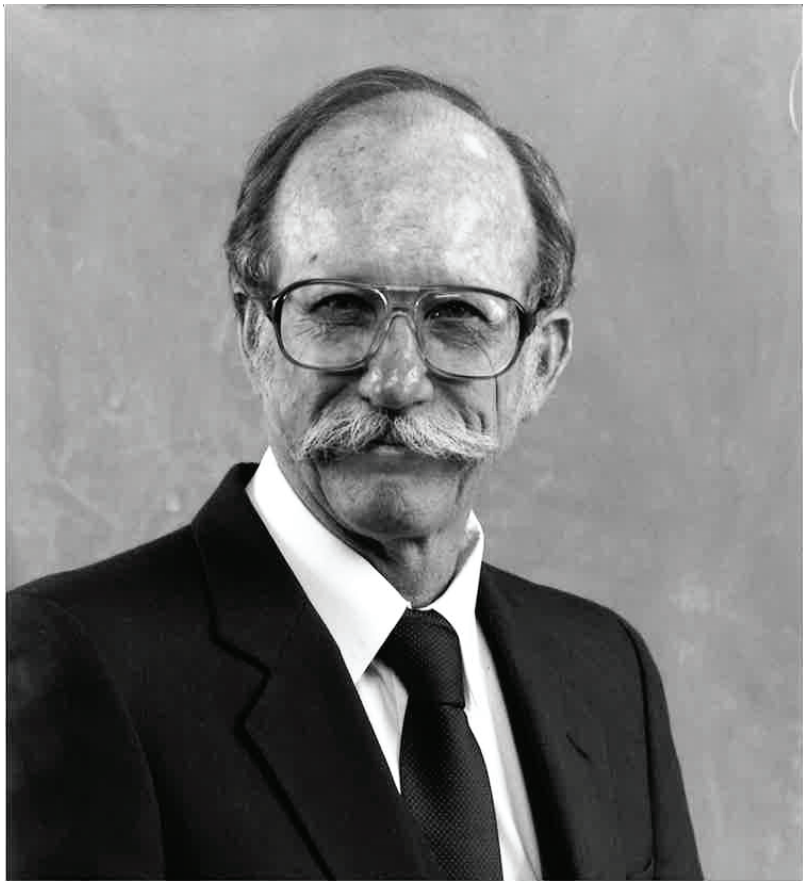

J. DAVID HELLUMS

1929–2016

Elected in 1998

"For the application of biofluid mechanics and cellular engineering methods to biological research and education."

BY LARRY V. McINTIRE

JESSE DAVID HELLUMS, the A.J. Hartsook Professor Emeritus in Bioengineering and in Chemical and Biomolecular Engineering at Rice University, died June 26, 2016, at age 86.

He was born to Fannye May (née Beauchamp) and John Verrell Hellums on August 19, 1929, in Stamford, Texas, and raised in nearby Rotan. He attended the University of Texas in Austin and received a BS in chemical engineering in 1950. After spending 6 years as a process engineer for Mobil Oil and in the US Air Force, he resumed his studies in chemical engineering at the University of Texas (MS, 1958) and then the University of Michigan (PhD, 1961), where he worked with Stuart Churchill.

David joined the faculty of chemical engineering at Rice University in 1960 as an assistant professor and remained there for his entire career. He became an associate professor (1965), professor (1968), department chair (1970–76), director of the Biomedical Engineering Laboratory (1968–80), and dean of the George R. Brown School of Engineering (1980–88), and in 1988 he was named the A.J. Hartsook Professor of Chemical Engineering and later also of bioengineering. He held concurrent appointments, until his retirement in 1998, as adjunct professor of medicine at Baylor College of Medicine

(from 1968) and at the University of Texas Medical School in Houston (from 1973).

David Hellums was a pioneer in the application of quantitative chemical engineering analysis to important problems in cardiovascular medicine and one of the true founders of what is now called cellular engineering. His early studies on the mechanisms of individual red cell hemolysis in artificial heart valves provided basic design guidelines for combinations of fluid stress magnitude and exposure times that need to be avoided in blood-contacting devices in patients because they lead to red cell damage.[1]

Human blood platelets play a crucial role in arterial thrombosis, the cause of heart attacks and stroke, the largest cause of death in the Western world. David and his colleagues at the Texas Medical Center demonstrated that shear stresses associated with blood flow in many medical devices and stenotic arteries play a vital role in platelet activation and receptor expression.[2] These studies identified the significant role of von Willebrand factor in arterial thrombosis and the formation of platelet emboli under flow, leading to important new ways of thinking about therapeutic approaches.

David and his students also made seminal contributions to quantitative knowledge of oxygen transport in microcirculation,[3] using a single-cell-level approach that combined computational modeling with complex well-controlled in vitro experiments. These studies enhanced understanding of resistances to mass transfer at the micron scale in capillary beds, leading to important applications in several pathologic states, including sickle cell anemia, and in the evaluation

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[1] Leverett LB, Lynch EC, Alfrey CP, Hellums JD. 1972. Red blood cell damage by shear stress. *Biophysical Journal* 12:257–65.

[2] Moake JL, Turner NA, Stathopolos NA, Nolasco LH, Hellums JD. 1986. Involvement of large plasma von Willebrand factor (VWF) multimers and unusually large forms derived from endothelial cells in shear stress induced platelet aggregation. *Journal of Clinical Investigation* 78:1456–61.

[3] Hellums JD. 1977. Resistance to oxygen transport in capillaries relative to that in surrounding tissue. *Microvascular Research* 13:131–36.

of proposed blood substitutes such as chemically modified hemoglobin and artificial red cells.

David was one of the first engineers to be honored with the National Institutes of Health MERIT Award (1986–97), a 10-year award given to investigators for exceptional research contributions and productivity. He also served on the Cardiology Advisory Committee of the National Heart, Lung, and Blood Institute (1987–91). The Biomedical Engineering Society awarded him the Whitaker Foundation Distinguished Lectureship in 1993. He was elected to the National Academy of Engineering in 1998 and was a fellow of the American Institute of Chemical Engineers and a founding fellow of the American Institute for Medical and Biological Engineering.

David loved life and lived it to the full. When he was in Austin at UT he met the love of his life and soulmate, Marilyn Biel; they married in 1957. They both loved sailing, particularly along the Texas Gulf Coast, and delighted in leisurely multiday excursions along the beautiful bays and channels with family, friends, and wonderful food. Magnificent sunsets provided an exceptional backdrop to the conviviality on board.

In addition to attending several America's Cup Races, including those in New Zealand, Spain, and San Francisco, they loved international travel and learning about different cultures, and developed a special fondness for Japan. They spent sabbatical years at Cambridge University (1966–67), Imperial College London (1974–75), Tokyo Institute of Technology (1989), and University of Tsukuba (1995). In 1997 David was named eminent scientist at the Institute of Physical and Chemical Research (RIKEN) in Wako, Japan.

David was a dedicated tennis player into his 80s. His style of play could be disarming, as he would appear to be tired, and then hit a hard left-handed topspin forehand zipping past his opponent for a clean win.

David is survived by Marilyn, sons Mark William (Joyce) and Jay David (Julia), and five grandchildren. He was preceded in death by son Robert James, who died of a congenital heart defect. This family tragedy was an underlying motivation for David's lifelong interest in cardiovascular research.