

**Advances in Neurosurgery 6**

# **Treatment of Hydrocephalus Computer Tomography**

Edited by

R. Wüllenweber H. Wenker

M. Brock M. Klinger



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# Treatment of Hydrocephalus

## Computer Tomography

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# Advances in Neurosurgery 6



# Preface

More than 40 years ago British and German neurosurgeons met in Berlin and Breslau to exchange their experiences, to strengthen their friendly bonds, and to enjoy the attractions of both cities and their surroundings.

In 1960 a joint meeting of the Dutch and German societies took place in Rotterdam by invitation of the **Nederlandse Vereniging van Neurochirurgen**. All who attended this meeting thankfully remember the great hospitality during these unforgettable days.

In 1970, by courtesy of the **Society of British Neurological Surgeons**, German neurosurgeons had the pleasure to become acquainted with the great tradition of British sciences at one of the most famous places during the meeting in Cambridge. These impressions were deepened by visits to other famous sources of British scientific tradition during the European Congress in Oxford in 1975.

The critical distance sometimes necessary towards our own discipline is implicit in the major themes of this meeting. Complications following shunting procedures for hydrocephalus have been discussed on the basis of the results of a cooperative study of some German neurosurgical departments.

The second main topic was problems and diagnostic errors in computer tomography. The papers presented contain critical considerations about the findings obtained by this method, as well as on its possibilities and limitations.

German neurosurgeons felt deeply indebted to their British and Dutch colleagues and wanted to return their kindness at this joint meeting in Berlin. We hope that all participants will retain pleasant memories of the days in this city.

In the name of the German Society for Neurosurgery, the organizers of the Joint Meeting in Berlin express their gratitude to Professor G. Finger of Sharp & Dohme GmbH München for generously supporting the publication and distribution of *Advances in Neurosurgery* 6.

Horst Wenker  
Rolf Willenweber

# Reminiscences of the Meeting of 1937 and of Otfried Foerster<sup>1</sup>

C. GUTIÉRREZ<sup>2</sup>

There are two steps to be taken by those who wish to advance a medical specialty: the formation of a society and the publication of a journal. The birth of the first neurosurgical society was reported by Ernest SACHS in his autobiography [27]: Harvey CUSHING delivered a memorable address on his brain tumor statistics in 1919 before the American College of Surgeons with William MAYO in the chair. At the conclusion Dr. MAYO announced solemnly: "Gentlemen, we have this day witnessed the birth of a new specialty – neurological surgery". After the meeting CUSHING was congratulated by many and he said enthusiastically: "Wouldn't it be a good idea to get the fellows interested in this work together? Why not form a society and hold regular meetings in which we could discuss our problems and compare results? In this way we could make much more rapid progress." This suggestion was followed and the first meeting was held in Boston in 1920. CUSHING was elected president, SACHS secretary, and the first neurosurgical society was founded. The first neurosurgical journal, the *Zentralblatt für Neurochirurgie*, was started in Germany in 1936 by TÖNNIS [15] but not until 1948 was the *Deutsche Gesellschaft für Neurochirurgie* founded [8]. The societies mentioned above were established by surgeons. It was different in the Netherlands. The Dutch Study Club for Neurosurgery was formed in 1936 [29], the membership consisting of four neurologists and four neurosurgeons. The initiative came from a neurosurgeon, VERBECK, but it was the neurologist BROUWER, who was the driving force. He was elected the first president and remained so until his death in 1949. The *Nederlandse Vereniging van Neurochirurgen* was founded in 1952 [29].

When the Society of British Neurological Surgeons (SBNS) was created by Geoffrey JEFFERSON in 1926, it intended to hold two meetings each year, at home in winter and abroad in summer. The first meeting abroad was held in Paris in 1930 and the next in Amsterdam in 1932 which I attended and found wonderfully rich in culture and hospitality, but not very stimulating neurosurgically. I remember how disappointed BROUWER was when OLJENICK, the neurosurgeon in his clinic, outdid CUSHING as regards the most minute operating details, performed a ventricular estimation (which was in fashion at that time), but when he opened the skull he did not find the tumor. The specialty had not yet gotten on its feet in Holland, but soon thereafter de VET, LENSHOEK, VERBECK, and VERBRIEST brought it to a proper high standard.

The summer meeting of 1937 [16, 31] was held in Berlin and Breslau, and again I was a guest of the SBNS. The three days in Berlin included visits to the Neurosurgical Clinic of TÖNNIS, the Kaiser-Wilhelm-Institut für Hirnforschung and SAUERBRUCH's Clinic. A joint meeting was held with the Berlin Medical Society, where President MCCONNELL of

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1 Society of British Neurological Surgeons, 29 June to 3 July 1937 at Berlin and Breslau.

2 Institute of the History of Medicine and Neurosurgical Clinic of the University of Göttingen.

the SBNS lectured on the Chiasmal Syndrome [20, 21]. The principal topic of the meeting [32] was intracranial tumors, their nature, and their diagnosis with ventriculography, arteriography and EEG. The distinction from pseudotumor cerebri was discussed by NONNE who had coined the term in 1904 [23]. Other matters considered were subdural hematomas, spasmodic torticollis, and the importance of angiography for the diagnosis and treatment of aneurysms. Among those who read papers were BUSCH (Copenhagen), BERGSTRAND, OLIVECRONA, RINGERTZ and SJÖQVIST (Stockholm), TORKILDSEN (Oslo), NONNE (Hamburg), SCHALTENBRAND (Würzburg), and OSTERTAG, SPATZ and ZÜLCH (Berlin).

The trip to Breslau to honor FOERSTER and to visit his institute was especially interesting and pleasant. FOERSTER had close neurological connections with England, having been a devoted disciple of HUGHLINGS JACKSON and of SHERRINGTON. He had given three lectures under the auspices of London University in 1931 [10], the SCHORSTEIN Lecture at the London Hospital in 1932 [11], and the HUGHLINGS JACKSON Centennial Memorial Lecture of the Royal Society of Medicine in 1935 [14]. He was made Emeritus Member of the SBNS at the Breslau meeting where he entertained and instructed us royally with three lectures. These formed a report of the 552 verified tumors of the nervous system which he had collected in 17 years from 12000 admissions to his Neurological Department at the Wenzel-Hancke-Krankenhaus. The social activities included a supper for the entire company at FOERSTER's villa in Scheitniger Park to which the visitors were transported in a specially provided tram, FOERSTER being of the opinion that the town could be seen better and more comfortably from a tram than from a taxi. FOERSTER restricted his work to Neurology and dedicated all his efforts to establishing neurology as an independent specialty [24]. Neurology had been a stepchild in Germany, at first of internal medicine, later of Psychiatry. ROMBERG, Professor of Therapeutics in Berlin, wrote the first textbook of Neurology in 1840 [26], having been influenced by the writings of Charles BELL, which he translated in 1832 [1]. Soon afterwards GRIESINGER wrote the first German textbook of psychiatry in 1845 [19], and, declaring that mental illness was due to disease of the brain, brought psychiatry and neurology together for treatment and teaching. This set some psychiatrists to the very productive anatomical study of the brain, among whom were MEYNERT, FOREL, WERNICKE, NISSL and ALZHEIMER. But FOERSTER felt strongly that the field was too wide for one man to straddle and do justice to both specialties, thereby impeding the development of neurology [12]. But in spite of his constant efforts for 40 years, the German regulations for medical education and examination in 1966 [25] still lumped psychiatry and neurology together and stated that the examination in neurology might be conducted by an examiner of internal medicine.

When FOERSTER qualified as a physician in 1897 [5], he went to Heiden in Switzerland to study with H. S. FRENKEL and to the DEJERINES in Paris. Straight away he started physiological studies on the sensation and gait of patients with tabes dorsalis [6], which formed the basis for his great success with the treatment of pain, the relief of spastic paralysis, and exercise therapy. Within ten years on 3 May 1907, he directed the performance by TIETZE of the FOERSTER operation, the division of posterior roots for the treatment of spastic paralysis [9]. This was the beginning of physiological neurosurgery. At the same time he continued the study of movement and further developed the field of exercise therapy [7], now known as rehabilitation, to which he contributed consecutively

for 40 years [13]. FOERSTER prepared Ludwig GUTTMANN, who was his assistant for several years, to extend the field of rehabilitation. GUTTMANN did this with great zeal and success, but without giving FOERSTER any sign of recognition or of gratitude for the great debt he owed his master. Sadly, GUTTMANN had suffered for political reasons and had to leave his position in the hospital with FOERSTER in 1933. He complained unjustly that FOERSTER had not protected him, although he secured an appointment for GUTTMANN in another hospital in Breslau. But who was able to oppose the will of HITLER at that time? Nevertheless, Germany's loss was England's gain, and thousands of neurologically disabled throughout the world have benefitted, through GUTTMANN, from FOERSTER's neurophysiological research and teaching.

FOERSTER encountered many obstructions to his efforts for the liberation of Neurology. The greatest opposition came from psychiatrists such as BONHOEFFER, who considered themselves competent as neurologists and maintained that they should continue to direct both psychiatry and neurology [2, 34]. The fallacy of their opinion has been proven by the relatively few contributions made by them to the progress of Neurology. The field is too great for one man to be productive in both specialties.

BONHOEFFER was assistant to WERNICKE in Breslau for 10 years, from January 1893 until October 1903, and succeeded him in October 1904 as Director of the Psychiatric and Nervenlinik. He left Breslau for Berlin in 1912 [4]. FOERSTER was an assistant in the clinic and laboratory of WERNICKE from 1899 until October 1904. Thereafter for several years FOERSTER's papers were published from the surgical department of Prof. TIETZE in the Allerheiligen Hospital. Little is known about the relationship between BONHOEFFER and FOERSTER but it is striking, that in his autobiography [4] BONHOEFFER did not once mention the name of FOERSTER, although he wrote interestingly about his colleagues and life in Breslau for about 20 years. During 12 of these FOERSTER was there, and for 4 years they were both in WERNICKE's department. BONHOEFFER was in Breslau to live through FOERSTER's becoming Privatdocent in 1903 [8], titular professor in 1909, and head of an independent Neurological Department at the Allerheiligen Hospital in 1911. FOERSTER must have been very difficult for BONHOEFFER to overlook and, much more so, to swallow.

BONHOEFFER was just as determined to keep Neurology under the control of Psychiatry as FOERSTER was opposed. The battle smouldered until it burst into flame at the time of the First International Neurological Congress at Bern in 1931 [17, 18]. MINKOWSKI, the neurologist in Zürich, who had been trying to make Neurology independent in Switzerland, published data [22] to show that the development of Neurology in Germany was far behind that in a number of less important countries. BONHOEFFER [3] reacted vigorously to the report and the recommendations of MINKOWSKI. FOERSTER replied with an eloquent rebuttal of BONHOEFFER's arguments [12]. FOERSTER's forthright comments on BONHOEFFER's attitude at this time may be attributed to a confidence he acquired that Neurology was gaining ground, after the discussion he had in October 1930 about "Neurology in Germany" with Dr. Alan GREGG, who was head of the Medical Sciences Division of the Rockefeller Foundation. They developed a plan to make Neurology an independent specialty in Germany which appeared to lead to a certain success. It consisted in a promise that the Rockefeller Foundation would build a Neurological Research Institute in Breslau, to be controlled by the University, if the City



of Breslau, the Province of Silesia, and the State of Prussia would supply funds for the upkeep of the institute, and the Prussian Ministry of Science, Art and National Education would establish a Chair of Neurology in the University. After 2 years of tedious and strenuous work FOERSTER was able to assure the upkeep of the institute, but not the keystone of the plan, since the Ministry found it impossible to establish even one new chair in any university, because of the grievous state of the economy at that time. FOERSTER was almost in despair, but the Ministry did promise to make his professorship permanent and to continue it for his successors. This satisfied the Rockefeller Foundation, so the institute was built and it was opened in 1934. It was there that the Breslau meeting of the SBNS was held in 1937. After FOERSTER's death in 1941 it was named the Otfried FOERSTER Institute [30].

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# The Development of Neurosurgery in Berlin

R. WÜLLENWEBER

Until the end of the Second World War, the street which lies between Brandenburg Gate and the Victory Column was named “Siegesallee” (Victory Avenue). As it was embellished with a collection of esthetically unremarkable statues, it was more pertinently described in the Berlin vernacular as “Puppenallee” (Dummy Avenue). At the midpoint of the street stood a statue of Markgraf Otto the Fourth „with the arrow“. This margrave, head of the older Askanian line at the end of the 13th century, had suffered a head wound by an arrow in the course of one of his many battles, but this arrow was not removed for more than one year thereafter. The fact so impressed his posterity that he was henceforth referred to as “Otto with the arrow”, but the phenomenon casts a shadow on 13th century neurosurgery in Berlin, since apparently no one had dared to remove the arrow.

We have no evidence of neurosurgical activity in Berlin in the late middle ages. This changed in the 18th century with the foundation of the Charité, a very progressive hospital for its time and a center for the training of military physicians. The spirit of medical practice at the Charité in the early years was influenced by the Dutchman BOERHAAVE, whose clinic at Leyden was known to the entire medical world. With all due regard to current knowledge in anatomy, physiology and chemistry, the guiding principle of BOERHAAVE’s practice was his experience in practical medicine. Most physicians at the Charité were, directly or indirectly, pupils of BOERHAAVE, and his influence was extraordinary, as is evident in Frederick the Great’s remark: “In medicine the professors must adhere to Boerhaave’s method.”

As described by DIEPGEN and HEISCHKEL, trepanation was one of the major operations that were current at the Charité:

“The primary indications are: removal of bone splinters, foreign bodies, hemorrhages and other effusions; depression of the skull and compression of the brain after injury to the head, the symptoms of which have been well described; more rarely, carious and purulent processes of the inner layer of the calvarium; and refractory headache. In hemiplegia, one seeks the lesion on the opposite side of the cranium, and if it is not found there, one may still apply the trepan to the other side. It seemed to be especially important to avoid cooling of the brain, for which reason the instruments were kept near a brazier, the room was kept warm and rinsing solutions and medications were heated before application. The drill-like crown trepan was used with great care, layer for layer. The dura mater was opened only if it was tense and showed fluctuation. Otherwise, it was treated with alcohol, in order to protect it from ‘corruption’. If it was inflamed, bloodletting was performed. Prolapse of the brain was prevented by applying a lead or silver cap.”

Trepanation was controversial even at the time, and rancor among colleagues was not uncommon, as is evident in the comment that Dr. PALLAS, of the Charité, “had placed the trepan on the suture and near the sinuses with the greatest audacity.” In fact, PALLAS had warned against this and allowed trepanation at these two locations only in emergencies.

After the foundation of the University of Berlin in 1811 under the influence of Wilhelm von Humboldt and after establishment of the Royal Surgical Clinic in the Ziegelstraße, surgery was well represented at the university, with two clinics, but the university itself stood entirely under the influence of the enlightenment, idealism and natural philosophy.



Fig. 1. Johann Friedrich Dieffenbach 1792–1847

In a speech at the 164th anniversary meeting of the “Gesellschaft für Natur- und Heilkunde zu Berlin”, Ewald HARNDT reported that the faculty of philosophy, guided by the spirits of FICHTE, SCHLEIERMACHER, HEGEL and SCHELLING, was dominant for decades and the “science” was understood exclusively as humane arts and sciences, not at all as natural science. So the “sciences of nature” were ranked as an adjunct to the philosophical faculty at the University of Berlin. In succeeding generations, the battle raged between proponents and opponents of trepanation. The second physician to occupy the chair for surgery in Berlin, Johann Friedrich DIEFFENBACH (Fig. 1), belonged to the latter group. DIEFFENBACH was an exceptionally versatile person, and he has been called the father of plastic surgery with some justification. Among his many publications is an article “On division of the sternocleidomastoid muscle in the treatment of wry neck”, which appeared in 1838. In 1828 he reported his experience with blood transfusion, and in 1845, in his book “Operative Chirurgie”, he noted the influence of English surgeons on his work. In the same book, DIEFFENBACH reports that after unsuccessful division of the infraorbital nerve for treatment of trigeminal neuralgia, intracranial division of the V. nerve was considered but rejected as too risky. He recognized the advantages of ether anesthesia and published “An introduction to patient care” in order to improve nursing, which was apparently in a dismal state. The following lines are quoted from the “Introduction”:

“What is the situation in the wards, for young men, especially for students? There is no cake and pastry there, as there is in the women’s wards, but there is certainly beer and tobacco. Thick smoke fills the room. Men with mustaches and long pipes lie about on the sofas and chairs, and it is only with effort that one discovers the patient in bed as though on a palanquin. And among all these one finds a busy person

running back and forth, carrying beer, filling pipes and so on. That is the nurse! He often runs out of the room, as though to carry out an empty bottle, but he puts it to his mouth and takes a long draught. And then he smokes a few draughts of tobacco ...”

DIEFFENBACH died while presenting a patient during a lecture. His successor, Bernhard von LANGENBECK (Fig. 2), took his chair for surgery in 1848. LANGENBECK, who had become lecturer in physiology and pathology in Göttingen in 1838, was decisively influenced by England in his development as a surgeon. He felt strongly attracted to Astley COOPER, who was the dean of British surgery, though almost 70 years of age, and who opened the doors of the Royal Medico-Chirurgical Society to LANGENBECK. His close ties to British surgery over several decades resulted in the nomination of PAGET, LISTER and SPENCER WELLS as the first honorary members of the Deutsche Gesellschaft für Chirurgie, of which LANGENBECK was a co-founder.



Fig. 2. Bernhard von Langenbeck, 1810–1887

Gunshot wounds of the skull dominated LANGENBECK's neurosurgical practice, since he was surgeon-general and entrusted with the education of Prussian military physicians (as was his successor, Ernst von BERGMANN). In addition, he was interested in the treatment of hydrocephalus. In this regard, there is the following reference on ventricular puncture in the "Handbuch der speziellen Pathologie und Therapie", edited by Rudolf VIRCHOW (1869): "Langenbeck's method – which is to enter the anterior horn of the lateral ventricle from below, by introducing the trocar behind the upper eyelid and piercing the top of the orbital cavity – deserves special attention." He reported "On hypodermatic ergot injections in aneurysms" before the "Berliner Medizinische Gesellschaft" in 1869.

In 1880 he presented a patient before the same society "On nerve repair with presentation of a case of secondary suture of the radial nerve". LANGENBECK was also able to report success in the surgical treatment of sarcomas of the skull and the dura mater with a

procedure in which he removed part of the dura with the tumor. We today might suspect a number of meningiomas among these tumors.

Ernst von BERGMANN (Fig. 3), LANGENBECK's successor, came from Würzburg to Berlin, as has DIEFFENBACH more than fifty years before and as would TÖNNIS more than 50 years later. Neurosurgery was his special interest, and his experimental work on intracranial pressure, begun in Dorpat and Würzburg, established basic principles of the pathology of intracranial pressure which are still valid today. His observations on the symptoms of increased intracranial pressure, published in "Die Lehre von den Kopfverletzungen" in 1880, and his articles "Über den Hirndruck" from 1885 and 1886 contain, together with the work of NAUNYN and SCHREIBER, most of the knowledge that had been rediscovered in this area in the past ten years.

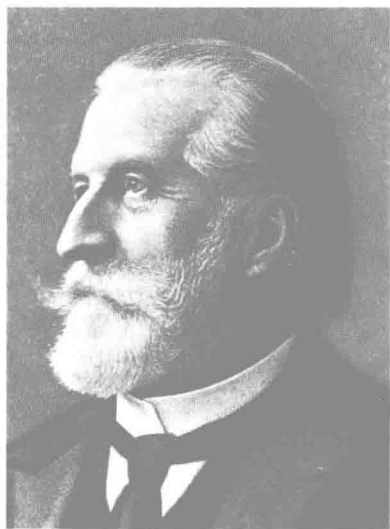


Fig. 3. Ernst von Bergmann, 1836–1907

In the second edition of his "Chirurgische Behandlung der Hirnkrankheiten" (1888–1889), von BERGMANN took an extremely critical position on attempts at surgical treatment of brain tumors, epilepsy and hemorrhage. The lists of papers, delivered before the "Gesellschaft für Natur- und Heilkunde", the "Berliner Medizinische Gesellschaft" and the "Berliner Chirurgische Gesellschaft" contain about ten lectures per year on neurosurgical topics for the period of the 1890's and at the turn of the century (including addresses by BERGMANN's pupils BORCHARD, GULEKE, KÖNIG, LEXER and SCHMIEDEN), ample evidence of the enormous interest in the newly developed field of neurosurgery.

In addition to the work at the university centers, surgeons in municipal and denominational hospitals performed neurosurgical operations. Eugen HAHN, a pupil of WILMS removed a brain tumor at the Bethanien Krankenhaus in 1882, making use of the diagnosis by WERNICKE. The Augusta-Krankenhaus, where Fedor KRAUSE (Fig. 4) was appointed head of a surgical department in 1900, was also a non-academic institution. KRAUSE had been trained as an ophthalmologist and then became director of the

municipal hospital in Altona. His inaugural dissertation from the year 1887 dealt with malignant neuromas, and a monograph on trigeminal neuralgia appeared during his period in Altona. In 1892 HARTLEY and KRAUSE, independently of each other, described the extirpation of the Gasserian ganglion via the extradural approach from the floor of the middle fossa. As a result of the training in ophthalmology, KRAUSE was especially interested in the question of keratitis in relation to the ganglion extirpation. He did not limit himself to neurosurgery, as lectures on gastric surgery, reconstructive surgery of the ureter, of the mandible and free transplantation of large areas of skin, as well as major works in the fields of ophthalmology and bacteriology, a monograph on tuberculosis of the bones and joints and his textbook of surgical operations clearly show. He was enormously productive in the field of neurosurgery and described surgical approaches to almost all areas of the brain cavity. He was the first to employ the transfrontal intradural approach to the pituitary gland, and he performed the first exposure of the cerebellopontine angle and the first operative removal of a tumor in the lamina quadrigemina. In 1909 he reported his experience in 28 operations on the spinal cord, and in 1908 and 1911 he published his "Chirurgie des Gehirns und Rückenmarks", in which he not only described and illustrated surgical technique of the highest order, but also furnished exact statistics on a patient group that was exceptionally large for that period.



Fig. 4. Fedor Krause, 1857–1937

A surgeon such as KRAUSE, with interests in all fields of surgery, depended on the co-operation of an outstanding neurologist in order to succeed in neurosurgery. This neurologist was Hermann OPPENHEIM, who had published the first edition of his "Lehrbuch der Nervenkrankheiten" in 1894. OPPENHEIM, a pupil of WESTPHAL, had mastered neurology as no other at the time and pursued his medical and scientific activities with untiring effort despite a difficult professional and personal situation.

The activity of Fedor KRAUSE and of his pupil and successor HEYMANN at the Augusta Krankenhaus made this house a center of neurosurgery, which was also cultivated by

SAUERBRUCH and others in the university hospitals in the 1920's and 1930's. The Surgical Congress of 1935 produced a break – in that neurosurgery was recognized as a separate speciality – and this led to the appointment of TÖNNIS in Berlin 1936. TÖNNIS writes that he was able to begin work in the clinic at Hansaplatz on May 1, 1937 and that the British Society of Neurological Surgeons held its congress in Berlin and Breslau in June of the same year, in order to provide a favorable start for TÖNNIS and his co-workers and to emphasize the significance of Berlin for European neurosurgery. The first efforts were, in fact, so successful that many foreign physicians came to Berlin for training in the short period before the outbreak of World War II. A large number of patients were treated also during the war in the first academic neurosurgical clinic in Germany, and many publications appeared, especially in the “Zentralblatt für Neurochirurgie” which was founded by TÖNNIS.



Fig. 5. Arist Stender, 1903–1975

At the end of the Second World War, in which the neurosurgical clinics were destroyed, Arist STENDER (Fig. 5), who had been Otfried FOERSTER's successor as director of the clinic in Breslau, began his work at the Augusta-Krankenhaus, where F. KRAUSE had worked. A few weeks later, he moved to the municipal hospital in Westend to develop a neurosurgical-neurological clinic where none had existed before. Shortly after the war, he successfully reestablished his earlier relations with the United States, and with his revered neurosurgical mentor Percival BAILEY. The basis of his practice, which encompassed the whole of neurosurgery, was neurological diagnosis. He was a master of this field and felt himself bound by a debt of gratitude to his teacher Max NONNE. Gangliolysis of the Gasserian ganglion carries his name. Trigeminal neuralgia was also a topic of major neurosurgical interest for Willy FELIX, SAUERBRUCH's successor at the Charité. The



quality of neurological and neurosurgical training in STENDER's clinic is most evident in the fact that a large number of his pupils became successful physicians and scientists not only in the field of neurosurgery, but in neurology and neurophysiology as well.

Berlin gained a second academic neurosurgical clinic with the construction of Klinikum Steglitz, where Wilhelm UMBACH became director until his untimely death. It was certainly not easy for Artist STENDER to accept a successor in his Westend clinic, who had been educated in an entirely different school and whose training was primarily in surgery rather than in neurology. Nevertheless, STENDER did so without prejudice and smoothed the way for him in Berlin. STENDER's memory lives on in many hospitals in this city, as one can hear when his baltic cadence is parodied in jovial company, for anecdotes spring up only around personalities.

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