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1998 AATS SCIENTIFIC ACHIEVEMENT AWARD RECIPIENT—NORMAN E. SHUMWAY, MD, PHD

The American Association for Thoracic Surgery established the AATS Scientific Achievement Award in 1994, and John W. Kirklin, MD was the first awardee in 1995. At the 1998 AATS meeting in Boston, President Floyd D. Loop presented the second AATS Scientific Achievement Award to Norman E. Shumway from Stanford University Medical School. Dr Shumway was the president of the AATS in 1987.

Dr Shumway's accomplishments in cardiovascular surgery cover many parts of the discipline, but he perhaps is most widely renowned as the father of clinical heart transplantation. Even though he did not perform the first successful heart transplant in a human being, his experimental work in the laboratory going back to 1958 and his subsequent tenacity, diligence, and perseverance ultimately paved the way for the widespread clinical acceptance of cardiac transplantation. Interested observers from that early era, however, can recall that the road to eventual success was not completely smooth. A frenzied burst of activity in cardiac transplantation soon took place around the world, and despair in the early 1970s after discouraging early clinical results spawned plangent cries of protest and even outrage in the lay press (including the cover of *Life* magazine) and the medical community; all of this out-

cry nearly brought heart transplantation to a premature demise. Quiet, persistent effort by Shumway and his transplant team at Stanford ultimately turned this situation around.

Dr Shumway comes from humble Midwest roots. He was born on February 9, 1923, in Kalamazoo, Michigan. He completed one year of pre-law education at the University of Michigan before being drafted into the army in 1943. After completing basic training at Camp Wolters in Mineral Wells, Texas, he was sent to the John Tarleton Agriculture Junior College in Stephenville, Texas, for engineering training. At the end of 6 months, he was given an army medical aptitude test. The final question on the examination asked: "If you were to pass this test, would you prefer a career in medicine or dentistry?" He marked the box marked "medicine," and the rest is history.

Dr Shumway thus enrolled in the Army Specialized Training Program, which consisted of an accelerated nine-month pre-medicine preparatory course at Baylor University in Waco, Texas, and medical school at Vanderbilt University, from which he graduated in 1949. Dr Shumway completed an internship and one year of residency training in surgery at the University of Minnesota with Dr Owen Wangenstein before again being drafted into the air force in 1951, where he served as a flight surgeon in Lake Charles, Louisiana. He subsequently returned to the University of Minnesota to finish his surgical residency training and begin his research career. Those were exciting pioneering days at the University of Minnesota, and Dr Shumway developed an intense interest in cardiac surgery during these years of training with Dr C. Walton Lillehei and Dr F. John Lewis. It was here in Minneapolis that he purportedly came up with the aphorism, "The only hard thing about cardiac surgery is getting to do cardiac surgery." Apparently, the residents in Lillehei's unit in those years were not allowed to get too close to the action due to the many attending surgeons who were scrubbed.

After 6 weeks in private practice in Santa Barbara, Dr Shumway was invited by Dr Victor Richards to join the Stanford University surgical faculty on February 1, 1958. The Stanford University Hospital was located in San Francisco at that time, and Dr Frank Gerbode was chief of Cardiovascular Surgery; this arrangement made surgical referrals to this young, rather outspoken cardiac surgeon from Minnesota quite sparse. Soon, however, the new Stanford University Medical Center was built on the main campus in Palo Alto, where Dr Shumway started the Cardiovascular Surgery program in January 1960.

Shortly after his arrival at Stanford in 1958, Dr Shumway began a variety of research studies. Building on the total body hypothermia work by F. John Lewis at Minnesota, he devised a simple method of cooling

only the heart ("topical myocardial hypothermia"), an advance that helped revolutionize cardiac surgery since the early work with cardioplegia in that era by Melrose and others was all too often associated with hearts that stayed depolarized forever. Dr Shumway opined that topical hypothermia "provided plenty of time for any procedure we cared to do. From then on, we were only limited by our imagination, rather than by the fear that the heart would not beat again." Applying his imagination to the problem of transposition of the great vessels, Dr Shumway and Richard Lower investigated a technique using elective cardiac arrest whereby the heart could be completely excised and then placed back into the circulation with maintained viability. Early success with this biatrial technique of cardiac replacement in animal studies set the stage for human cardiac transplantation. Over a ten-year period of animal experimentation, Dr Shumway and his Stanford colleagues perfected the technical details and systematically investigated and documented the clinical, physiologic, and pathologic events following orthotopic cardiac autotransplantation and later with allograft hearts in immunosuppressed animal hosts. On November 20, 1967, Dr Shumway proclaimed that the time was right to proceed with human cardiac transplantation; apparently, one of the foreign research fellows who previously had visited Lillehei's unit in Minnesota when Shumway was there was listening, and Dr Christiaan Barnard went ahead on December 3, 1967. Dr Shumway performed the world's fourth human heart transplant (if one considers Hardy's pioneering 1964 xenograft attempt as the first) on January 6, 1968. Based on the knowledge acquired from the perseverance of the Stanford program, almost 50,000 cardiac transplants now have been performed at over 300 centers world wide. In addition, the clinical application of combined heart-lung transplantation was introduced in 1981 by Bruce Reitz and Shumway. Single- and double-lung transplantation, and living-related lung transplants followed.

Dr Shumway's innovative cardiac surgical research contributions were not limited to transplantation. He and the young surgical residents working in the laboratory in the early 1960s also explored using homograft valves for cardiac valve replacement, and the early clinical stented homografts in the aortic or mitral position were mounted on the SAC (Shumway-Angell-Cutter) stent. Indeed, as Donald Ross freely admits today, Shumway and one of his residents named Cree Pillsbury first performed pulmonary autograft aortic valve replacement operations (or the "Ross procedure") successfully in dogs in 1964 before Ross's

intrepid first clinical application. Shumway also made major contributions to the surgical treatment of congenital abnormalities in the 1960s, including a published series of 100 children undergoing total correction of tetralogy of Fallot without operative mortality. His aversion to condemning patients to indefinite warfarin anticoagulation after valve replacement and his encouragement of others led to development of the Hancock glutaraldehyde-preserved porcine xenograft bioprosthetic valve and the Angell-Shiley bioprosthesis. In the 1960s, when some surgical authorities were still arguing for medical treatment of patients with *acute* type A aortic dissections, his indomitable “just keep operating” spirit was responsible for the advent of successful emergency surgical repair of the ascending aorta in these patients. In 1970 the Stanford type A/B classification system for dissections was put forth, and indeed he and his colleagues even suggested that selected patients with acute type B dissections would benefit from early operation. A few years later in 1975, a young Stanford faculty member, Randall B. Griepp, introduced the clinical feasibility of replacing the entire transverse aortic arch using profound hypothermic circulatory arrest, which soon opened up new surgical vistas to cardiovascular surgeons interested in challenging thoracic aortic problems. Finally, in 1992 the successful clinical introduction of endovascular stent-grafts to treat descending thoracic aneurysms emanated from Shumway’s department at Stanford, which was followed by the use of stent-grafts for patients with complicated acute type B aortic dissections.

In 1965 Dr Shumway was appointed chief of the Cardiovascular Surgery Division, and in 1974 he successfully negotiated academic and financial separation of his small group from the Department of Surgery when the Department of Cardiovascular Surgery was formed. Shumway served as chairman of the Department of Cardiovascular Surgery until 1993. He was president of The Western Thoracic Surgical Association in 1979, president of The American Association for Thoracic Surgery in 1987, and was elected honorary president for life by the International Society of Heart and Lung Transplantation in 1980. He has received a host of honorary degrees and fellowships in learned societies and has been honored with many awards, including both the Flance-Karl Award and the Medallion for Scientific Achievement from the American Surgical Association, the American Medical Association Scientific Achievement Award, and the Trustees Medal for Distinguished Achievement from the Massachusetts General Hospital. American Heart Association awards include the Gold Heart Award,

Glenn Lectureship, and Research Achievement Award. He also is the recipient of the Medal of the City of Paris, the Medawar Prize from The Transplantation Society, the first recipient of the Texas Heart Institute Medal, the Michael E. DeBakey Award from the Michael E. DeBakey International Surgical Society, the Distinguished Alumnus Award from Vanderbilt University, and the Outstanding Achievement Award from the University of Minnesota.

It was in the 1960s and 1970s that Shumway’s forward thinking in terms of surgical resident education and training earned him the enmity of many prominent surgeons serving on the American Board of Surgery and American Board of Thoracic Surgery. This point of contention, his shyness and humble nature (which prompted him to minimize trips on the national speaking circuit), and Shumway’s innate irreverence and iconoclastic spirit perhaps all had something to do with what was widely construed at the time to be a maverick or outlaw school of surgical thought. Shumway had always believed that inquisitive young minds should not spend up to 10 years in residency before applying their energies to their chosen field of endeavor. At Stanford, he identified promising candidates early on (in their medical school years or during internship) and then subsequently alternated them through rotations on Cardiovascular Surgery and General Surgery while minimizing the years spent in General Surgery. Before 1977, many of his residents actually finished their cardiac surgical training before their chief resident year in General Surgery (which produced a windfall of experienced talent for the General Surgery attendings). On the other hand, this unorthodox approach predictably led to serious obstacles for some of his trainees when it came time to apply for the Board examinations. One of Shumway’s most notable residents, Edward Stinson, performed a human heart transplant before he had ever seen or scrubbed on a hernia operation. Shumway believed that young trainees should be able to exercise their creative intellectual capabilities earlier in their careers. It was more than 25 years later, however, that the leading authorities in thoracic surgery education changed their philosophy and attempted to reduce the number of years spent doing general surgery before entering residency training in cardiothoracic surgery. It turned out that Shumway was just way ahead of the times.

Throughout Dr Shumway’s long teaching career at Stanford, he insisted that the residents actually perform the operations as surgeon and not just assist; he has been wont to say, “I might not be the best surgeon in the world, but I certainly must be the best first assistant.” Of all of his accomplishments, the training of an

entire generation of accomplished cardiac surgeons may be the one he treasures most. He always strived to maintain an environment that was "friendly to learning" and has been known to quip, "After someone visits Houston, they leave thinking that only Cooley or DeBakey could do those cases, whereas after a visitor leaves Stanford, they are convinced anybody could do those cases." Shumway is also proud of his axiom that he never hired a junior faculty member who was not at least as smart or as talented as he was, and in fact preferred those who were even better and smarter than he. This policy certainly was not the norm around the

country in those early years, and similar examples are only rarely found today.

Dr Shumway is an intelligent, imaginative, and sagacious surgeon who possesses a truly pioneering spirit and an unquenchable yearning to teach. He has been blessed with the innate qualities that make for strong and visionary leadership. Through his skill, dogged dedication, and courage, Dr Norman Shumway has had a monumental influence on the growth and development of cardiac surgery as we know it today.

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