John Leask Lumley

November 4, 1930 – May 30, 2015

John Leask Lumley, the Willis H. Carrier Professor of Mechanical and Aerospace Engineering at Cornell University, died in Ithaca on May 30, 2015 of a brain tumor. It is widely believed that his contributions to fluid mechanical turbulence were among the most significant in the second half of the twentieth century.

John Lumley was born November 4, 1930 in Detroit, Michigan. His parents were immigrants, his father from England and his mother from Scotland. John’s father, Charles Swain Lumley was an architectural engineer, and instilled in him a deep appreciation of good design. His mother, Jane Leask Lumley, was the likely source of his extensive repertoire of British aphorisms with which he occasionally sprinkled his conversations.

John enrolled in Harvard University in 1948, and received an A.B. in engineering sciences and applied physics in 1952. His interest in statistical physics was piqued by a course taught by Stanislaw Ulam, who was visiting Harvard. He chose to attend the Johns Hopkins University for graduate work, primarily (or so he said) based upon the attractiveness of their recruiting brochures. After receiving a M.S.E. in mechanical engineering in 1954, he switched to the aeronautical engineering program to work with Stanley Corrsin on turbulence, earning his Ph.D. in aeronautics in 1957. After two years as a postdoctoral fellow with Corrsin, he joined the Pennsylvania State University initially as a Research Professor at the Garfield Water Tunnel of the Applied Research Laboratory, and then as a professor in aeronautics. By age 44, he was appointed Evan Pugh Professor of Aerospace Engineering, the youngest person to hold this title. In 1977, he accepted an offer from Cornell as the Willis H. Carrier Professor of Mechanical and Aerospace Engineering. He thrived at Cornell, and built a turbulence group that became recognized worldwide.

His thesis advisor was a prominent experimentalist, and John’s first research activities upon joining Corrsin’s group were in the laboratory. That apparently did not go as well as hoped, and he moved to a theoretical project. That did go well, and he had found his personal scientific
niche as a theoretician. That said, he was always well versed in experiment, wrote papers on instrumentation and experimental methods, and many of the 34 or so Ph.D. candidates that he supervised at Penn State and later at Cornell wrote theses on experimental topics.

While at Harvard, John met Jane French, a student at Radcliffe. They married while John was a graduate student and their three children were born in Baltimore.

John’s own work covered many areas, from the fundamental physics and the mathematical theory of turbulence, to the very practical, like his design of very quiet water tunnels for testing full scale torpedoes. He was an expert on undersea warfare, in which turbulence plays a central role, and he was involved in this work throughout his tenure at Penn State. The scope of his work was remarkably broad, ranging from turbulence modeling (he insisted on models that obeyed the same invariance properties as the physics), to incisive experiments, to computation. He wrote about environmental flows, technological flows, drag reduction, and buoyant plumes, among other applications. In a seminal paper presented at the 1967 Moscow conference, “Atmospheric Turbulence and Radio Wave Propagation,” he showed that a particular series representation of any turbulent flow, a “proper orthogonal decomposition,” could be found. For a given number of terms, this kind of series captures more of the energy of the flow than a Fourier or any other series, and in this sense, is an optimal representation. Each term can be thought of as representing a “structure” in the turbulence, and in this way he provided a precise definition of what had been a loose notion of the coherent features observed in turbulent flows. This paper appeared in an obscure publication, and it took some time to become widely known. Proper orthogonal decompositions of turbulent flows has since developed into a cottage industry, and a standard method for understanding coherent structures.

He wrote six books: Structure of Atmospheric Turbulence, with H. Panofsky; Statistical Tools in Turbulence; A First Course in Turbulence, with H. Tennekes; Engines: An Introduction; Turbulence, Coherent Structures, Dynamical Systems and Symmetry, with P. Holmes and G. Berkooz; and A Still Life with Cars: An Automotive Memoir and he edited several more. He also wrote 229 scientific papers, and produced and performed in two films in the well-known National Science Foundation series on fluid dynamics. In addition to his books and papers, he was active in the scientific community in numerous ways, including memberships and chairmanships of many national and international committees, editorial duties for several journals, including over 30 years with Annual Reviews of Fluid Mechanics, nineteen years of which he was Co-Editor or Editor. His impact on the field was impressive and lasting.

During the cold war, Soviet scientists had developed turbulence theory and experiment further than their counterparts in the West. John brought their advances to the attention of Western researchers first by editing English translations of the important two volume treatise Statistical Fluid Mechanics: Mechanics of Turbulence, by A.S. Monin and A.M. Yaglom. These had to be smuggled out of the Soviet Union. He also edited the translation of the book Variability of the Oceans, by Monin, Kamenkovitch, and Kort. In addition, for many years he edited the cover-to-cover English translations of Izvestiya: Atmospheric and Oceanic Physics, a transaction series of the Soviet Academy of Sciences.
He made several trips behind the iron curtain, and got to know the most prominent and productive Soviet scientists working in turbulence. His work had caught their attention starting with his 1964 book with Panofsky, *Structure of Atmospheric Turbulence*. This was recognized as an important contribution and was translated into Russian by Monin.

Among the most prominent of the many honors John received were election to the National Academy of Engineering and the American Academy of Arts and Sciences; he was a Fellow of the American Physical Society and Fellow of the American Academy of Mechanics; he was awarded the Timoshenko Medal of the American Society of Mechanical Engineers; the Fluid and Plasmadynamics Award of the American Institute of Aeronautics and Astronautics, and the Fluid Dynamics Prize of the American Physical Society. He also received honorary doctorates from the University of Poitiers and the Ecole Central d’ Lyon. He was especially proud of these.

John developed a love for automobiles as a small child that stayed with him for his lifetime. He attended a preparatory school in Detroit together with children of auto company executives. In addition to a fine academic curriculum, the school also offered shop courses, including ones particular to the automobile industry, which he appreciated and in which he excelled. Throughout his life, his avocation was the repair of family cars – mostly his family’s small fleet of Volkswagen Beetles - and the restoration of classic cars. The six classic cars he restored ranged from about 50 to 80 years old. He was a self-taught craftsman, rebuilding cars that arrived at “Lumley’s Good Enough Garage” in poor condition, and on one occasion, in boxes. He did all aspects of the restorations himself, including all mechanical work, body work, painting, and the fabrication of the interior, even the sewing of the leather upholstery and reconstruction of the interior wood veneer. Some of this is captured in his memoir written after retirement, *Still Life with Cars: An Automotive Memoir* (McFarland & Com 2005). He had an expert knowledge of the history of the automobile, and enjoyed talking about it, and especially about the engineering solutions to various subsystems that the designers adopted, some of which he admired, and some not.

His curiosity and memory were remarkable, as was the facility for language so evident in his writings. Together with his love of reading and sense of humor, these characteristics made conversation with him entertaining and rewarding. Despite this, he was not at ease with those he did not know well, and could seem reticent in their company. While he had strong opinions about research, and rapidly arrived at theories for controversial questions, he was always willing (though not always happy) to abandon a pet theory if experiment proved it untenable. On many occasions, he talked about theory and theoreticians. For example, on the occasion of receiving the American Physical Society Fluid Dynamics Prize, he wrote (one would expect with tongue in cheek) of how experimentalists and practical engineers regard theoreticians with alarm. “It does not help that any theoretician worth his salt can come up with several contradictory theories a day. He had a beautiful theory to explain yesterday’s data, but this morning it seems that those data are wrong; this afternoon he has a new theory to explain the new data. Who can trust a man like that?”

Although he was not a natural classroom teacher, his books and films provide a lasting testament to his role as an educator. His graduate students, and the many others whose careers John
promoted, write of their deep appreciation of his influence. He taught the research method by example: few spoken words, many written words communicated by handwritten notes.

John and Jane were gourmets, which no doubt was why John preferred France as the destination for his sabbatical leaves. Jane taught in the School of Hotel Administration at Cornell, and was a restaurant critic for *Distinguished Restaurants of North America*. Both John and Jane loved to cook, and hosted many delightful dinner parties at their home.

John was predeceased by his wife, Jane Lumley (nee French). He is survived by his children, Katherine Leask Lumley-Sapanski, Jennifer French Lumley and John Christopher Lumley, and five grandchildren.

*Sidney Leibovich and Zellman Warhaft*