nearly forty years later Professor Airy published an account of a remarkable instance of the same anomaly, and showed how vision could be improved by the use of cylindrical glasses. It was not, however, until Cramer and Helmholtz solved the much-disputed question of the accommodation of the eye to different distances, and

Donders published his great work on the *Anomalies of the Refraction and Accommodation of the Eye*, that this subject was placed on a scientific basis, and properly understood by ophthalmologists. In this book, published in 1864, Donders for the first time demonstrated what is meant by the refraction and accommodation of the eye, the changes which they undergo with age, how they are related to the movements of the eyes, their anomalies, and lastly the art of neutralising or correcting these. If it had not been for him the brilliant discoveries of Helmholtz might not even yet have been utilised for the good of mankind—discoveries of the widest importance in everyday life for all ages, all classes, and all time. But these researches in ophthalmology were not the only achievements of Donders; along with his friend Mulder he made many discoveries in organic chemistry, and there is not a department of physiology which has not been enriched by his valuable contributions. Yet this man, who ultimately attained such eminence, possessed no advantages of birth or of station; his parents were poor and humble, and his father—an honest burgher of Tilburg—dying shortly after his son's birth, left his family in straitened circumstances. His early education was received at a village school, and it was here that his precocity first manifested itself. He rapidly acquired all the information his humble schoolmaster could impart to him, and when he was only eleven years of age he became a teacher in the school and was paid a salary for his services. Subsequently he was sent to other schools at Tilburg and Boxmeer, where he was conspicuous for his remarkable power of acquiring languages. At this time he had thoughts of becoming a priest, but when seventeen years old he changed his mind, and entered himself as a pupil in the Military Hospital and enrolled as a student in the University of Utrecht. He obtained his doctor's degree at Leyden before he had completed the regulation time

of study, and at the age of twenty he was appointed military surgeon at the Hague. Two years afterwards he returned to his Alma Mater to fill the post of lecturer on Anatomy and Physiology. Here, teaching with an eloquence which in dignity, precision, and elegance, reminded one of the great orators of the past, he wrought for forty-seven years, built an Ophthalmic Hospital, founded a Physiological Laboratory, and made for himself such a brilliant reputation, that the little town of Utrecht became one of the greatest scientific centres on the Continent. The years brought him world-wide reputation and honour, but fame only made the simplicity of his character more clear and impressive. "Do not speak of my merits, but congratulate me on my good luck," he modestly replied when on his seventieth birthday an address of homage was presented to him by his admiring countrymen and by men of science from far and near. It is true that he was fortunate in living in a period when discoveries were taking place destined to inaugurate a new era for many branches of science, and becoming thoroughly imbued with the spirit of the times, in the pursuit of truth, in the noble offices of the scientist and teacher, he sought and found the end and reward of living. His work can never die.

Of the three men whom chance first threw in each other's way during the Great International Exhibition of 1851, William Bowman, although he was the oldest, survived the other two. He was born in 1816 at Nantwich, where his father was a banker. His early medical education was received at the Birmingham General Hospital, and there he gave special attention to pathology and practical surgery. In 1837 he entered the Medical Department of King's College, London, and two years later was appointed Demonstrator of Anatomy, as well as Curator of the Museum, and assistant to Todd, the eminent physiologist. The first important addition he made to scientific knowledge was a

paper he communicated to the Royal Society in 1840, on the "Structure of Voluntary Muscle," and this was followed two years later by a second and equally valuable article on the "Structure and Use of the Malpighian Bodies of the Kidney." It was about this period of his career that he was appointed assistant-surgeon at King's College Hospital, where from the first he was noted for his skill in diagnosis as well as for the excellence of his operations. At this time he intended to devote himself to general surgery, but circumstances, more particularly the retiral of Dalrymple in 1846, led him to take up the study of diseases of the eye. The laborious and valuable scientific work of his earlier years, as well as his skill as an operator, had already gained for him a great reputation, and soon almost the whole of the consulting eye-practice of London fell into his hands. Besides his classical lectures *On the Parts Concerned in Operations on the Eye*, papers of great practical value frequently came from his pen, and he was one of the very first to avail himself of the brilliant discoveries of Helmholtz, of Donders, and of von Græfe, and to introduce them to the notice of English ophthalmologists. His clinique at Moorfields was always well attended by practitioners, many of whom came from long distances to listen to his demonstrations, or to watch with delight the supreme skill with which he performed his operations. As a consultant he was held in the highest esteem by both his patients and his fellow-practitioners. He was calm, dignified, and courteous, but his courtesy was not merely a gracious manner, it was the fitting and inevitable expression of a deep inward considerateness for the feelings of others. For nearly thirty years he was the acknowledged leader of ophthalmology in this country, and the example he has left is of no less value than his numerous contributions to the advancement of Science.

I am fully conscious that no verbal description can adequately convey to you what manner of men these were, who have adorned our profession, and left us the legacy of their skill and of their characters. My aim in this address has been to show you that the rise of modern ophthalmology has been achieved by a few great men who at all times lived up to the highest standards of work, of duty, and of professional honour. May we try to be worthy, though humble, followers of these masters, seeking to work as they worked, with singleness of purpose, untiring industry, and steadfast faith. Much has been done: more still remains to do: therefore "with firmness in the right as God gives us to see the right, let us strive on to finish the work we are in," ever mindful that we must be up and doing while it is called to-day, for the night cometh when no man can work.

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