

The University of Wisconsin Department of Neurological Surgery

Brandon G. Rocque, MD

Department of Neurological Surgery,
University of Wisconsin,
Madison, Wisconsin

John S. Kuo, MD, PhD

Department of Neurological Surgery,
University of Wisconsin,
Madison, Wisconsin

Robert J. Dempsey, MD

Department of Neurological Surgery,
University of Wisconsin,
Madison, Wisconsin

Reprint requests:

John S. Kuo, MD, PhD,
Department of Neurological Surgery,
School of Medicine and Public Health,
University of Wisconsin,
K3/803 Clinical Science Center, Mail
Code 8660,
600 Highland Avenue,
Madison, WI 53792.
E-mail: J.Kuo@neurosurg.wisc.edu

Received, June 16, 2009.

Accepted, March 1, 2010.

Copyright © 2010 by the
Congress of Neurological Surgeons

THE PRACTICE OF neurological surgery at the University of Wisconsin has evolved and expanded greatly over the past nearly 70 years. From its beginnings as a 1-man division of general surgery, the Department of Neurosurgery has grown to the current department consisting of 14 neurosurgeons and 12 full-time researchers, along with fellows, residents, nurse practitioners, laboratory personnel, and support staff. The department is able to take advantage of the unique opportunities provided by this large research institution to foster close collaborations between surgeons and researchers, both within and outside of the department. This article chronicles the development of the Department of Neurological Surgery at the University of Wisconsin, directed by its 3 chairmen, in the context of the University, the state of Wisconsin, and the Midwestern United States.

KEY WORDS: Education, History, Neurosurgery, Research, University, Wisconsin

Neurosurgery 67:424-430, 2010

DOI: 10.1227/01.NEU.0000372084.38520.9B

www.neurosurgery-online.com

The University of Wisconsin (UW) Department of Neurological Surgery began in 1942 as a division of the Department of General Surgery. Since that time, it has grown into a department with a national reputation for innovative research and clinical excellence in all aspects of neurosurgery. This development has occurred against the backdrop of a major research institution following the theme that difficult clinical problems are best addressed by bringing to bear the resources of such an institution. The Department of Neurosurgery is one manifestation of the "Wisconsin Idea," a concept stating that all activities of UW should be applied for the benefit of all people of the state of Wisconsin. For neurosurgery, this focus reflects the tripartite mission of patient care, research, and teaching, which is the basis of this department's growth and accomplishment. This article begins with a brief history of the state and the University, culminating in the history of the Department of Neurological Surgery.

WISCONSIN AND THE UNIVERSITY

After the Blackhawk War of 1832, during which a Union army including 3 future presidents chased the Native American leader Blackhawk across areas of southern Wisconsin, Madison was chosen as

the site for the future capital of what was then the Wisconsin Territory. Wisconsin became a state in 1848, and Madison has remained its capital.

The UW was established only months after statehood in accordance with a provision in the Wisconsin Constitution that called for "the establishment of a state university at or near the seat of state government." The first class was held in February 1849, and the first PhD degree was granted to future university president, Charles Van Hise.

In 1904, Van Hise, who had become the president of the University, declared that he would "never be content until the beneficent influence of the university is available to every home in the state." This became known as the Wisconsin Idea and has been the underlying idea behind the work done at the university since that time. The application of the Wisconsin Idea has been seen throughout the university in agriculture, architecture, art, ecology, education, medicine, and neurosurgery (Table 1). Currently, UW is home to 41,000 students, including 29,000 undergraduates. In 2006, the University generated more than \$900 million in research funding, placing it second in National Science Foundation rankings.

THE SCHOOL OF MEDICINE

In October 1907, the Wisconsin Board of Regents approved the proposal to establish a

ABBREVIATIONS: CNS, central nervous system;
UW, University of Wisconsin

TABLE 1. University of Wisconsin Affiliates and the Wisconsin Idea

Affiliate	Wisconsin Idea
John Muir	Ecologist: founder of Sierra Club
Aldo Leopold	Ecologist: considered the father of wildlife management
Frank Lloyd Wright	Architecture
Harry Steenbock	Vitamin D fortification of milk
Frederic Mohs	Mohs microsurgery for skin cancer
Harvey Littleton	Founder of the Studio Glass program
Dale Chihuly	Contemporary glass artist
Howard Temin	Discovery of reverse transcriptase (Nobel prize)
Folkert Belzer and James Southard	Organ preservation solution for transplantation
Charles Strother	Innovations in endovascular therapy
Karl Paul Link	Discovery of warfarin
James Thompson	Human embryonic and induced pluripotent stem cell

**FIGURE 1.** *The University of Wisconsin School of Medicine and Public Health (left) and the University of Wisconsin Hospital and Clinics (right).*

school of medicine at UW. The first classes were held in September 1908. In 1924, the State of Wisconsin General Hospital opened, and in 1927, the first class from the 4-year medical program graduated. This class included 6 women among the 25 graduates.

The hospital itself relocated to its present location in 1979 (Figure 1). More recently, the medical school became the School of Medicine and Public Health, confirming a commitment to the health of the people of the state of Wisconsin, in accordance with the Wisconsin Idea.

The medical school moved to its present location in 2004. This state-of-the-art facility was designed to bring together the School of Medicine and Public Health, the School of Nursing, and the School of Pharmacy and to facilitate interdisciplinary cooperation and learning. Currently under construction is the Wisconsin Institutes for Medical Research, a \$135 million facility adjacent to the hospital and medical school buildings. The first tower was completed in late 2008 and houses researchers in cancer biology, cardiovascular health, and neuroscience.

In August 2007, the American Family Children's Hospital opened adjacent to the University Hospital. This 60-bed facility features a 37 000-ft² surgical pavilion with 6 state-of-the-art operating theaters and 2 procedure rooms.

Collaboration is integral for the success of the neurosurgery department, and UW provides ample opportunities for collaborative efforts. Chief among these is the Waisman Center, across the street from the main hospital complex. Opened in 1973, the Waisman Center was established in response to a presidential panel calling for multidisciplinary centers dedicated to further understanding, treatment, and prevention of mental retardation and developmental disabilities. Currently, more than 50 faculty

members representing 25 academic departments of the university work at the Waisman Center, many of whom work in close collaboration with the Department of Neurosurgery.

Overall, the department is situated on a busy university campus, in proximity to its collaborators in engineering, medical physics, pharmacy, public health, and many other departments. This facilitates basic science and translational research with a broad range of collaborators including current projects with focus on human stem cells, regenerative medicine, tumor biology, stroke, congenital central nervous system (CNS) disorders, and rehabilitation.

THE DEPARTMENT OF NEUROLOGICAL SURGERY: HISTORY

Beginnings of Neurological Surgery at UW

In 1942, Theodore Erickson was hired as the chair of the new Division of Neurological Surgery, within the Department of Surgery (Figure 2). Dr Erickson had completed his training at the Montreal Neurological Institute under Dr Wilder Penfield, including landmark work with Penfield on cerebral function and localization.¹ The following year, he established a residency program that continues to the present. Dr Erickson began what has become the Wisconsin tradition of close collaboration with basic scientists by recruiting Clinton N. Woolsey to UW in 1948.

Clinton N. Woolsey, a native of New York, attended The Johns Hopkins Medical School with the intention of becoming a brain surgeon. Unfortunately, he developed pulmonary tuberculosis during his fourth year and was advised that the physical demands of a surgical internship might reactivate his disease. Instead a career in neurophysiology lay ahead. He developed a method of subpial

aspiration of cortex that made possible experimental lesions with no damage to adjacent cortex and with minimal bleeding.² Using these techniques, Professor Woolsey went on to define in great detail the organization of the primary somatosensory, auditory, and visual cortex. Furthermore, in the early 1940s, he discovered secondary receptive areas for somatic sensation, vision, and hearing.³⁻⁶ In a further set of pioneering studies, Woolsey and colleagues used a series of careful thalamic lesions to define thalamocortical connections of various thalamic subnuclei.⁷⁻⁹ These studies remain some of the definitive work on cerebral localization.

The Javid Era

Manucher J. Javid was born in Tehran, Iran, in 1922. He planned to travel abroad to obtain his medical education, with specialization in neurosurgery, and subsequently to return to Iran and establish the first neurosurgical department in the Middle East. His training began at the University of Illinois College of Medicine, where one of his mentors was Percival Bailey. He then continued his neurosurgical training in Boston at the Lahey Clinic, New England Medical Center, and Massachusetts General Hospital with Dr James White. Dr Javid planned to remain in the United States for 2 more years to gain more experience before returning to Iran. However, the outbreak of severe religious persecution of those of the Baha'i faith prompted Dr Javid to drop his plan to return to Tehran. In 1953, Dr Javid joined Dr Erickson at UW. He became a full professor in 1962 and succeeded Dr Erickson as chair of the Division of Neurological Surgery in 1963 (Figure 3).

Dr Javid's most lasting contribution to the field of neurosurgery has been his pioneering use of osmotic agents for control of intracranial and intraocular pressure.¹⁰ In July 1954, Dr Javid was in the audience of a Department of Anatomy monthly research meeting when students of Dr Paul Settlage presented the use of urea in primate models. Immediately after this conference, Drs Settlage and Javid discussed the possible use of urea in humans. The first

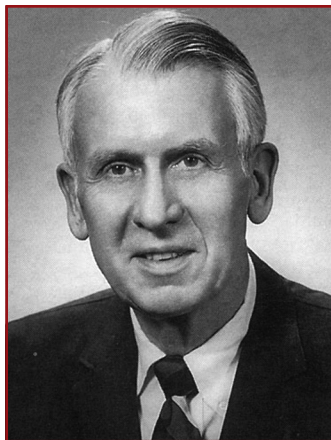


FIGURE 2. Dr Theodore Erickson, first chairman (1942-1963).

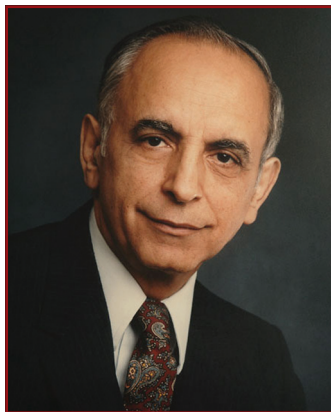


FIGURE 3. Dr Manucher J. Javid, chairman (1963-1995).

human trial occurred in a laboratory in the University Hospital solarium on July 25, 1954. A lumbar puncture was made and connected to an open manometer, after which the patient was given an infusion of 100 mg/kg of urea, causing a drop in intrathecal pressure. In 1955, the first article was published detailing administration of urea to and monitoring of intracranial pressure in 21 patients.¹¹ This would be followed by several more articles, chronicling a personal and scientific experience using urea in more than 3200 patients and mannitol in about 700.¹²⁻¹⁴ In addition, in 1954, Dr Javid was the first to perform a carotid endarterectomy in the state of Wisconsin.

Dr Javid built the Division of Neurosurgery into an important academic unit, finally orchestrating the transition of neurosurgery at UW from a division of general surgery to an independent department in 1989.

Dr Robert J. Dempsey

After 33 years as chairman, Dr Javid was succeeded by Dr Robert J. Dempsey in 1995 (Figure 4). Dr Dempsey attended the University of Chicago Medical School where he was exposed to basic science and clinical research. He received his neurosurgical training from Drs Richard Schneider, Glen Kindt, and Julian Hoff at the University of Michigan. In 1983, Dr Dempsey joined the faculty at the University of Kentucky and established his practice in cerebrovascular surgery. There he developed his research interests in brain responses to ischemia, biochemical events in brain injury, and causes and treatments for carotid atherosclerosis.

In 1995, Dr Dempsey came to Wisconsin as the third chairman of the Neurosurgery Department, a position that would become the Manucher J. Javid Endowed Professorship in 1998. Continuing in the tradition of his predecessors, Dr Dempsey has encouraged the growth of the neurosurgery department, taking full advantage of the collaborative opportunities and resources provided by UW. He founded the Multidisciplinary Stroke Program and established laboratories within the department to study molecular mechanisms underlying brain damage and atherosclerosis. Two of Dr Dempsey's former laboratory personnel are now faculty in the department with their own National Institutes of Health-funded laboratories. The commitment to basic science, translational, and clinical research is seen throughout the department, with 3 clinical faculty members also receiving National Institutes of Health sponsorship. In addition to his duties in Wisconsin, Dr Dempsey is active in the neurosurgical community. He is the President of the Society of Neurological Surgeons and served as host for the 2008 meeting at



FIGURE 4. Dr Robert J. Dempsey, chairman (1995-present).



FIGURE 5. *The University of Wisconsin Department of Neurosurgery.*

UW. Dr Dempsey is also the Secretary of the Foundation for International Education in Neurosurgery.

Under the direction of Dr Dempsey, the Department of Neurosurgery at UW has grown to 16 neurosurgeons (14 faculty and 2 fellows) and 12 full-time researchers. For the academic year 2008 to 2009, UW Department of Neurological Surgery had more than 2500 neurosurgical cases. Furthermore, the residency program has grown significantly, accepting 2 residents per year since 2006.

THE DEPARTMENT TODAY

At present, the UW Department of Neurological Surgery comprises distinct areas of specialization, encompassing both clinical and investigative aspects of care for neurological diseases. Each division within the department is organized to provide excellent patient care. This principle demands basic and clinical research to provide new knowledge for improvement of patient care and excellence in teaching to promulgate that new knowledge.

The department is made up of 14 neurosurgeons, 12 full-time research faculty, 2 fellows, and 12 residents, along with 31 nurse practitioners, laboratory personnel, and support staff (Figure 5). Continuing the tradition started by Dr Erickson, the faculty of the Department of Neurosurgery works in close collaboration with other departments within the medical school and throughout the University (Table 2). From embryonic stem cell biology to biomedical device design, UW neurosurgeons are able to take advantage of the resources of this large research insti-

tution with experts in various fields close by in the medical school and around campus.

Cerebrovascular Division

The cerebrovascular division is led by Dr Dempsey and includes Drs David Niemann and Mustafa Baskaya. In close collaboration with interventionalists from the Department of Radiology, neurosurgeons with special interest in cerebrovascular diseases provide comprehensive care for patients with cerebral or spinal aneurysms or vascular malformations, stroke, or other cerebrovascular diseases. Dr Niemann practices actively in both open and endovascular neurosurgery and has particular experience in the embolization of arteriovenous malformations with liquid agents. Dr Baskaya's practice focuses largely on open treatment of cerebrovascular diseases, as well as cranial base approaches for CNS tumors.

Research in the division is very active with basic science research in cerebral plasticity and regeneration (Drs Dempsey, Baskaya, and Vemuganti), cellular membranes and edema (Dr Sun), lipid homeostasis (Dr Adibhatla), surgical procedure development (Drs Baskaya and Niemann), atherosclerosis and genetics (Dr Dempsey), and translational studies (Dr Dempsey).

Tumor Division

The tumor division includes Drs Dempsey, Baskaya, and John Kuo. Dr Kuo is the Codirector of the Multidisciplinary Brain Tumor Clinic and the Multidisciplinary Pituitary Clinic. In addition to clinical duties, Dr Kuo is the Director of the UW Brain Tumor Research Lab, which focuses on cancer stem cell research,

TABLE 2. Neurosurgery Faculty and Their Collaborators at the University of Wisconsin

Faculty Name	Collaborator(s)
A. Leland Albright, MD	Departments of Communicative Disorders, Orthopedics and Rehabilitation, Neurology
Rao Adibhatla, PhD	School of Pharmacy, Departments of Surgery, Physiology, Biochemistry, Neurology, Pediatrics
Mustafa Baskaya, MD	Departments of Plastic and Reconstructive Surgery, Otolaryngology, Ophthalmology
Robert J. Dempsey, MD	Departments of Medical Physics and Psychiatry, Internal Medicine, Biostatistics, Psychology and Psychiatry, Neurology, Neuroradiology, Cardiothoracic Surgery, Neuropsychology, Medical Physics, Center for Women's Health and Research, Anatomic Pathology, Comparative Biosciences, Pathology and Laboratory Medicine, Pediatrics, Orthopedics and Rehabilitation
Bermans Iskandar, MD	Departments of Anesthesiology, Urology, Pediatric Plastic and Reconstructive Surgery, Pediatric Hematology and Oncology
John Kuo, MD, PhD	Paul P. Carbone Comprehensive Cancer Center, McArdle Center for Cancer Research, Center for Stem Cell and Regenerative Medicine, Departments of Biological Chemistry, Human Oncology, Medical Physics, Otolaryngology, Neuropathology, Biological and Chemical Engineering, Anatomy, Neurology, Animal Sciences
Joshua Medow, MD	Departments of Anesthesiology, Internal Medicine, Endocrinology, Neuroradiology, Neurology, Medical Physics and Engineering, Human Oncology
David Niemann, MD	Departments of Neuroradiology, Anatomy and Neurology, Medical Physics, Biomedical Engineering
Lincoln Ramirez, MD, PhD	Department of Neurology
Daniel Resnick, MD	Departments of Orthopedic Surgery, Biostatistics, Comparative Biosciences, Anatomy and Neurology
Karl Sillay, MD	Departments of Physiology, Neurology, Biomedical Engineering
Dandan Sun, MD, PhD	Departments of Physiology, Pathology and Laboratory Medicine, Pediatrics, Medical Physics, Anesthesiology, Neurology, Biomedical Engineering
Raghu Vemuganti, PhD	Departments of Biostatistics and Medical Informatics and Computer Sciences, Neurology, Dermatology, Comparative Biosciences, Anatomy and Neurology

in both the identification and characterization of brain tumor stem cells and developing novel therapies. He also pursues extensive translational research with members of the Department of Human Oncology, particularly in the area of innovative adjuvant therapy for gliomas, and by chairing the UW Comprehensive Cancer Center CNS clinical trials group.

Pediatric Division

Drs Bermans Iskandar and Leland Albright make up the section of Pediatric Neurosurgery. Dr Iskandar has special interest in craniofacial surgery and brachial plexus/peripheral nerve surgery. He works closely with the Division of Plastic and Reconstructive Surgery and is the director of a research laboratory that studies the cellular, biochemical, and molecular basis of the folate pathway during CNS injury and regeneration.

Dr Leland Albright came to Madison from the University of Pittsburgh in 2006. His practice specializes in the treatment of pediatric movement disorders, and he directs the multidisciplinary pediatric movement disorders clinic at the Waisman Center. His research focuses on development of innovative treatments for spasticity, dystonia, and other movement disorders.

Division of Spine/General Neurosurgery

Dr Greg Trost is the Department Clinical Vice Chair. His practice focuses largely on spine surgery, but also includes adult brachial

plexus and peripheral nerve surgery. Dr Trost is active in neurosurgical education both at UW and globally.

Dr Daniel Resnick is the Vice Chair for Academics. His practice also focuses on spine surgery. Dr Resnick runs an active research laboratory along with Gurwattan Miranpuri, PhD, to study spinal cord injury with the goals of promoting functional recovery and alleviating neuropathic pain. Previous studies of the role of cyclooxygenase 2 inhibitors and current studies on the effects of the folate pathway and stem cell transplantation are in progress. Dr Resnick is the current Treasurer of the Congress of Neurological Surgeons and a past Chairman of the American Association of Neurological Surgeons/Congress of Neurological Surgeons Joint Section on Disorders of the Spine.

Drs Kris Chan and Praveen Deshmukh both practice general and spinal neurosurgery, based at Meriter Hospital, a local affiliated facility, and at the Madison Veterans Administration Hospital. Dr Amgad Hanna completes the spine division, having also completed fellowship training in brachial plexus and peripheral nerve surgery.

Functional and Epilepsy Division

Dr Karl Sillay's practice focuses on brain stimulation for various diseases including movement disorders and Parkinson's disease as well as stimulative and resective surgeries for epilepsy. Dr Sillay works closely with the Department of Neurology and with

Waisman Center researchers and the Department of Engineering. One current area of research focus is the interface between the brain and computers.

Dr Lincoln Ramirez has been with the UW Department of Neurosurgery since 1979. He is now Emeritus Professor, dedicated to resident education. Dr Ramirez is integral to the maintenance of the residency program and the day-to-day function of the entire department. He is still clinically active, assisting other faculty with functional and epilepsy surgeries.

Critical Care Division

Dr Joshua Medow, a former UW resident, completed the first neuroendovascular fellowship at UW and joined the department thereafter to start a neurocritical care program. This program has become a focus of the department's educational activities. His research focus is on outcome improvement and quality control in the neurosurgical intensive care unit population, and he is heavily involved in medical device design in collaboration with the Department of Engineering.

Research Faculty

The Department of Neurological Surgery employs 12 active research faculty, including 4 full-time PhD tenure-track faculty, Drs Dandan Sun, Rao Adibhatla, Raghu Vemuganti, and Julie Olson. Their work focuses on varied aspects of the normal and diseased CNS, from ion homeostasis after stroke to cerebral inflammation, neuroimmunology, and lipid metabolism. These researchers, in keeping with the focus set forth by Dr Dempsey and the Wisconsin Idea, work in close collaboration with researchers throughout the medical school and the university.

Neurosurgery Residency

Since its inception in 1943, the neurosurgery residency has been a focus of the department. UW residents have been recipients of 5 national awards and grants over the past 3 years. In 2006, approval was won for expansion to a 2-resident-per-year program. Residents are able to access the vast resources of the entire UW, the Waisman Center, a vibrant Biomedical Engineering program, and multiple other clinical departments, in pursuit of academic interests.

Education

Education is a major focus of the Department of Neurological Surgery. At UW, all medical students participate in a 6-week neuroscience clerkship, administered by the Department of Neurosurgery, during the third or fourth year. This clerkship consists of rotations in neurology, neurosurgery, ophthalmology, neuroradiology, and rehabilitation medicine. The principal mission of the course, in keeping with the Wisconsin Idea, is to educate future primary care physicians in the diagnosis and appropriate prespecialist management of neurological disorders. Each student in the medical school class learns on the neurosurgery service by following patients with a faculty mentor and observing surgeries in the

operating rooms. In addition, 4-week advanced electives are available in neurosurgery and neurocritical care.

UW Neurosurgery residents, in addition to the traditional teaching conferences and educational experiences common to neurosurgery programs, participate in several structured didactic courses. Dr Baskaya administers a weekly, resident-driven course in cranial base anatomy and surgical techniques with a curriculum that rotates over approximately 4 years, including both seminars and hands-on dissection in the cranial base laboratory. UW has served as host to multiple international fellows as well as the Midwestern Skull Base course in 2009 and 2010. In addition, the UW Spine Review is an annual resident-driven course based on cadaver dissection and spinal instrumentation.

The Department of Neurosurgery extends the Wisconsin Idea in education to service of patients beyond our borders and worldwide. Drs Albright and Dempsey have long volunteered in serving the neurosurgical needs of developing countries in South America and Africa. Dr Dempsey serves as the Secretary of the Foundation for International Education in Neurosurgery, an organization that provides educational curricula, certification, and assistance with establishment of neurosurgical training programs in the developing world.

UW NEUROSURGERY AND THE WISCONSIN IDEA

In keeping with the philosophy espoused by the Wisconsin Idea, the UW Department of Neurosurgery is involved in extensive basic science, translational, and clinical trials research. From novel applications for and delivery methods of embryonic stem cells to surgical treatments for stroke, Chiari malformation, and epilepsy, to long-term outcome studies in spine, the UW Department of Neurosurgery is active both in single-institution studies and as a partner in many multi-institution efforts.

The UW Health system serves as the primary health care provider for more than 500,000 people in southern Wisconsin, whereas the Department of Neurosurgery provides tertiary/specialty care to patients from a multistate region, a population approaching 4 million people. At the university level, the Wisconsin Idea has tangible effect with the creation of the School of Medicine and Public Health. This academic situation serves to directly translate research ideas to the patients at risk.

An example of such research is the Department of Neurosurgery Carotid Atherosclerosis Project under Dr Dempsey. This started as a vascular biology investigation of the genetics of symptomatic atherosclerosis and has benefited from the collaboration of the Department of Medical Physics and cognitive specialists from the Department of Neurology. With this team assembled, it is now focused on the discovery and prevention of vascular cognitive decline in the at-risk population in Wisconsin and beyond.

With this active research and educational program, the large population served by the UW Department of Neurosurgery is an ideal example of "the beneficent influence of the university reaching every home in the state and beyond."

CONCLUSION

The UW Department of Neurological Surgery is uniquely positioned to take advantage of the resources of this large midwestern research institution. The Department has grown from its beginnings in the 1940s as a division of general surgery to the large, clinically and academically active entity that it is today. The varied talents and interests of its faculty working closely with other personnel and departments are a manifestation of the Wisconsin Idea.

Disclosure

The authors have no personal financial or institutional interest in any of the drugs, materials, or devices described in this article.

REFERENCES

1. Penfield W, Erickson TC. *Epilepsy and Cerebral Localization: A Study of the Mechanism, Treatment, and Prevention of Epileptic Seizures*. Springfield, IL: Charles C Thomas; 1941.
2. Thompson RF, Clinton Nathan Woolsey. <http://www.nap.edu/readingroom.php?ook=biomems&page=cwoolsey.html>. Accessed May, 2008.
3. Erickson TC, Woolsey CN. Observations on the supplementary motor area of man. *Trans Am Neurol Assoc*. 1951;56:50-56.
4. Woolsey CN. Comparative studies on cortical representation of vision. *Vision Res*. 1971;(suppl 3):365-382.
5. Woolsey CN. Comparative studies on localization in precentral and supplementary motor areas. *Int J Neurol*. 1963;4:13-20.
6. Woolsey CN, Erickson TC, Gilson WE. Localization in somatic sensory and motor areas of human cerebral cortex as determined by direct recording of evoked potentials and electrical stimulation. *J Neurosurg*. 1979;51(4):476-506.
7. Montero VM, Guillery RW, Woolsey CN. Retinotopic organization within the thalamic reticular nucleus demonstrated by a double label autoradiographic technique. *Brain Res*. 1977;138(3):407-421.
8. Rose JE, Woolsey CN. The relations of thalamic connections, cellular structure and evocable electrical activity in the auditory region of the cat. *J Comp Neurol*. 1949;91(3):441-466.
9. Rose JE, Woolsey CN. The orbitofrontal cortex and its connections with the mediodorsal nucleus in rabbit, sheep and cat. *Res Publ Assoc Res Nerv Ment Dis*. 1948;27(1 vol):210-232.
10. Meyer GA, Manucher J Javid, MD. *Surg Neurol*. 1982;18(4):227-229.
11. Javid M, Settlege P. Use of hypertonic urea for the reduction of intracranial pressure. *Trans Am Neurol Assoc*. 1955-1956;(80th Meeting):204-206.
12. Javid M, Settlege P. Clinical use of urea for reduction of intracranial pressure. *Trans Am Neurol Assoc*. 1957;(82nd Meeting):151-153.
13. Javid M. Urea in intracranial surgery. A new method. *J Neurosurg*. 1961;18:51-57.
14. Javid M, Gilboe D, Cesario T. The rebound phenomenon and hypertonic solutions. *J Neurosurg*. 1964;21:1059-1066.

COMMENTS

This manuscript eloquently describes the history of The University of Wisconsin Department of Neurological Surgery and an impressive array of achievements by previous and current department leaders and faculty. The authors cite the service-first notion of the "Wisconsin Idea" and indicate that such a noble concept serves as the philosophical cornerstone of the department. The authors also emphasize the importance of intellectual collaboration within a comprehensive, multi-disciplinary research institution, in which the experiments such as those conducted by Javid and Settlege on osmotic agents, among others, have had a profound impact on the practice of neurosurgery.

The senior reviewer attended the Senior Society meeting in Madison alluded to in the manuscript and was struck by the impressive array of clinical, research and educational programs in which the department was engaged. One could argue if anything this manuscript, while avoiding hyperbole and superlatives that should be absent from such writings, hardly does justice to how impressive the program has become under the leadership of its current Chairman, Dr Robert Dempsey.

Ning Lin
A. John Popp
 Boston, Massachusetts