The most recent surgeon to receive the Nobel Prize in Medicine is Joseph E. Murray, MD. On December 23, 1954, he performed the first successful human renal transplantation between identical twins. It was this accomplishment, furthered by his eventual perfection of the technique, for which he won the Nobel Prize in 1990. However, this achievement represents only a fraction of Murray’s accomplishments during his long career.

He was born in Milford, Mass, 30 miles southwest of Boston, in 1919. His father was a lawyer and district court judge, and his mother was a teacher. His parents had a strong influence on his pursuit of education as well as his desire to serve others. Although he nurtured a deep love of science, his undergraduate work at the College of the Holy Cross focused primarily on languages (Greek, Latin, and English) and philosophy. He felt he would have ample opportunity to study science in medical school.

The 4 years spent at Harvard Medical School were an enriching time in Murray’s life. He also lived a full life outside of his studies and his responsibilities in the hospital. He spent his free time attending the Boston Symphony, playing squash, and singing in a weekly music group. It was in the last months of medical school that he met his future wife, Virginia “Bobby” Link, a music student at the time. They dated over the following 2 years and married in June 1945.

Murray’s interest in transplantation began during his military service in World War II. After completing a 9-month surgical internship at the Peter Bent Brigham Hospital, now known as the Brigham and Women’s Hospital, and with the rank of First Lieutenant, he was assigned to Valley Forge General Hospital while he awaited an overseas assignment. Valley Forge was a major plastic surgical center at the time, and he was intrigued by the results of the reconstructive procedures on soldiers who had sustained battle injuries. He spent all of his available time on the plastic surgical wards assisting in patient care and learning as much as possible about wound healing and reconstructive surgical techniques. COL James Barrett Brown, the chief of plastic surgery, was so impressed by Murray’s dedication that he successfully petitioned for Murray to remain stateside to continue his work at the hospital.¹

Among the more common injuries Murray encountered were burns, especially to aviators. Murray subsequently became intrigued by the process of skin grafting. In patients with extensive burns, where no autograft was available, skin allografts were used with variable success. The seemingly capricious nature of skin

Author Affiliations: Department of Surgery, Grady Memorial Hospital and School of Medicine, Emory University, Atlanta, Ga.

H. Murray was fascinated by organ transplantation. The reason for tissue rejection was not clear at the time because much of the research on this subject would not be performed for years. His mentor, Colonel Brown, also had an interest in skin graft rejection and theorized that a graft from a donor who had a close genetic relationship to the recipient was less likely to be rejected. This theory was supported when Brown performed a cross graft with monozygotic twins in 1937. These early experiences with skin transplantation formed the basis for Murray's interest in solid organ transplantation.

Following his discharge from the Army in November 1947, Murray returned to the Peter Bent Brigham Hospital to complete his surgical residency. During this time, he spent 6 months at the Memorial Sloan-Kettering Cancer Center on the head and neck service, which would provide the foundation for his future work in plastic surgery. Following his residency, Murray needed an additional year of plastic surgery training to qualify for board certification. He spent half of that year at what was then New York Hospital with Herb Conway and the other half under Bradford Cannon at 2 Boston Veterans Administration hospitals.

After a brief period of time in private practice, he became a faculty member at the Peter Bent Brigham Hospital where the Department of Surgery was led by the legendary Francis Moore. There, Murray worked in both plastic surgery and renal transplantation surgery. Solid organ transplantation was a natural career progression given Murray's experience in the military and allowed ample opportunity for answering his questions about rejection.

When Murray arrived at the Brigham, he received motivation and support for performing a successful renal transplantation from Francis Moore's leadership and the pioneering work of such surgeons as David Hume, the director of the renal transplantation program at the time, and Charles Hufnagel, then a research fellow. Hufnagel performed the first renal transplantation at the Brigham in 1945. The kidney was anastomosed to the brachial vessels of a patient with acute renal failure resulting from multiple obstetrical complications. The kidney never became significantly functional, and the patient ultimately recovered on her own.

It was Murray's understanding of skin grafting and the rejection process that would ultimately lead to the first successful transplantation in 1954. In the years leading up to the transplantation, Murray devoted much of his time to perfecting the technique in dogs. He published many articles on his findings and the clinical manifestations of the rejection process. The opportunity to attempt the operation in a human arose when a patient was referred to the hospital after developing what was later discovered to be diffuse chronic glomerulonephritis. Fortuitously, this patient was a monozygotic twin, which allowed Murray to transplant a genetically identical kidney. Prior to the renal transplantation, and to ensure a genetic match, Murray performed a successful cross skin graft between the 2 brothers.

After the match was confirmed, only the ethical questions remained. In his Nobel lecture in 1990, Murray illustrated the magnitude of the moment by saying, "For the first time in medical history, a normal, healthy person was to be subjected to a major surgical operation not for his own benefit." To gain support and a broad perspective of the issues at hand, the administration and surgical staff at the Peter Bent Brigham Hospital discussed these issues with as many members of the community as possible, including clergymen of different faiths, local business people, and members of the local and national medical community. Finally, on December 23, 1954, many years of hard work came to fruition with the first successful human renal transplantation. Murray was 35 years old at the time. The transplanted kidney functioned as hoped, and the improvement in the patient's renal and cardiopulmonary status was substantial. The graft remained functional for nearly 8 years until the original renal disease recurred in the transplanted kidney, leading to the patient's death.

Murray was not alone in his endeavors. Many other scientists were addressing similar questions. It was his passion for combining clinical and laboratory science, however, that set the foundation for many professional and personal relationships, which would become important for his continued clinical success. The development of immunosuppressive drugs by people such as Sir Peter Medawar, Robert Schwartz, William Dameshek, Sir Roy Calne, George Hitchings, and Gertrude Elion allowed for a significant improvement in graft survival. In the mid 1950s, only 1 in 12 kidneys were viable at 3 months, but by 1965, the 1-year survival rate had improved to an incredible 80%. During these years, Murray's accomplishments in the field of transplantation included performing the first dizygotic twin transplantation in 1959, the first living unrelated transplantation in 1961, and the first cadaveric unrelated transplantation in 1962.

Later in his career, while continuing to lead the field of transplantation, Murray also worked in the field of medical ethics. Murray's success with renal transplantation had opened a new debate regarding the definition of death. In 1967, Norman Shumway noted that if brain death could be legally recognized, heart transplantation would be justifiable in certain patients. In that same year, a committee was formed at Harvard Medical School to explore the concept of brain death. Members of that committee included Murray, the neurosurgeon William Sweet, the neurologist Raymond Adams, and several other physicians and ethicists. The brain death criteria written by that committee are still in use today and were included in the Uniform Determination of Death Act in 1981.

Murray continued to lead the transplantation service at the Brigham until 1971, when he requested that the leadership be passed to Richard Wilson. He has spent the remainder of his career making advancements in plastic surgery, most notably in the techniques of facial corrective surgery. Today, he continues as faculty emeritus at Harvard Medical School and spends his free time with his wife, 6 children, and 15 grandchildren. Murray's career has lasted longer than 6 decades and has resulted in the expansion of both transplantation and plastic sur-
gery. During this time, his monumental accomplishments included performing the first successful living-donor and cadaveric renal transplantations, helping define brain death, and developing improvements in craniofacial surgical techniques.

There are at least 2 vital lessons to be learned from Murray's career, both addressed in recent years by Murray himself. First, medical institutions providing support to their individual scientists is imperative to continuing the advancements that have been made in the past century. In an interview at the time he received the Nobel Prize, Murray stated that the support of the chiefs of service at the Brigham, especially Francis Moore, was crucial to his success with organ transplantation. Second, collaboration between clinical surgeons and basic scientists is a useful model that should continue to be championed today. Murray wrote, "It is absolutely essential for medical progress that dedicated clinical surgeons and scientists understand and work with scientists of other basic disciplines. It is a simple fact that basic scientists cannot be surgeons, so it is essential that surgeons be scientists."9

Accepted for Publication: September 30, 2004.
Correspondence: Christopher J. Dente, MD, Rm 307, Glenn Memorial Bldg, School of Medicine, Emory University, 69 Jesse Hill Jr Dr, Atlanta, GA 30303 (cdente@emory.edu).

REFERENCES