

## In Memoriam

### Arthur Allen Ward, Jr., M.D. 1916–1997



Arthur Allen Ward, Jr.

Arthur Allen Ward, Jr., Editor-in-Chief of *Epilepsia* from 1976 to 1986, President of the American Epilepsy Society in 1972, and a past member of the Executive Committee of the International League against Epilepsy, died on December 23, 1997. He was 81 years old.

#### CAREER

Dr. Ward was born in Manipay, Sri Lanka (then known as Ceylon), of missionary parents. His early education was at the Kodaikanal School in Southern India. Many of his classmates at that boarding school were also children of missionaries and diplomats. His family's roots, however, were in New England, so at age 15 he entered Deerfield Academy; later, he attended Yale University.

Yale in the 1930s was a center of neurophysiologic research, with John Fulton perhaps the best remembered of the neurophysiology faculty. As an undergraduate, Dr. Ward worked in the laboratory of another prominent neurophysiologist, J. G. Dusser de Barenne. Dr. Ward's first publication, on reflex inhibition of the knee-jerk from distention of several intestinal organs, was derived

from this experience (1), but was only one of a number of Yale experiences that shaped Dr. Ward's future. As he told it, the policy in that laboratory was that undergraduates and visiting scientists worked the night shift during the long primate neurophysiologic experiments. One of the visiting scientists was Percival Bailey, on sabbatical from his position as head of neurosurgery at the University of Chicago. During one of those night shifts, Bailey convinced the undergraduate Ward that he should go to medical school and be trained as a neurosurgeon so that he could undertake neurophysiologic observations in clinical settings in humans. That was a goal Arthur pursued for the remainder of his career, and one he passed on to those of us who trained with him.

Dr. Ward then attended Yale Medical School, receiving his M.D. in 1942. He published his medical school thesis, on the effects of cholinergic drugs on recovery of function after CNS lesions in monkeys, with Margaret Kennard (2). Arthur interned at the Mary Imogene Bassett Hospital in Cooperstown, New York, and then embarked on another experience that had major influences on his later career, a neurosurgical residency at the Montreal Neurologic Institute (MNI). Wilder Penfield was

clearly a role model for Dr. Ward and his future career in epilepsy, but the two men were not very close. However, they published a case report together on calcifying angiomas as a cause of epilepsy (3), and Arthur learned from Penfield the importance of always remaining a gentleman, even in the most trying clinical circumstances, a precept he attempted to transmit to us. At the MNI, Arthur was much closer to Dr. William Cone, who had a significant influence on Arthur's subsequent approach to neurosurgery. Having observed Dr. Cone's mood swings in clinical situations, in later years Arthur often reminded us not to allow the outcome of the last case to influence our clinical judgment excessively.

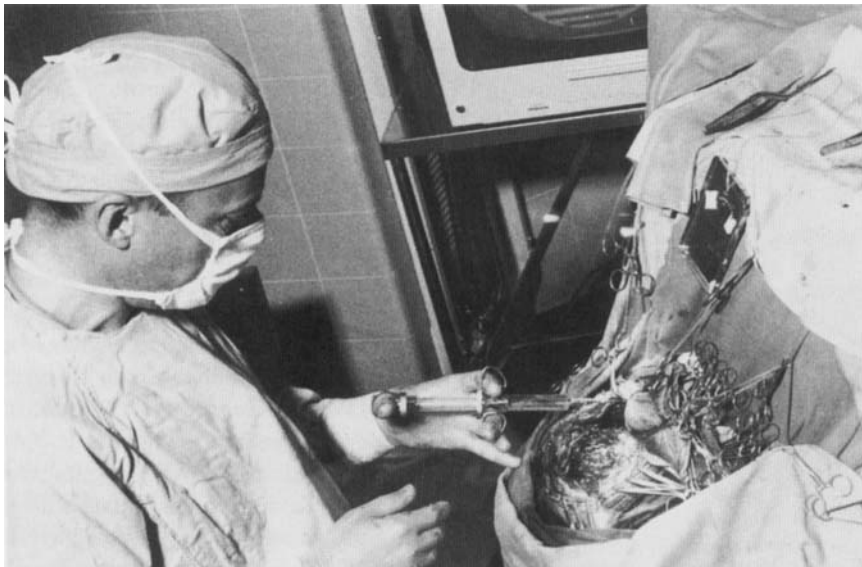
In 1945, Dr. Ward became a research assistant at Bailey's Illinois Neuropsychiatric Institute (INI) in Chicago. He was there for only 1 year, but that year was a significant one. He renewed acquaintances with Warren McCulloch, whom he had known earlier at Yale. Not only did they publish together (4-6) but McCulloch's unique insights into neurophysiology were a continuing influence on Arthur, and McCulloch's unique personality and that of some of the visitors to the INI, most notably the night wanderings of Norbert Wiener (MIT cybernetics) into the Wards' apartment, were the stuff of many of Arthur's subsequent stories. The Chicago year was a very productive one scientifically (4-10). Arthur then joined Glenn Spurling's neurosurgery group at the University of Louisville. Spurling is remembered especially for his lumbar disc surgery. He too had a significant influence on Arthur's neurosurgical judgment and technique (11).

Soon after World War II, the University of Washington in Seattle (UW) established a medical school. The first Professor of Physiology was Dr. Theodore Ruch, from the neurophysiology laboratories at Yale. Research,

as well as clinical and teaching skills, were important considerations in selection of the early faculty. Ruch and Ward had collaborated at Yale (12,13). Thus, despite his youth and inexperience, Ward seemed an appropriate choice for Director of the (one man) Division of Neurosurgery at the new medical school. And so he was. This was the venue for the remainder of his career. The Division prospered and became a Department in 1965. Dr. Ward remained its chairman until 1981. He retired as Professor and Chairman Emeritus in 1986.

### BUILDING A DEPARTMENT AROUND EPILEPSY

Epilepsy played a prominent role in the development of the new Division of Neurosurgery. Dr. Ward's vision for the division included combining basic science research with clinical activities. Epilepsy was a focus for these interdisciplinary activities. Experimental animal models of epilepsy were developed, particularly the model of spontaneous seizures produced by injection of alumina cream into monkey somatosensory cortex. Structural (14,15), electrophysiological (16,17), and behavioral aspects (18,19) of this model were investigated by both basic science and clinical faculty working together in neurosurgery. Neurons in the experimental epileptic focus showed several intrinsic changes, including loss of dendritic spines and burst firing in a highly structured pattern, characteristics that Dr. Ward believed defined an "epileptic neuron" (20). He was always concerned that the experimental epilepsy models parallel the human disease, and this led to his intraoperative investigation of the electrophysiology of the epileptic neuron in humans (21-23), with findings of similar patterns in detailed structure of burst firing in both the alumina model and in humans with epilepsy.



Dr. Ward performing an operation for intractable epilepsy (about 1965).

However, Arthur's interests in the basic mechanisms of epilepsy were quite broad, including conditioning of neurons (if deafferented, as suggested by loss of spines, could their activity be modified?) (19), patterns of neuronal activity in different experimental models of epilepsy (24–26), extracellular potassium levels (27), role of glia (28), effects of local manipulation such as cooling (29), and intracellular changes in tissue slices from experimental and human foci (30). He also encouraged testing of therapeutic approaches in the alumina model, including subcortical lesions, stimulation, and new antiepileptic drugs (31–35).

With regard to his clinical activities, development of an epilepsy clinic and of electroencephalographic (EEG) services were among Dr. Ward's concerns on coming to UW. At a time when medical neurology was not well developed at UW, this required recruiting both a neurologist and clinical electroencephalographer in the Division of Neurosurgery. Dr. Ward remained a major supporter of EEG throughout his career. He was president of the American EEG Society in 1980. Like many of the neurosurgeons of his generation interested in epilepsy surgery, Dr. Ward preferred to operate on a relatively small number of thoroughly evaluated patients. One of his patients published her experiences with successful epilepsy surgery performed by him (36). Each patient also provided him with an opportunity to increase knowledge of basic mechanisms of human brain function and of human epilepsy, in earlier years in studies of bursting "epileptic" neuronal activity in humans and later in supporting intraoperative studies of the neurobiology of cognitive processes (37).

To support these basic and clinical research activities, Dr. Ward actively sought National Institutes of Health (NIH) support, at a time when this was not popular with some senior neurosurgeons. Arthur was soon involved in many NIH advisory committees; this culminated in his appointment to the NINDS advisory council from 1975 to 1979. The NIH initiative in the early 1970s in developing comprehensive epilepsy centers provided Arthur an opportunity to expand the clinical services for epilepsy. After winning one of the early contracts, he also



Arthur and Janet at the International Epilepsy Congress in Kyoto, Japan in the early 1980s.

had to overcome resistance from the UW administration to establish the new Comprehensive Center, for that was a time of economic downturn in Washington State and of a rigid "no-growth" policy at UW. Once established, the new Center allowed expansion of clinical research, particularly into the study of new antiepileptic drugs (38). Dr. Ward was actively involved in the dissemination of epilepsy research. In addition to his role as editor-in-chief of *Epilepsia*, he was one of the organizers, with Dr. A. Pope and Dr. H. Jasper, of a 1969 symposium on the basic mechanisms of the epilepsies (39) and its 1986 sequel (40). The research from his department related to epilepsy was summarized in a 1980 volume: *Epilepsy, A Window to Brain Mechanisms* (41). He was also one of the organizers of the Society for Neuroscience.

Dr. Ward also had active clinical and research interests outside the field of epileptology. Some of these were derivatives of his epilepsy interests, particularly studies of the bursting neuronal activity that characterizes the pathophysiology of trigeminal neuralgia and deafferentation pain (42,43). He investigated the neurophysiology of the basal ganglia and thalamus in both experimental and clinical settings, with a particular interest in thalamotomy for dyskinesias (5,44–46), including developing his own human stereotaxic instrument, the Ward Planisphere. He had a long-standing interest in the pathophysiology and pathopharmacology of head injury (47–49) and in the function of the cingulate gyrus (50,51). With Eldon Foltz, he provided one of the early descriptions of hydrocephalus, including that of normal pressure hydrocephalus after subarachnoid hemorrhage (52). In recognition of his neurosurgical research accomplishments, Dr. Ward was the first recipient of the Grass Prize for Meritorious Research of the Society of Neurological Surgeons.

Dr. Ward was also active in many neurologic and neurosurgical societies outside the field of epileptology. He was President of the American Academy of Neurological Surgery in 1977 (53), of the Society of Neurological Surgeons in 1974, and of the Western Neurosurgical Society in 1967. He was a First Vice President of the American Neurological Association (1973) and Vice President of the World Federation of Neurological Societies from 1981 to 1985. He was Chairman of the Editorial Board of the *Journal of Neurosurgery* for 1971 and 1972 and a Director of the American Board of Neurological Surgery.

When Dr. Ward first arrived in Seattle, there were only medical students to teach and only a single hospital, Harborview (then known as King County Hospital), partly staffed with volunteer faculty. With considerable effort, both a Veterans Administration (VA) hospital and a university hospital were developed, the latter with a specialized neurosurgical operating room designed to Dr. Ward's specifications (which is still used). A neurosur-

gical residency was established by the mid-1950s, providing training opportunities for a number of us who have gone on to academic neurosurgical careers. Fellows and medical students were part of the laboratory from the beginning. Dr. Ward had an interesting approach to these trainees, often telling them all the reasons their proposed project wouldn't work and then providing them with all the resources to prove him wrong. As the neurosurgical faculty grew, he demonstrated his abilities to manage in a collegial environment: He was clearly the chief but always sought advice and preferred (and was very good at) consensus decision making.

### INTERESTS OUTSIDE THE FIELD OF MEDICINE

One of the additional consequences of Dr. Ward's Yale experiences was an introduction to the students at nearby Smith College, where he met Janet Miller, his wife of five and a half decades. Arthur and Janet, for socially one always thought of them together, had many interests apart from medicine. They had two daughters, Sally and Lindy, and two grandchildren, on whom Arthur doted.

Arthur loved excitement. He had a series of sports cars, including an XKE Jaguar, that he drove with gusto, and often tuned himself. He was an avid skier, though some of us were not sure that he had ever learned to turn: straight down the hill was his preferred way. His skiing experiences also demonstrated that you could operate while on crutches, waiting for the several-times-fractured tibia to heal (again). After the first of these demonstrations, John Fulton wrote Arthur (April 11, 1949):

There are two forms of lunacy in which some of my best friends indulge; one is golf and the other, skiing. I am terribly sorry to hear that you have broken both bones in one leg and I can only hope that this may convince you of the wisdom of my deductions. The cingulate is far more interesting than a wretched ski trail—and much more devious!

However, Arthur enjoyed both the cingulate and ski trails; the tibia still had two fractures to go. Arthur was also an avid boater; the boating outings too produced some hair-raising stories. In later years, he took up golf, perhaps with more enthusiasm than accuracy. Many of us particularly remember Arthur's impromptu piano playing, which often brought to a pleasant close faculty retreats and Christmas parties at his home, and the plaid pants he often wore on such occasions.

When Arthur retired, he gave up his clinical and research activities completely. However, he and Janet remained very active. In addition to continuing boating and golf, and a bit of investment advising, they traveled extensively. This past summer, although Arthur was in his 80s, they cruised the canals of France, spent a month



Arthur and Janet on their boat in 1996.

cruising the Pacific Northwest on their boat, and visited the Eastern Mediterranean. Arthur lived a vigorous and full life nearly until its end and leaves significant contributions to research, teaching, and patient care. He is remembered at the University of Washington with a professorship in Neurological Surgery named in his honor.

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