

cancer as well as the treatment of the diagnosed disease. The NCI achieved developments in both research and treatment under his leadership.

His scientific work received international recognition, and he was named Knight of the Portuguese Order of Santiago, Doctor *honoris causa* by the University of Bordeaux, *Officier de la Légion d'honneur*, and Honorary Fellow of the American College of Surgeons.

Goyanes developed the intra-arterial regional anesthesia approach and various surgical techniques for the treatment of laryngeal cancer. He also published on the statistics, etiology, and pathogenesis of cancer. In addition to his clinical studies, he was a prolific writer of literature. He also published texts on the history of medicine, such as his publications on Miguel Servet [Michael Servetus] (1511–53) and Maimonides [Rabí Mosheh ben Maimon] (1135–1204), and on the portrayal of physicians in the works of the writer Francisco Quevedo (1580–1645).

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Rosa María Medina-Doménech

GRAAF, REINIER DE (b. Schoonhoven, the Netherlands, 30 July 1641; d. Delft, the Netherlands, 17 August 1673), *anatomy, physiology*.

As a son of Catholic parents—Catharina van Breenen and Cornelis de Graaf—de Graaf went to study in Louvain in the Spanish Netherlands. In 1663 he exchanged Louvain for Utrecht, where he studied medicine with Ysbrand van Diemerbroek, but soon he set out for Leiden, matriculating at Leiden University on 5 April 1663. It was there that de Graaf befriended Jan Swammerdam and Niels Steno, with whom he studied anatomy under Johannes van Horne and Franciscus de le Boë, Sylvius. In 1664 de Graaf published an account of the famous experiment that enabled him to drain some juice from the pancreas of a living dog using a fistula. He performed this experiment for audiences elsewhere and graduated while in Angers (France) on 23 July 1665. In 1666 he set up practice in Delft, where, on 14 June 1672, he married Maria van Dyck. Their firstborn son died in April 1673, only seven weeks old. Shortly after, de Graaf himself expired at the age of thirty-two.

In Delft, de Graaf continued his innovative research. He experimented with the use of the needle and invented a flexible tube that made it possible to apply enemas in private. It was from Delft, too, that de Graaf introduced his fellow citizen Antonie van Leeuwenhoek to the Royal Soci-

ety in a letter of 28 April 1673. De Graaf, however, had by then become entangled in painful disputes with Jan Swammerdam over questions of priority relating to his research on the male and female genital organs.

A surgeon and anatomist of unusual skill, de Graaf acquired lasting fame for his description of the female reproductive organs, in particular for the idea that mammalian eggs are formed in what we now know as the 'Graafian follicles'. De Graaf examined successive stages of pregnancy in rabbits and studied human ovaries as well as those of cows, sheep, and pigs. He described the process of ovulation without being able to observe the egg itself (it was found only much later, in 1827, by Karl Ernst von Baer). Others, including Niels Steno, had already suggested that the 'female testicles' were in fact ovaries, but de Graaf's *De mulierum organis* of 1672 lent the idea scientific credibility.

De Graaf's experimental way of settling questions through observation and experiment—a method that had become popular among a group of Sylvius's Leiden students—marked a new development in scientific inquiry. The method was not devised in opposition to any medical theory or school. Indeed, the pancreas experiment was supposed to confirm one of Sylvius's iatrochemical views. The pancreatic juice was thought to be the acid factor in a mixture of juices (the *humor triumviratus*) that supposedly caused a process of effervescence in the duodenum.

Gradually improving his methods and discussing his research findings with local colleagues who checked and reexamined them, de Graaf developed into a much-appreciated experimentalist. Already renowned in his own time, his fame has stuck with later generations. Today, the main hospital in his hometown of Delft carries his name.

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Han van Ruler

GRAEFE, FRIEDRICH WILHELM ERNST ALBRECHT VON (b. Berlin, Germany, 22 May 1828; d. Berlin, 20 July 1870), *ophthalmology, surgery*.

Graefe was born in the Prussian capital of Berlin in Villa Finkenheerd as the son of Carl Ferdinand von Graefe into a moderate noble family, which had established social relations with many intellectuals and artists of the time, including the writer Karl Immermann and the architect

Friedrich Schinkel. His father was a rather famous surgeon who directed the Clinisch-chirurgisch-augenärztliches Institut in the Surgical Clinic of Berlin University, from 1818. Carl Ferdinand persuaded his son to study medicine.

Medical Training

After going to the elitist French high school in his hometown, Albrecht Graefe graduated with his 'matura' at the early age of fifteen. Graefe took up his medical studies in 1843, at the Friedrich-Wilhelms-University of Berlin, and lived in a small flat next to Oranienburger Tor and Chausseestrasse. At the University Hospital, he was trained in the most up-to-date methods in experimental medicine and was the student of the anatomist and physiologist Johannes Mueller, the physiologist Emil Du Bois-Reymond, and the pathological anatomist Rudolf Virchow. Yet Graefe was also greatly influenced by the clinical approaches of Ludwig Schoenlein, the surgeon Johann Friedrich Dieffenbach, and a representative of the younger generation of university teachers, Johann Christian Juengken, who mutually introduced the novices to the recently introduced type of bedside-teaching and the 'rational' classification of internal diseases. In 1847 Graefe graduated MD in Berlin with a dissertation *De bromo ejusque praesipuis praeparatis*. His thesis was part of the research program of Juengken, who wanted to introduce a new kind of narcosis into surgery. Unfortunately, while working in his private laboratory at Finkenheerd, the experimental apparatus exploded, and Graefe sustained serious lung injury from the bromine vapor. One year later, however, he passed the state examinations and was given the doctor's certificate to practice medicine. In his case, this also included the right to perform general surgery and surgical obstetrics. Just made a young medical doctor, he helped to stem the outbreak of a cholera epidemic in Berlin. This is also reflected in his work: *Über Tannin als Choleramittel* (1848).

In autumn of the revolutionary year 1848, Graefe, who was an antiroyalist, commenced a scientific peregrination that brought him in close contact with Ferdinand Arlt, the famous eye-surgeon at the Allgemeine Krankenhaus of Prague, where Graefe finally decided to become an ophthalmologist. He then went to visit Louis-Auguste Desmarres and Julius Sichel at the Medical Faculty of Paris. The latter had emigrated from Frankfurt am Main to the French capital for political reasons. When Graefe crossed the channel for his residency in London, he met the histologist William Bowman, the ophthalmologist Franciscus Cornelis Donders, and George Critchett. In Donders, who had originally come from Utrecht, Graefe found an ingenious colleague who, like him, was very much occupied with medical research. Later, Donders and Graefe stayed in close contact. On his return to Berlin, Graefe had met many of the key figures of his field and was provided with various innovative concepts and methods. Yet Graefe felt com-

pelled to open a private ophthalmologic practice on 1 November 1851, a practice that was to become the mecca for many young ophthalmologists who came to practice with Graefe. In 1852 he was given the *venia legendi* for surgery and ophthalmology at the Friedrich-Wilhelms-University of Berlin. His Habilitations thesis, *Über die Wirkung der Augenmuskeln*, was on the physiology of eye movement. Being a Privatdozent at the clinic for surgery, Graefe was made the first full professor for ophthalmology in Germany in 1866. His university chair *ad personam* was immediately withdrawn, however, after his death, because of the perpetual financial crisis of the Charité Hospital during the nineteenth century. In addition, Graefe had stated in his will that his private clinic should only be continued if the state would take over the funding of its ongoing costs. This the Prussian administration refused.

Ophthalmology and Ophthalmologic Surgery

The surgeon Johann Christian Juengken, who was also in charge of minor ophthalmologic surgery and the ophthalmologic diseases in the outpatient department of the Charité Hospital, stepped down from his professorship in 1868. Graefe, who was already seriously ill at the time, was given the directorship of the Charité Hospital's ophthalmologic clinic. Graefe died two years later from the effects of lung tuberculosis, which he had contracted at the age of thirty, and his death was marked with a small funeral service at his place of birth. However, he left a wide legacy and had many pupils who were appointed to chairs in ophthalmology all over Germany and even in Switzerland. Typical is the case of Paul Heinrich Braunschweig, who worked as assistant to Graefe until his academic teacher was given emeritus status. Braunschweig went on to receive his *venia legendi* with an exclusively ophthalmologic topic: *Über die Geschwülste des Sehnerven* (1893). In 1902 he was offered a position as a professor of ophthalmology at the University of Halle. There, he committed himself to the early differentiation of the field and advocated the construction of a comparatively large clinic, with forty-five beds for his eye patients and another fifteen for the ear patients.

Together with Donders, Graefe was among the first ophthalmologists who regularly used the ophthalmoscope of Hermann von Helmholtz for the diagnosis of the fundus oculi when going on their ward rounds. After many years of experimental tinkering at his Institute for Physiology at Königsberg, East Prussia, Helmholtz had come up with this new diagnostic instrument in 1850, independently of the work of Charles Babbage in Great Britain. Numerous are Graefe's students' solemn accounts of his diagnostic skills. For example, the ophthalmologist Richard Liebreich, a pupil of Helmholtz who was born in Königsberg and later moved to London, served as assistant to Graefe and learned accurate diagnostic techniques in Graefe's Berlin clinic. When he later moved to London, he proved to be an important popularizer of his mentor's ideas

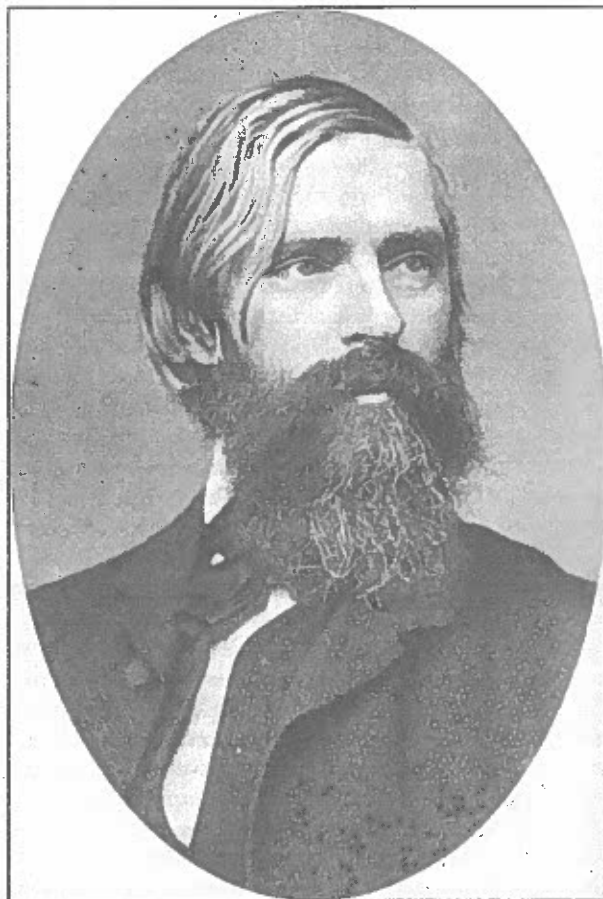
and spread the art of ophthalmoscopy among many physicians of the English capital. Also, Liebreich's delicate and artistic illustrations of the diseases of the eye, as they were displayed in his *Atlas der Ophthalmologie* (1863), made him well known outside the Prussian borders. The art of drawing and the scientific representation of ophthalmic diseases were also pet occupations of Graefe, together with his care for what is now one of the most important collections on ophthalmology, which is housed at the Museum for Medical History in Berlin. This collection also contains many glasses and spectacles; Graefe had been deeply interested in the investigation and cure of weak-sightedness. Already in 1848, he had been engaged with Donders to work on the physiology of sight. They both scrutinized whether the application of specific spectacles would illuminate the relation of accommodation and convergence of the eye. Additionally, the heritage of Graefe is passed on to present generations by the Graefe Museum, established through the Deutsche Ophthalmologische Gesellschaft at the Ruprecht-Karls-University of Heidelberg.

Another landmark of Graefe's achievements was his introduction of a surgical therapy for glaucoma, what he called an 'iridectomy', as a release operation for the increase of intraocular pressure. His method consisted of a surgical intervention into the iris of the eye. He furthermore introduced surgical treatments for squint disorders and modified the cataract operation. Very important for him was the exchange with his clinical colleagues, as Graefe defended the position that many diseases of the eye could only be understood etiologically, when also focusing on internal and neurological diseases. His work even touched on various internal pathologies—for example diabetes, nephritis, and tumors of the brain—and he described the congested papilla as a curvature of the retina, which could be seen in his funduscopy. He also realized that inflammations of the optic nerve could be a cause for amblyopia. Yet Graefe's main research interest remained weak-sightedness without organic lesion of the eye.

Medical Societies and Specialist Publications

As already noted, Graefe created a wide school of ophthalmologists and was a key figure in the establishment of this 'small discipline' at German universities. Many later *ordinarii* in ophthalmology went through his clinic. Yet in order to connect the small and disseminated scientific community, Graefe was deeply engaged in setting up various medical societies and specialist publications. Among these was the *Archiv fuer Ophthalmologie*, which he founded together with Donders in 1854 and which is still in existence, under its new title *Albrecht von Graefes Archiv für Ophthalmologie*. It is likewise one of the oldest scientific journals among the small clinical disciplines.

In 1857 Graefe initiated the first congress on ophthalmology in Germany, what was later (in 1920) called the Deutsche Ophthalmologische Gesellschaft. This initial congress took place at the University of Heidelberg, as did the following ones during



Albrecht von Graefe. Halftone reproduction from *Münchener medizinische Wochenschrift*, 1928. Wellcome Library, London.

Graefe's lifetime. Here, Graefe made use of a wide platform to discuss his innovative ideas and to present patient histories from his private clinic in Berlin. Many of these early presentations were later published in his *Archiv für Ophthalmologie*.

In his day Graefe was very popular, and his methods were often seen as if they stemmed from another world. Graefe was thus also the subject of many local writers, such as Felix Philippini or Eugenie John, who praised his ingenuity and his engagement in the medical treatment of the Berlin poor. Nowadays, the name of Albrecht von Graefe is still associated with the Graefe sign because he realized that in hyperthyroidism and some tumors, the upper eyelid does not follow downward movements of the eye bulb. This pathogenic process causes the white sclera to be rendered visible and continues to be a proper diagnostic sign. Yet Graefe was also an inventor, a passion he shared with his friend Donders, and a surgical instrument, the 'Graefe knife' for cataract operations, named after him. Acknowledging his wide contributions to the science of ophthalmology, the Deutsche Ophthalmologische Gesellschaft created a Graefe Medal in 1885.

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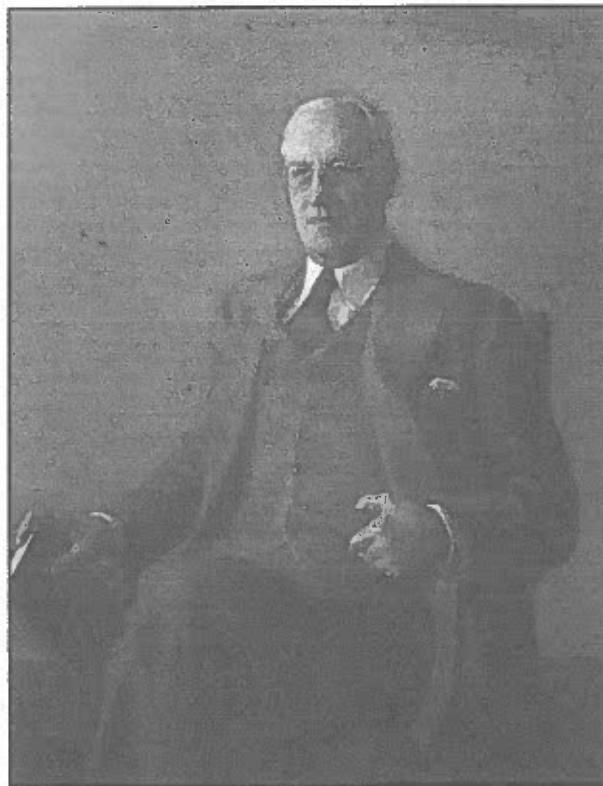
GRAHAM, EVARTS AMBROSE (b. Chicago, Illinois, USA, 19 March 1883; d. St Louis, Missouri, USA, 4 March 1957), *surgery*.

Graham was the son of a community surgeon. He received his Baccalaureate degree from Princeton in 1904 (first in his class) and his MD from Rush Medical College in Chicago in 1907. His surgical training was at Rush and Presbyterian Hospital in Chicago. Graham was also a special student in chemistry at the University of Chicago. He had a brief stint as a solo practicing surgeon in Mason City, Iowa, and served in the U.S. Army Medical Corps near the end of World War I. From 1919 to 1951, he was the Bixby Professor of Surgery at Washington University School of Medicine in St Louis and Surgeon-in-Chief at Barnes Hospital and St Louis Children's Hospital. He became Bixby Professor Emeritus in 1951.

Graham was one of the most prominent American surgeons during the middle third of the twentieth century. His research altered the management of empyema, and he was one of the pioneers of the then-new specialty of thoracic surgery. Together with one of his surgical residents, he developed the radiologic method of visualizing the gall bladder (cholecystography, the Graham-Cole test). Graham performed the first successful one-stage pneumonectomy for lung cancer in 1933. His studies carried out with a medical student, Ernst Wynder, were instrumental in establishing the relationship between cigarette smoking and lung cancer. He had major leadership roles in the American College of Surgeons, the American Board of Surgery, and the Joint Commission on Accreditation of Hospitals. He was responsible for training hundreds of surgical residents at Barnes Hospital.

Graham had great integrity and strong convictions, vigorously advocating his objectives and always welcoming a good fight. He strongly opposed fee-splitting, which he had encountered during his brief experience as a practicing surgeon in Iowa. A tall, imposing figure, Graham had a rather abrupt, somewhat reserved demeanor. He was known for his intellectual acuity and dignified manner. He was quiet, polite, and incapable of small talk. He and his wife, Helen, had three sons, one of whom was stillborn.

Graham received a multitude of honors, including fourteen honorary degrees and numerous medals and prizes. Ironically,



Everts Graham. Oil Portrait by Robert Brachman, 1952. Becker Medical Library, Washington University School of Medicine.

he continued to be a heavy cigarette smoker despite his groundbreaking work pointing out the association between smoking and lung cancer. He died of that malignancy after a brief illness. Twenty of Graham's protégés became department chairmen at medical schools around the world. Graham's biographer termed him the 'Surgical Spirit of St. Louis.'

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DICTIONARY OF MEDICAL BIOGRAPHY

Volume 2, C-G

Edited by

W. F. Bynum *and* Helen Bynum



GREENWOOD PRESS
Westport, Connecticut • London