

Presidential address

Tradition in Neurosurgery: Doing Well What Has Been Done Before

Edward R. Laws, Jr., M.D.

Department of Neurological Surgery, Mayo Medical School, Mayo Clinic, Rochester, Minnesota

One of the fond memories of my medical student days at Johns Hopkins is that of Monday morning neurosurgery rounds with Dr. A. Earl Walker (Fig. 1). A sorely intimidated student would be struggling through a case presentation and would naively say, "The Babinski sign was positive." Dr. Walker would interrupt: "Just who was Babinski, anyhow?" The ordinary student would admit ignorance, but the bold one would immediately reply, "Babinski was the foremost Russian neurologist in the court of Czar Nicholas." Dr. Walker would then tell the class (and the patient) about the famous French neurologist, Babinski, the chief at la Pitié in Paris from 1890 to 1927. Later, when I was Dr. Walker's resident, he confided to me that he looked up some historical fact before each of the student presentations "so that the students would understand that history is important and that we care about it."

Now, when I am in the operating room and the resident asks for a Sachs retractor, I may ask, "Who was Dr. Sachs anyhow?" (Fig. 2). Unfortunately, more often than not the resident is ignorant of this remarkable pioneer in neurosurgery.

It was a pleasure to have the 34th Annual Meeting of the Congress of Neurological Surgeons emphasize the traditional in neurosurgery, as I believe it is a subject worthy of both study and respect. As Billroth has stated, "Nur wer die Wissenschaft und Kunst der Vergangenheit und Gegenwart genau kennt, wird ihre Fortschritte mit Bewusstsein fordern!" (Only the man who is familiar with the art and science of the past is competent to aid in its progress in the future) (9).

This discussion, therefore, explores the role of tradition in the evolution of neurosurgery by examining the contributions of individual surgeons and specific traditional roles that they played and, in more general terms, considers the importance of tradition to scientific progress.

A neurosurgeon's life and work tend to be dominated by action, and the challenge and excitement of our clinical World of Action, with its aneurysm clipping, removal of acoustic tumors, computer-guided stereotaxis, and enormous progress in investigative neuroscience, occupy most of our intellectual efforts. These activities, however, depend upon a substrate of values, and this World of Values (10) within which we operate depends in no small part on tradition. Traditions influence our knowledge and our techniques. They also influence our professional behavior, providing normative models of action and belief (7). The normative aspect of these traditions of behavior is an inertial force that sets us apart. It was recog-

nized and articulated in the code of Hammurabi and later by Hippocrates (Fig. 3). These formulations of ethics, conduct, and responsibility to society still have meaning for physicians. They survive today in the concept of professionalism in neurosurgery so aptly described by Edmund Pellegrino in his 1983 Cushing Oration (6). In it, Pellegrino highlighted the central "professional" concept of placing the patients' interests ahead of our own.

Inevitably, the evolution of neurosurgery within a traditional framework of values, behavior, and knowledge depended on individuals of talent and vision. (In neurosurgery, we still maintain a custom, long gone from neurology, of describing a colleague by the person with whom he trained.) These individuals have played many roles, as we have after them. All of these roles (e.g., the Surgeon as Innovator, the Surgeon as Technical Virtuoso, the Surgeon as Physiologist, and the Surgeon as Clinical Investigator) have been part of the tradition of neurosurgery and stand as examples of what may be possible for us to achieve. Several roles and role models are of particular pertinence to a consideration of tradition in neurosurgery.

The birth of neurosurgery depended upon the ability of the founders of the field to apply conceptual revolutions in medical science to disease of the nervous system. The basis of Sir William Macewen's (Fig. 4) ability to operate successfully on a meningioma in 1879 was not his skill as a surgeon or even the ability to localize lesions such as tumors and abscesses based on their clinical signs. It was his exposure in Glasgow to Lord Lister and Lister's principles of aseptic technique. Macewen embraced, perfected, and applied these principles to cranial surgery, and they were the foundation of his success. In Germany, Ernst von Bergmann (Fig. 5) was able to influence an entire school of surgical pioneers with the same diligence in applying this new concept of antisepsis.

To those general surgeons who influenced neurosurgery seminally, we may add our predecessors as neurosurgeons who exemplify the Surgeon as Innovator. Harvey Cushing's (Fig. 6) initial successes with surgery of the nervous system were based on his ability to adopt Halsted's new principles of surgery. These included not only antisepsis, but compulsive control of bleeding, uncompromising respect for surgical anatomy, the use of fine silk ligatures rather than gross catgut, and ritualistic attention to proper pre- and postoperative care (Fig. 7). This was a drastic change during an era when the prevailing surgical philosophy was "get in quick, get out quicker."

Walter Dandy's (Fig. 8) innovations provided the theme of the 34th Annual Meeting of the Congress of Neurological Surgeons, and they extend to include neurological diagnosis, unprecedented surgical techniques, and novel concepts of neurological disease. He too owed a great debt both to Halsted's basic surgical principles and to Cushing's influence as the founder of neurosurgery in the United States.

Other examples of the Surgeon as Innovator should be acknowledged: Norman Dott of Edinburgh (Fig. 9), who operated successfully on an intracranial aneurysm in 1931; Cushing, again, when he introduced electrocautery, and Greenwood (Fig. 10) and Malis (Fig. 11), who gave us bipolar cautery; Yasargil (Fig. 12), who is most responsible for the development of microneurosurgery; Guiot (Fig. 13) and Hardy (Fig. 14), who applied microneurosurgery to disorders of the pituitary gland; and many others upon whose skills we depend in our daily work.

This tradition of the Surgeon as Innovator is alive and well. It is a proud part of our past and will be an important part of our future. Anyone who doubts the effects of this steady stream of innovation in neurosurgery need only examine Figure 15, which shows the mortality rate associated with operations for low grade astrocytomas. The steady decline from 20% in 1934 to 2% in 1974 is a dramatic and multifactorial reflection of continuing progress.

Another aspect of the birth of neurosurgery in the 19th century is based on the concept of the Surgeon as Physiologist. Sir Victor Horsley exemplifies this role. His ability to carry on experimental neurophysiology and to apply the results to the surgical management of patients with neurological disease secures his position as one of the founders of neurosurgery. There are many examples of this tradition of the Surgeon as Physiologist. Both Cushing and Dandy (Fig. 16) included in their early surgical careers a period in the Hunterian laboratory of the Johns Hopkins Medical School, and both based much of their clinical work on experimental physiology, investigating cerebral blood flow, intracranial pressure, cerebrospinal fluid circulation, and what we now call neuroendocrinology. Otfried Foerster in Breslau, who elucidated spinal cord physiology, and Wilder Penfield (Fig. 17) in Montreal, who developed an approach for the investigation and surgical management of seizure disorders, are but two of many neurosurgeons who have made fundamental contributions to neurophysiology. This tradition continues in our colleagues who today are actively investigating the regulation of cerebral blood flow, spinal fluid dynamics, neuronal metabolism, neurotransmitters, and higher cortical functions.

Intelligent, capable, well-organized, and affable neurosurgeons have given us a rich tradition of the Neurosurgeon as Organizational Leader. After leaving Johns Hopkins, Cushing became Professor of Surgery at Harvard and Chief of Surgery at the Peter Bent Brigham Hospital. Charles Frazier (Fig. 18) was Dean at the University of Pennsylvania. Loyal Davis (Fig. 19) was Chief of Surgery at Northwestern, President of the American College of Surgeons, and Chairman of its Board of Regents. Major university, medical school, and military administrative posts have been held by Howard Naffziger (Fig. 20) (Regent of the University of California), Barnes Woodhall (Fig. 21) (Dean and Chancellor at Duke University), Winchell Craig (Fig. 22) (Chief of Surgery at Bethesda Naval Hospital with the rank of Rear Admiral), Lyle French (Fig. 23) (Vice-Chancellor at the University of Minnesota), Charles Drake (Fig. 24) (Chairman of the Department of Surgery at the University of Western Ontario, President of the American College of Surgeons, and Chairman of the Board of Regents), Eugene Stern (Fig. 25) (Chairman of the Department of Surgery at UCLA), Thomas Langfitt (Fig. 26) (Chancellor of

the University of Pennsylvania), and William Collins (Fig. 27) (Chairman of the Department of Surgery at Yale), and so this tradition continues.

There are other traditions and other inspiring figures in neurosurgery. One of the most important and sustaining traditions is that of the Surgeon as Educator and mentor for future generations of academic neurosurgeons. This role was pioneered by Harvey Cushing, Charles Frazier, Percival Bailey (Fig. 28), Norman Dott, and Hugh Cairns (Fig. 29), and has been carried on by, among others, Barnes Woodhall, Paul Bucy (Fig. 30), Lyle French, William Sweet (Fig. 31), and Henry Schwartz (Fig. 32). These individuals and their successors in the United States and in other parts of the world, with their dedication to scholarship, have been essential to the continued tradition of excellence that has characterized academic neurosurgery.

As noted earlier, the Surgeon as Pathologist, the Surgeon as Neuroanatomist, the Surgeon as Neuroendocrinologist, and the Surgeon as Clinical Investigator are other roles that are major parts of our tradition. These different roles coalesce to form our World of Values (8) as neurosurgeons. They are our tradition, they set our standards, and none is necessarily beyond the reach of any of us.

In addition to traditions that can be linked to individuals, we share an impressive tradition of scientific knowledge, a set of paradigms (5) that are the basis of new knowledge and that may need to be altered as scientific progress is made (7). Some of us will be fortunate enough to play a role in such modifications of knowledge or even to discover new paradigms, thereby changing the face of neuroscience and creating new traditions of fact and theory.

If one examines the basis of most of the true revolutions in science (4), exemplified by the discoveries of Newton, Galileo, Darwin, and Einstein, one usually finds that they stem not from the so-called "divergent" thinker who has a flash of brilliance, but rather from a worker who has used "convergent" thinking that adheres closely to the scientific paradigms of the time. Such an individual lives with an Essential Tension between the traditional paradigm and the need for an innovative reassessment of the scientific theory upon which it rests (5). The revolutionary scientist usually has been involved in problem solving experiments based on traditional rules and disciplines of science. His genius frequently lies in the recognition of discrepancies or inadequacies of the traditional scientific paradigm in explaining his results. The insight that allows resolution of these discrepancies is rooted first in the intellectual honesty that acknowledges the inadequacy of the paradigm and second in the ability of the individual to be a "role hybrid" who has a flexibility of thought allowing the application of some special knowledge from another area or discipline to the solution of the problem. It is because "Nature tells us one secret in terms of another, and she may refuse to disclose one secret until another has been laid bare" (5) that diligence and insight are so important. Watson and Crick and their discovery of the double helix of DNA are excellent examples of this process. A flexible mind, solid scientific knowledge, uncompromising intellectual honesty, and sustained concentration of thought and effort lie at the root of most important scientific discoveries. The last is a characteristic shared by many of our neurosurgical heroes—an infinite capacity for taking pains. Thomas Carlyle stated: "Genius means transcendent capacity for taking trouble first of all" (2).

It is my hope that the educational traditions of the Congress of Neurological Surgeons may help inspire some of its members to make dramatic discoveries leading to revolutions in neuroscience. Perhaps some others will become neurosurgical

innovators, carrying on the traditions of those who have preceded us. The majority of us, though, should be content in the knowledge that there is great virtue in continuing to do well what has been done before, maintaining the traditions, the skills, and the concepts of patient care that we learned as residents and are constantly trying to perfect and improve. This is no easy task. We are reminded of its challenges by the first aphorism of Hippocrates, so eloquently restated for neurosurgery by Chaucer: "The lyf so short, the craft so long to lerne, Th' assay so hard, so sharp the conquering" (1, 3).

We are among the most fortunate of men: we have our craft, we have our science, we have our traditions to guide us, we have our humanity with which to care for our patients. With these values secure, we can build upon and enhance our traditions, a continuing source of pride and accomplishment.

ACKNOWLEDGMENTS

The author is grateful to his wife, Margaret, and his daughters, Elizabeth, Margaret, Victoria, and Eleanor, who provided support and constructive criticism of this address; to Mrs. Constance B. Hoefl, who expertly prepared many drafts of this manuscript; and to the Congress of Neurological Surgeons for the privilege of serving as President.

Presented at the 34th Annual Meeting of the Congress of Neurological Surgeons, New York, New York, September 30–October 5, 1984.

Reprint requests: Edward R. Laws, Jr., M.D., Department of Neurological Surgery, Mayo Clinic, 200 First Street Southwest, Rochester, Minnesota 55905.

REFERENCES

1. Botterell EH: Kenneth George McKenzie, MD, FRCS, 1923–1963. *Surg Neurol* 17:81–88, 1982.
2. Carlyle T: On heroes, hero-worship, and the heroic in history, in Harrold CF, Templeman WD (eds): *English Prose of the Victorian Era*. New York, Oxford University Press, 1938.
3. Chaucer G: Parliament of fowls, in Fisher JH (ed): *The Complete Poetry and Prose of Geoffrey Chaucer*. New York, Holt, Rinehart and Winston, 1977.
4. Kuhn TS: *The Structure of Scientific Revolutions*. Chicago, University of Chicago Press, 1970, ed 2.
5. Kuhn TS: *The Essential Tension: Selected Studies in Scientific Tradition and Change*. Chicago, University of Chicago Press, 1977.
6. Pellegrino ED: "The common devotion"—Cushing's legacy and medical ethics today. *J Neurosurg* 59:567–573, 1983.
7. Shils E: *Tradition*. Chicago, University of Chicago Press, 1981.
8. Turner TB: The world of values: Reflections on the history of the Johns Hopkins Medical Institutions. *Johns Hopkins Med J* 136:226–230, 1975.
9. Walker AE (ed): *A History of Neurological Surgery*. Baltimore, Williams and Wilkins, 1951, p vi.
10. Whitehead AN: *Essays in Science and Philosophy*. New York, Philosophical Library, 1947.