

ASA Award: John D. Michenfelder

IN 1973, as this tribute-writer studied for the American Board of Anesthesiology Exam, he came across a paper entitled "The effects of anesthesia and hypothermia on canine cerebral ATP and lactate during anoxia produced by decapitation."¹ No question about it, I mused, decapitation should produce anoxia, but how many authors would put the word "decapitation" in the title? A scientist who could write for publication with this degree of tenacity and forthright accountability was someone your present chronicler decided he wanted to meet. Such a meeting did occur shortly thereafter, as part of a job interview. My first encounter with Jack Michenfelder, his face almost completely obscured by smoke from a cigar, his voice gravelly (presumably also from the stogies), convinced me that here was a man who lived in an infectiously exciting world of his own creation. I also came away convinced that he had seen, with ease, every corner I'd cut; each path of least resistance I'd tripped down; every unpreparedness I'd somehow survived. Here was a man who could teach me how to ask answerable questions; how to dissect, reassemble, test, experiment, and, maybe, how to gain understandings that could help patients.

Born in Saint Louis in 1931 to a close-knit family of modest means, Dr. Michenfelder attended "streetcar college," as he put it, graduating from St. Louis University and then that same institution's medical school. After an internship at Presbyterian Hospital in Chicago and a brief flirtation with internal medicine, he became one of Mayo Clinic's anesthesiology residents in 1958. He joined the Mayo faculty in 1961, and has spent his entire career (thus far) at that institution.

In the early 1960s, Neurosurgery was not the most popular part of the Mayo surgical suite in which to work. New faculty were often assigned to this area, which among anesthesiologists had a reputation similar to that of Devil's Island. One day, Dr. Michenfelder was relieving an anesthesiologist for a break. The neurosurgeon's rule was that if the blood pressure changed, the anesthesiologist was to inform the surgeon immediately. The surgeon had not heard from "anesthesia" in quite some time, and so he asked about the blood pressure. Dr. Michenfelder responded accurately with a number somewhat lower than it had been before, which set off a tirade from the surgeon. The story goes that, every minute or so thereafter, as fast as the cuff could be inflated and carefully deflated, for at least an hour, the following polite but deadly serious exchange occurred:



John D. Michenfelder

Dr. Michenfelder: "Dr. _____?"

Dr. _____: "Yes, Dr. Michenfelder."

Dr. Michenfelder: "Dr. _____, the blood pressure is _____."

Dr. _____: "Thank you, Dr. Michenfelder."

Later, in the locker room, Dr. Michenfelder laid out his objections to the surgeon's behavior toward "anesthesia" in general, and toward Jack Michenfelder in particular, in no uncertain terms. It is not recorded whether or not this resulted in an immediate improvement in neurosurgeon-anesthesiologist relationships. It is my belief that this episode had something to do with the birth of the subspecialty of neuroanesthesia. Dr. Michenfelder and the neurosurgeons eventually developed deep mutual respect. In 1969, Dr. Michenfelder coined the simple title "Neuroanesthesia"² for his now-classic review, which many would mark as the beginning of that subspecialty.

Jack Michenfelder has been interested in cerebral metabolism and the effects of anesthesia on it since his earliest

days in neuroanesthesia. Cerebral blood flow had to be measured somehow to get at metabolism. Kety and Schmidt's 1944 nitrous oxide wash-in–wash-out technique required a relatively long period (about 14 minutes) during which steady-state conditions had to be assumed.³ Further, results often were not forthcoming until the next day. Although a venous outflow method had been qualitatively described, one of Michenfelder's early pivotal achievements was to quantitate and validate a continuous venous outflow method, which became the standard against which other cerebral blood flow measurement methods have been compared for many years.⁴ This venous outflow method speaks volumes about the Michenfelder way of tackling problems. He reasoned that if one wanted to measure flow to an organ (in this case, brain), why not simply collect its venous drainage per unit time? Timed collection is the gold standard of any flow measurement, so Jack "merely" learned how to cannulate the saggital sinus, block off all inflowing extracranial diploic veins, and later assess, in each animal, exactly what percentage of the brain's venous drainage he had been collecting. The blood simply was allowed to flow into a volumetric device by gravity and was timed. Direct, simple . . . and elegant.

After he developed his now-classic venous outflow method, and believed he finally had a method with which he could begin to study the acute effects of anesthetics on cerebral metabolism, Jack's own mentor, Dr. Richard A. Theye, demanded an independent-method validation. Dr. Harry Wollman had modified the Kety-Schmidt technique to use krypton instead of nitrous oxide, making measurements considerably easier. Dr. Wollman graciously journeyed to Rochester, Minnesota and helped Jack perform this independent validation.⁵ Using venous outflow, Jack subsequently studied numerous anesthetic effects on cerebral metabolism and laid the foundations of our current knowledge in this critically important area. These researches in animals became world standards, not just in anesthesiology circles, but in all the neurosciences.

Dr. Michenfelder is or has served on the editorial boards of *Stroke*, *Resuscitation*, *Journal of Neurosurgery*, *Brain Injury*, *Journal of Clinical Monitoring*, *Archives Internationales de Pharmacodynamie et de Therapie*, and the *Journal of Cerebral Blood Flow and Metabolism*. This is overwhelming testimony to the respect for his work that exists outside anesthesiology. His research has been competitively funded by the National Institutes of Health for 22 years, mostly *via* neuroscience study sections, where he competed with our nation's best neuroscientists. His is a remarkable track record indeed. His research has resulted in over 130 peer-reviewed original articles, as well as 32 chapters, 11 editorials, over 50 abstracts, and two books (although he contended for years that he would

never write a book!). Dr. Michenfelder's laboratory continues to be quite active, with two original articles (one first-authored by Dr. Michenfelder) published within 8 weeks of this writing (May, 1990). Also in May of 1990, Dr. Michenfelder was elected to the prestigious Institute of Medicine of the National Academy of Sciences. He is only the fifth anesthesiologist to be so honored.

Jack Michenfelder became world-renowned for his research on brain metabolic function and blood flow, and then developed extensive knowledge of the mechanisms by which cerebral ischemia produces injury. These interests led to an elegantly documented series of researches about pharmacologic protection against cerebral ischemia. For years, various controversies have swirled around this area of wide interest. One of the most important findings he reported from this research was the fact that no further depression in cerebral metabolic rate for oxygen occurred during progressive dosing with thiopental once EEG isoelectricity was attained.⁶ The ability of barbiturate to depress cerebral function (EEG activity) but not cellular maintenance itself was pivotal information, because it led to numerous subsequent increments in our understanding of the mechanisms underlying barbiturate cerebral protection.

His selection as Editor-in-Chief of *Anesthesiology* in 1979, after 6 years as an Editor, is testimony to the fact that although he has long been a well-known neuroscientist outside our specialty, he continued to bend most of his massive efforts toward anesthesiology, both as a basic and as a clinical science. His 6-year tenure as Editor-in-Chief of *Anesthesiology* was accompanied not only by continued growth of our basic science respectability, but also by real growth in the journal's clinical science reportage. I know that Jack is proud of his leadership of our most widely circulated journal, and deservedly so.

Dr. Michenfelder did not spend these past 29 years at Mayo closeted in his lab. He headed the Mayo Section of Neurosurgical Anesthesia from 1968–1975 and was Head of Anesthesia at Mayo's St. Mary's Hospital in Rochester from 1971–1975. These were enormous administrative tasks. At St. Mary's Hospital, approximately 25,000 anesthetics were performed annually during those years. Jack's skill in clinical neuroanesthesia is immense, and during his clinical service, his creativity and curiosity continued unabated. He insisted that right atrial catheters be inserted in patients undergoing craniotomy while in the sitting position,⁷ and taught us about Doppler monitoring for air embolism.⁸ He helped convince us that "stump pressures" were not particularly helpful as monitoring during carotid endarterectomy.⁹ Of the 135 original papers in his bibliography, 41 are clinical, as opposed to laboratory, science. His *curriculum vitae* does not list any of the hundreds of abstracts that he has helped author.

This reflects his long-held belief that fully peer-reviewed publications should appear in timely fashion after abstract and paper presentations at meetings.

Rochester, Minnesota gets chilly in winter. It was not the easiest place to which to recruit faculty during the 1960s and 1970s, and there were perennial shortages of clinical coverage. The clinical responsibilities shared by Dr. Michenfelder and his colleagues should be remembered when one views his scientific, administrative, and editorial accomplishments. Is he also a teacher? I remember a resident asking him, "Dr. Michenfelder, could you tell me about anesthetics and cerebral blood flow?". At the time, Jack was easily the most knowledgeable person in the world on the subject. Most professors probably would have responded sarcastically or worse to such a naive and open-ended query. Jack merely said, "No. When you've read enough about the subject to have some specific questions, I'd be happy to help you." Sure enough, that resident returned with solid questions and received world-class answers. Jack does not intimidate his students, but has little patience for marginal competence.

Jack Michenfelder has the finest ability to cut to the essence of a scientific problem of anyone I have ever met. He is uninterested in and unimpressed by jargon and despises deliberate complexity. His trainees discover that their manuscripts need to go through numerous drafts before they should be given to him to review. From the start, he had me pegged as loquacious. Once, on the cover page of a manuscript of mine, he wrote, "Tink, this manuscript is repetitious, titious, titious, titious, . . ." with "titious" repeated all the way to the bottom of the page. After being angry and humiliated for a time, I took out the manuscript and looked carefully. Sure enough, it was terrible, and the kindest thing Jack could have said about it was that it was "repetitious".

One of Jack's greatest enjoyments outside his science is bird hunting. He plans, he conditions himself, he trains his dogs, he checks his equipment, and his hunting expeditions, just like his science, are no-frills affairs that are successful. His single-minded pursuit of a successful hunting expedition is a reflection of his lifetime penchant about intellectual honesty: he meticulously follows all of the rules, gets proper permission, and respects the game laws. His 1988 Rovenstine lecture was anything but benign, and caused us all to reflect about the complexities of intellectual honesty.¹⁰

Jack fathered six children, and suffered through the tragic untimely death of their mother, to whom he was completely devoted. His long-term survival from this devastation came in the form of a true angel, namely Monica, to whom he has now been married for 18 years. Beneath his crustiness, his fiesty—but scientific, rather than evangelical—defenses of his theories on neurosci-

ence, his tough editorial stances, and his unswerving condemnation of intellectual dishonesty, Jack Michenfelder is a devoted, kind, and caring husband and father. He and Monica live in a huge rambling old house in a country town, surrounded by bucolic scenery. Such support and commitment in his personal life has formed the foundation of this man.

Sir Isaac Newton said, "If I have seen further (than you and Descartes) it is by standing on the shoulders of giants."¹¹ John D. Michenfelder is one of the giants on whose shoulders a considerable portion of the scientific foundation of our specialty rests.

I salute and honor John D. Michenfelder on his receipt of the American Society of Anesthesiologists 1990 Excellence in Research Award.

JOHN H. TINKER, M.D.
 Professor and Head
 Department of Anesthesia
 College of Medicine
 University of Iowa
 Iowa City, Iowa 52242

References

1. Michenfelder JD, Theye RA: The effects of anesthesia and hypothermia on canine ATP and lactate during anoxia produced by decapitation. *Anesthesiology* 33:430-439, 1979
2. Michenfelder JD, Gronert GA, Rehder K: Neuroanesthesia (review article). *ANESTHESIOLOGY* 30:65-100, 1969
3. Kety SS, Schmidt CF: The determination of cerebral blood flow in man by the use of nitrous oxide in low concentrations. *Am J Physiol* 143:53-66, 1945
4. Michenfelder JD, Messick JM, Jr, Theye RA: Simultaneous cerebral blood flow measured by direct and indirect methods. *J Surg Res* 8:475-481, 1968
5. Michenfelder JD, Messick JM, Jr, Theye RA: Simultaneous cerebral blood flow measured by direct and indirect methods. *J Surg Res* 8:475-481, 1968
6. Michenfelder JD: The interdependency of cerebral function and metabolic effects following massive doses of thiopental in the dog. *ANESTHESIOLOGY* 41:231-236, 1974
7. Michenfelder JD, Martin JT, Altenburg BM, Rehder K: Air embolism during neurosurgery. An evaluation of right atrial catheters for diagnosis and treatment. *JAMA* 208:1353-1358, 1969
8. Michenfelder JD, Miller RH, Gronert GA: Evaluation of an ultrasonic device (Doppler) for the diagnosis of venous air embolism. *ANESTHESIOLOGY* 36:164-167, 1972
9. McKay RD, Sundt TM, Jr, Michenfelder JD, Gronert GA, Messick JM, Jr, Sharbrough FW, Piepgras DG: Internal carotid artery stump pressure and cerebral blood flow during carotid endarterectomy: Modification by halothane, enflurane and innovar. *ANESTHESIOLOGY* 45:390-399, 1976
10. Michenfelder JD: The 27th Rovenstine Lecture: Neuroanesthesia and the Achievement of Professional Respect. *ANESTHESIOLOGY* 70:695-701, 1989
11. Sir Isaac Newton: Letter to Robert Hooke, 5 Feb 1675. Cited in *Bartlett's Familiar Quotations*, 15th Edition. Little, Brown & Co., Boston, 1980, p 313