



*W. W. King*

## WILLEM J. KOLFF

1911–2009

Elected in 1989

*“For innovative and unique artificial organ research and for leadership in bringing advanced engineering concepts to artificial organ design, construction, and implantation.”*

BY LAURA GUNDRY  
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WILLEM J. KOLFF, widely considered the father of the field of artificial organs, and University of Utah distinguished professor emeritus of bioengineering, surgery, and medicine, passed away on February 11, 2009, at the age of 97, in Newtown Square, Pennsylvania. Dr. Kolff invented the kidney dialysis machine and was instrumental in the development of the intra-aortic balloon pump, membrane oxygenator, artificial heart, and artificial eye.

Dr. Kolff based his highly productive research career on collaborative research because he believed it to be the most effective way of achieving his goal of developing and exploiting the possibilities of artificial human organs as a means to “restore people to an enjoyable existence.”

Due to his groundbreaking work on the artificial kidney, millions of patients worldwide have benefited from life-sustaining hemodialysis. His artificial heart is still in use, in subsequent designs, as a bridge to transplantation in patients with heart failure. Dr. Kolff’s broad vision inspired his colleagues to explore a wide variety of organs—an effort that contributed to pioneering research on such other artificial devices as the lung, placenta, ear, arms, and legs.

Dr. Kolff was born on February 14, 1911, in Leiden in the Netherlands. He received his medical degree at the University of Leiden Medical School in Holland in 1938. He received his Ph.D. at the University of Groningen in Holland in 1946. As a young physician in the Netherlands before World War II, he developed an interest in the artificial kidney when he witnessed the death of a young man due to kidney failure. In 1939 he began developing the first crude artificial kidney by finding parts and materials from a local factory in Nazi-occupied Holland. By 1942 he developed a prototype machine, and three years later the first patient was saved by an artificial kidney.

After the war, Dr. Kolff and his family immigrated to the United States in 1950, and he joined the Cleveland Clinic in Ohio as a researcher. At Cleveland he turned to the study of cardiovascular problems. His first work on an artificial heart began in 1957. He built one of the first heart-lung machines, a device that made open-heart surgery possible for the first time. He also improved his dialysis machine. The first membrane oxygenators were used successfully in patients in 1955.

In 1967, Dr. Kolff went to the University of Utah, where he headed the Institute for Biomedical Engineering and the Division of Artificial Organs. He continued his work on the artificial heart, and in 1982, under his supervision, the first "permanent" artificial heart was implanted into Seattle dentist Barney Clark at the University of Utah Hospital. Clark survived four months. When he died, the artificial heart was still functioning. The feat put the University of Utah at the forefront of artificial organ research and made Dr. Kolff and his team international medical celebrities.

Dr. Kolff's presence at the University of Utah acted as a magnet to attract scientists from all over the world who were interested in artificial organ research, and under his leadership the university has since developed one of the world's leading artificial organ research centers. Although he officially retired in 1986, Dr. Kolff continued to work as a research professor and director of the Kolff Laboratory at the University of Utah until 1997.

During his lifetime, Dr. Kolff published numerous books and more than 600 papers and articles, was inducted into the Inventors Hall of Fame in 1985, and received hundreds of awards. In 1990, *Life* magazine named him one of the 100 most important Americans of the 20th century. He was elected to the National Academy of Engineering in 1989. He also received the 2002 Albert Lasker Award for Clinical Medical Research, one of the highest honors in American medicine, as well as more than 12 honorary doctorates from universities all over the world.

Dr. Kolff once told a reporter that his mind rarely took a rest from the mechanics of medical device designs and how they could save or improve lives. "I nearly always do something. I can't bear to just lie in the sun. It would drive me crazy," he said. Dr. Donald Olsen, a former colleague and director of the Utah Artificial Heart Institute, said Dr. Kolff's work influenced most of those working today in artificial organs research. He said many worked either in Dr. Kolff's lab or with him on site. Dr. Olsen also said that Dr. Kolff had the ability to "recognize new technologies and find an immediate application to his own research. He also recognized talent, so that over the years he developed a tremendously important team of researchers."

His son Jack wrote:

As a father, he was an active family man. He spent summer vacations with his family traveling through the United States pulling a home-made trailer holding a boat, camping gear, and compartments to hold personal gear for each of his five children and their various friends. Any other free time was spent on the family's 125-acre tree farm, one hour outside of Cleveland, where many a Cleveland Clinic resident or fellow joined the family for painting, planting or chopping wood in exchange for hamburgers and hotdogs.

Dad always tried to reserve time for his family and openly criticized medical meetings or conferences that were scheduled on weekends. As an antidote, he would frequently include one or two children on selected medical travels where they would enjoy the local area

while he attended the meeting. Saturday evenings he would engage in family board games or card games and Sunday spring mornings were reserved for early bird walks.

He encouraged all of his children to pursue their own careers, yet three of them followed him into medicine and one into medical architecture.

Dr. Kolff is survived by four sons, Jack, Kees, Albert, and Therus; one daughter, Adrie Burnett; 12 grandchildren; and 6 great-grandchildren.

