

The Four Horsemen of American neurology

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ABSTRACT

Introduction. Drs Russell DeJong, Adolph Sahs, Francis Forster and Abraham B. Baker are referred to as the 'Four Horsemen of American neurology' because of the pivotal role they played in the development of neurology in the US and in the founding of the American Academy of Neurology.

Methods. Review of various historical documents.

Results and Discussion. Each of the Four Horsemen was an influential department chair, an exceptional clinician, gifted teacher and accomplished researcher. Together they became a powerful force that helped in recognizing Neurology as a specialty, establishing a specialty society, and launching a journal, *Neurology*, as its official publication, with DeJong as its founding editor-in-chief. They were all involved in establishing the National Institute of Neurological Disorders and Stroke, which provided vital research funding and helped create a golden age of advancement in the diagnosis and treatment of neurological disorders. Each made unique and invaluable contributions that are still felt today in such fields as epilepsy and cerebrovascular disease.

KEYWORDS

Neurology, history, neurological examination, AAN, NINDS

Introduction

The Four Horsemen of American neurology were individuals who were particularly influential in the development of neurology in the US in the late 1940s and early 1950s, and who were important figures in establishing the American Academy of Neurology (AAN). This was a time when neurology was emerging as a discipline separate from internal medicine and psychiatry. These four individuals were Dr Russell N. DeJong of the University of Michigan, Dr Abraham B. Baker of the University of Minnesota, Dr Adolph L. Sahs of the University of Iowa and Dr Francis M. Forster of Georgetown University and the University of Wisconsin (Figure 1). The origin of the term Four Horsemen is lost in the mists of neurologic history.¹

Methods

The historical documents reviewed describe the biographical details and accomplishments of each of the individuals referred to as the Four Horsemen. These

documents include *Giants in Neurology, History of 20th Century Neurology: decade by decade*, the *Centennial anniversary volume of the American Neurological Association: 1875-1975*, *A History of American Neurology* by Dr Russell N. DeJong and the obituaries of each of the individuals published in the neurologic literature.

Results

The reviewed material provided information regarding the lives of each these individuals. A great deal of interesting detail emerged, such as the athletic career of A.L. Sahs and the personal attributes of the men that resulted in so many holding them in such high regard. Other material helped place the Four Horsemen in the context of time in which they lived.

Discussion

In the world of medicine at large, the late 1940s and early 1950s saw momentous change with far-reaching conse-

quences: launch of the British National Health Service, discovery of the structure of DNA, placement of the first lumbar epidural catheter for anesthesia, the first isolation and characterization of prednisone, and the first use of ultrasound for medical purposes. The first known surgery under cardiopulmonary bypass was conducted at the University of Minnesota in 1951, following pioneering experimental work by the aviator Charles Lindbergh.² The British Doctors Study that would eventually prove the link between smoking and lung cancer started in 1951. Alexander Fleming had shared the Nobel Prize in Medicine in 1945 for discovering penicillin, and antibiotic treatments were just beginning. In 1952, Jonas Salk developed his polio vaccine, INH was offered commercially and the Austin-Moore hip prosthesis was introduced.

Up until that time neurology was still a small field that was often seen as a subspecialty of internal medicine or closely related to psychiatry. In most institutions in the US, neurology was either a division of a department of medicine or part of a department of psychiatry and neurology. Independent neurology departments were beginning to emerge as neurologists strived to separate themselves from the other disciplines. A.B. Baker estimated that in 1952 there were less than 250 true neurologists in the US and only 15 training programs.¹ Technological advancements of that era were important in demonstrating that handling diseases of the nervous system required special expertise. Pneumoencephalography had been introduced in 1919 by Walter Dandy, a neurosurgeon at Johns Hopkins University. Hans Berger had recorded the first human EEG in 1929. Egas Moniz had performed the first cerebral angiogram in Lisbon in 1927, and the introduction of the Seldinger technique in 1953 had made angiography much safer. The somatosensory evoked potential was first recorded from the human scalp in 1947 by George Dawson. Neither internists, psychiatrists nor radiologists were very familiar with these advances. By the end of the decade, there were 111 training programs and approximate half were in independent neurology departments.¹

DeJong, Sahs, Baker and Forster were all chairs of independent neurology departments and were recognized as outstanding clinicians, teachers, researchers and administrators.^{3,4} The idea for the AAN was Dr Baker's.⁵ The American Neurological Association (ANA) had been founded in December 1874, the inspiration of Dr William A. Hammond.³ Twenty-eight physicians were

originally invited to participate and the number of members was limited to 50. At the first meeting in June 1875, S. Weir Mitchell of Philadelphia was elected president. The ANA remained an exclusive organization, with its membership restricted to senior neurologists, almost exclusively academicians. Only physicians who had published a number of papers could apply for membership, and were then required to write a thesis for critical review.⁵

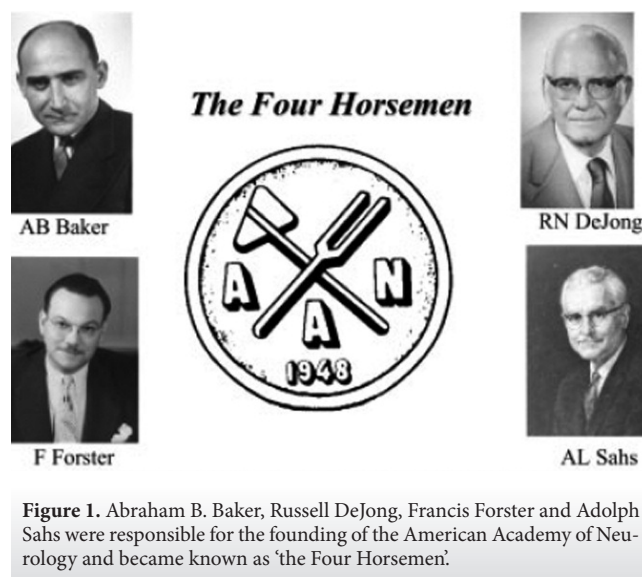


Figure 1. Abraham B. Baker, Russell DeJong, Francis Forster and Adolph Sahs were responsible for the founding of the American Academy of Neurology and became known as 'the Four Horsemen'.

In 1947, one of Dr Baker's residents at the University of Minnesota, Dr Joseph A. Resch, lamented that there was no organization for young neurologists.⁵ Dr Resch asked, "how can I join a neurology society?"¹ Dr Baker determined to remedy the situation by establishing a new national neurologic society with a relatively unrestricted membership. He sent a letter to a number of the leading American clinicians, teachers and investigators seeking input, and the response was enthusiastically supportive. The AAN was born and respondents to the letter became the charter members, including Drs DeJong, Sahs and Forster. The AAN was formally incorporated in Minnesota in March, 1948 and held an organizational meeting in Chicago three months later, at which the 70 original members elected Dr Baker the first president. The first scientific meeting was held at French Lick, Indiana in June 1949, a town now famous as the home of the American basketball star Larry Bird.

The other Horsemen provided early critical leadership and direction for the organization and all were eventually recognized for their contributions by election as President. All of them were extraordinary individuals.

Russell N. DeJong

Dr Russell N. DeJong was perhaps the Chief Horseman. His life and career are discussed more fully in a separate paper.⁶ He was born in Iowa but moved to Michigan as a child and spent the rest of his life there.^{3,4,7-9} His undergraduate studies were at the University of Michigan and he graduated from the School of Medicine in 1932. He trained in neurology there, then spent his entire career on the faculty, retiring as Professor Emeritus in 1977. He was described as a gentleman, a scholar and a clinical neurologist par excellence.³ Under his leadership, the department of neurology grew from a faculty of three to become one of the largest and most well-respected departments in the US. He was honored with selection to the University of Michigan Medical Center Alumni Society Hall of Honor.

Dr DeJong authored more than 200 books and articles. His research interests included migraine, epilepsy, multiple sclerosis and Parkinson's disease, and he published extensively in all these areas. He wrote *The Neurologic Examination*, the classical, definitive textbook on the neurologic examination, which was recently revised and updated in its 7th edition, and *A History of American Neurology*.^{5,10} He helped launch *Neurology*, the official journal of the AAN, and served as its founding editor-in-chief, from 1951 to 1976. Dr Robert Wartenberg, then professor of neurology at the University of California in San Francisco, was a staunch early supporter of the AAN, and firmly believed the organization could flourish only if it had an official scientific publication with which it could be identified.⁷ DeJong was selected by the other Horsemen to lead the effort.⁷ In addition to his own writing, Dr DeJong edited many manuscripts for *Neurology* and other publications, assisting many authors in improving the quality of their writing. He was a member of the American Medical Writers Association and served a term on its board of directors. He brought a level of expertise to the craft of medical writing that has seldom been equaled.

Dr DeJong was a leader in American neurology, serving at various times as president of the AAN, the ANA and

the American Epilepsy Society. He was interested in neurology worldwide. He was active in the World Federation of Neurology, helped found the Pan American Congresses of Neurology and was vice president of the First and Second Congresses, and was an honorary member of the neurologic societies of Peru, Guatemala and Germany.

Adolph L. Sahs

Adolph Sahs was a native son of Iowa, and one of her finest scholar athletes. He was born there in 1906, died there in 1986 and spent most of his life there.^{3,4,11,12} He matriculated as an undergraduate at the University of Iowa in 1925 and attended the University of Iowa medical school from 1927-1931. During his undergraduate years he was an outstanding athlete, playing first base on the baseball team. His baseball skills were impressive enough to draw the attention of scouts for professional baseball teams, but he declined the possibility of a career in baseball and opted to study medicine instead. He remained an avid fan of the Iowa athletic teams. Sahs and A.B. Baker orchestrated scientific presentations for the two departments to coincide with the annual Iowa-Minnesota football games.¹¹

Dr Sahs trained in neurology at Iowa under Dr Clarence Van Epps, then after residency he studied for a year with Dr Tracy Putnam at Boston City Hospital, and for an additional year at Yale, as a Rockefeller Foundation Fellow. He then returned to Iowa and rose through the academic ranks to become professor and finally department chair in 1948, serving in that position for the next 24 years. Dr Sahs's career exemplified the 'three-legged stool' concept of the academic life. Until not too many years ago, academicians were expected to be proficient in research, in teaching, and in patient care. Few individuals can do all of those things proficiently in the modern era, but in Dr Sah's day it was possible, and he exemplified the ideal, well-rounded academician. He was an outstanding teacher and won teacher of the year awards on multiple occasions. He was widely recognized as an exceptional clinician with outstanding clinical acumen and legendary diagnostic skills. He was fond of saying, "If you have 30 minutes to see a patient, spend 29 on the history, one on the examination and none on the EEG or skull x-ray".¹¹ He was also an outstanding researcher, publishing over 100 scientific articles.

Dr Sahs had yet another skill set. He was excellent at managing and relating to people. He was, in a word, a leader, and one with vision. He was able to inspire and motivate people, and organize them in pursuit of a goal.

Dr Sahs provided early, important leadership in the establishment of the National Institutes of Health (NIH), located in Bethesda, Maryland, and the National Institute of Neurological Diseases and Blindness (NINDB), which eventually became the National Institute of Neurological Disorders and Stroke (NINDS). He served on various committees almost continuously for nearly 20 years. The Cooperative Study of Intracranial Aneurysms and Subarachnoid Hemorrhage, an NIH-funded international study, was the first prospective multi-institutional investigation of any neurological disorder.¹³ Dr Sahs was the key figure in envisioning, organizing, implementing, and supervising that study. The Cooperative Study was a landmark investigation not only for the scientific knowledge it provided, but also because it served as a model for the conduct of future large, multicenter trials. The trial methodology developed in the study became a model for many subsequent multicenter investigations.⁴ It was one of the earliest major efforts at what we now call evidence-based medicine. It spawned numerous publications and two books. There are 15 papers directly reflecting the title *Cooperative study of intracranial aneurysms and subarachnoid hemorrhage* as well as numerous spinoffs. The first book reporting the results of the study, *Intracranial Aneurysms and Subarachnoid Hemorrhage: a Cooperative Study*, was published in 1969, and the second, *Aneurysmal Subarachnoid Hemorrhage*, in 1981.^{14,15}

All neurologists are familiar with *Guidelines for Stroke Care* and *Fundamentals of stroke care*, publications of the US Public Health Service.^{13,14} We essentially owe these to Dr Sah's organizational skills. In all, Sahs wrote almost 200 scientific publications, including the 5th and 6th edition revisions of Grinker's *Neurology*.^{16,17}

While juggling his other responsibilities, Dr Sahs helped birth the AAN. He was instrumental in its early formation and growth, providing critical direction and support for the fledgling organization. His contributions were recognized by his election as President in 1961. He also served as President of the ANA in 1967-68. He was the ANA representative to the American Board of Psychiatry and Neurology (ABPN) from 1959-1967 and was President of the Board in 1967. The University of Iowa honors him with the annual A.L. Sahs lecture.

Dr Sahs had a keen sense of humor, imparting such aphorisms as "Beware of the history given by women wearing large hats".¹² He once presented a fake patient to the visiting Frank Forster at Grand Rounds who had 'hyperstereognosis'. Dr Sahs demonstrated the finding by handing the blindfolded 'patient' (an intern co-conspirator) paper money, who then identified the denomination.

Francis M. Forster

Francis Forster was born in Cincinnati on February 14, 1912, attended Xavier University as an undergraduate and went to medical school at the University of Cincinnati.^{4,18} His neurology training was at the Harvard Neurological Unit at the Boston City Hospital under Drs Tracy Putnam and H. Houston Merritt. Putnam was also a fully trained psychiatrist, and perhaps because of his influence Forster also completed a psychiatry residency at Pennsylvania Hospital after his neurology training, although he never practiced psychiatry. He then spent a year as a Rockefeller Research Fellow at Yale.

Forster began his academic career in 1941 as an instructor in neurology at Boston University School of Medicine. After a period of time on the faculty at Jefferson Medical College in Philadelphia, where he became especially interested in the field of epilepsy, in 1950 he was recruited as the first professor and chair of the department of neurology at Georgetown University. Then in 1953 he was named the Georgetown University School of Medicine Dean. Research grant funding tripled during his tenure as dean. After his Georgetown years, he served as neurology chair at the University of Wisconsin from 1958 to 1978. During the transition from Georgetown to Wisconsin, he led a medical exchange mission with the Soviet Union, visiting facilities in Moscow, Leningrad, Kiev, and Tbilisi.

The word meteoric is overused but it is hard to think of a comparable term to describe the rapidity of Forster's ascension through the ranks of academic neurology, and it is doubtful there has been ever been anything to match it. He began as an instructor in 1941 and by 1953 he was a medical school dean! This kind of expeditious rise through the ranks is rarely seen in medicine. It brings to mind the speed of promotion of certain legendary soldiers in time of war. In the American Civil War, a Confederate, Nathan Bedford Forrest, rose from private to three-star general, and in the Union army George Arm-

strong Custer was promoted from second lieutenant to major general, both in the span of four years.

Some of the personal qualities that explained Forster's ascension from instructor to dean in 12 years were his intelligence, charisma and leadership abilities. One of his primary areas of research was reflex epilepsy, an interest that developed after seeing a child whose somatosensory evoked seizures were caused by a tap on her left shoulder.⁴ The seizures stopped after excision of the responsible cortical focus by Dr Wilder Penfield.¹⁸ Not only was he a pioneer in epilepsy surgery, Forster was instrumental in developing a technique for the simultaneous audiovisual recording of the clinical manifestations and EEG using a split-screen that was the forerunner of modern epilepsy monitoring.

Dr Forster authored more than 200 scientific publications, including four books.¹⁹⁻²² As chair of two university departments, he trained more than 100 residents, 16 of whom became chairs of neurology in the US, Taiwan, the Philippines, Japan, South America, and Europe.³ Forster received kudos as a member of the team that treated President Dwight D. Eisenhower for his 1957 stroke. He served as an expert witness in the trial of Jack Ruby, who killed Kennedy assassin Lee Harvey Oswald on live TV, to counter defense claims that Ruby committed the act during a psychomotor seizure, supported by the 6 per second spike waves on Ruby's EEG (now known to be a normal variant).¹⁸ The opposing expert was Dr Frederic A. Gibbs. The lawyer for the defense, Melvin Belli, a famous and flamboyant criminal defense attorney, apparently tried mightily to intimidate Forster, without success, and the jury ultimately believed Forster.

Because of his many accomplishments, later in his career his alma mater, Xavier, awarded him an honorary LLD and he also received an honorary Doctor of Science from Georgetown. The University of Wisconsin recognized his service by creating the Francis M. Forster Epilepsy Center at the Veterans Affairs Medical Center in Madison, now an Epilepsy Center of Excellence, in his honor. Forster was known for his sense of humor. At an AAN reception in his honor in 2005, he commented that "The city of Cincinnati has recognized my contributions by placing a plaque at my birthplace. It says 'Vine and Calhoun.'"¹⁸

Abraham Bert Baker

A.B. Baker, BA, BS, MB, MS, MD, PhD, the youngest of the Four Horsemen, was born in Minneapolis, Minnesota

in 1908.^{3,4,23} His academic abilities were such that he collected degrees with apparent ease and alacrity, the way some people might collect paintings or stamps, six of them altogether. He received his MD at the age of 23. He not only obtained these degrees, he did so at the top of his class. He was elected to both of the American academic honorary societies, Phi Beta Kappa in college and Alpha Omega Alpha in medical school, as well as the research honor society Sigma Xi.

Dr Baker spent three years training in pathology and then entered a neurology residency at the University of Minnesota.⁴ His academic career began with an appointment as an instructor in neurology and pathology at the University of Minnesota in 1937. In 1946, he was appointed professor and chair of a new independent department of neurology, and held that position for the next 31 years.²³ Under his leadership the training program grew from a single resident to the large, dynamic program it is today. An outstanding teacher, he won numerous best teacher awards from the medical students.^{3,23}

Dr Baker was interested in a number of things and conducted research in a multitude of areas, resulting in well over 200 publications in a very productive career. He was particularly interested in poliomyelitis and cerebrovascular disease, especially intracranial atherosclerosis.

Dr Baker is perhaps best known for his textbook, *Clinical Neurology*, a seminal publication that went to multiple editions.²⁴ The word edition is not quite the right descriptor, for this was an innovative publication that was constantly updated, with new chapters arriving regularly for insertion into a loose-leaf multivolume set of books. Certainly many neurologists set as a goal to read 'the Baker's', but few succeeded. For decades, *Clinical Neurology* was the definitive, authoritative source for all questions neurologic.

Dr Baker was a key figure in establishing the NINDB. His intensity, dynamism and enthusiasm were instrumental in persuading reluctant congressional leaders to fund the initiative.³ After it was established, Dr Baker played a key leadership role in its early operation, serving as the chairman of the first training grant committee and providing key leadership and direction for both training and research at the national level. He served on the Council of the NINDB from 1962 to 1966 and on the NINDS program projects committee from 1969 to 1972.

Like his fellow Horsemen, Dr Baker was instrumental in establishing the AAN.³⁻⁵ The original idea for the AAN was in fact Dr Baker's.⁵ In recognition of the pivotal role that he played, he was honored with the opportunity to serve as the first president (1948-1951). Baker was one of the individuals who insisted on devoting part of the scientific meeting to special educational courses in addition to scientific presentations. So the annual AAN courses, which generations of neurologists have grown to enjoy, appreciate, and depend on, were largely Dr Baker's idea.

Dr Baker served in many other leadership positions during his career. He was also president of the ANA, the ABPN, and the Epilepsy Foundation of America. He was honored with a Fulbright teaching scholarship to the University of Oslo and was elected to the Norwegian Academy of Science and Letters. He was also recognized with honorary memberships in the neurological societies of Argentina and Chile.

Conclusion

The Four Horsemen were remarkable individuals. All were exceptional clinicians, devoted and inspiring teachers, accomplished researchers and visionary leaders with warm personal qualities that produced devoted colleagues and trainees. Each left behind an impressive oeuvre. The field of neurology and the AAN in particular owe them a debt of gratitude.

Conflicts of interest

The author has no conflicts of interest to declare.

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