At a Meeting of the Faculty of Arts and Sciences on March 13, 2007, the following Minute was placed upon the records.

JOHN LYELL SANDERS, JR.

Born: September 11, 1924
Died: October 7, 1998

John Lyell Sanders, Jr., served on the Harvard faculty for a total of thirty seven years and as Gordon McKay Professor of Structural Mechanics for over thirty years from 1964 until his retirement in 1995. His tenure spanned a period of major advances in understanding the mechanics of solids and structures and coincided with the general expansion of engineering science and technology in American universities following the launch of Sputnik in 1957. Lyell, as he was known to all, focused primarily on the fundamentals of aerospace structures. To colleagues, Lyell was renowned for deep insights into mechanics combined with unusual mathematical dexterity. He will long be remembered for the accuracy and care behind his research and teaching and for his ever-present dry wit.

J. Lyell Sanders, Jr., was born on September 11, 1924, in Highland, Wisconsin, and died on October 7, 1998, in Sudbury, Massachusetts. He obtained an undergraduate degree in Aeronautical Engineering from Purdue University in 1945, and was drafted into the U.S. Army the day after his graduation serving for two years in a cryptography unit. Lyell was introduced to the field of shell structures at MIT where he obtained his master's degree with a theoretical thesis on a rather esoteric class of structures, helical shells. In 1954, Lyell obtained his Ph.D. from Brown University writing a thesis on plasticity theory, characterizing the irreversible deformation of metals when they are overstressed. Brown University was the pioneer in education and research in applied mathematics and mechanics in this country in the 1950s, and many leading mechanicians passed through its portals during that period, including two individuals who would become Lyell's close colleagues here at Harvard, Bernard Budiansky and George Carrier.

Lyell's full immersion into the world of structures took place in the Structures Division of NACA (National Advisory Committee for Aeronautics) at Langley Field, Virginia, the forerunner to NASA (National Aeronautics and Space Administration). There, from 1954 to 1958, he worked on problems connected with aircraft and space structures, primarily on what in the trade are called shells, exemplified by the thin fuselage of an airplane, the cylindrical structure of a rocket or the curved dome covering a cathedral or stadium. The challenge posed is that such structures must be both light and strong. From the beginning, Lyell stood out as someone who could tackle questions fundamental to the study of shells; he published a famous report on the equations of linear shell theory settling controversial issues that had been troubling the field for fifty years producing the equations used to analyze shells today. In 1958, Lyell accepted an invitation to join the faculty at Harvard, bringing into being a two-person group in solid mechanics and structures jointly with Bernard Budiansky, who had arrived at Harvard from NACA four years earlier. Although exceptionally small, especially by engineering standards, the Budiansky and Sanders group made its mark by important contributions of the highest quality. Harvard became a center for the study of solid mechanics and attracted and educated students from the U.S. and abroad, many of whom are today's leaders in the field.

Lyell Sanders was most known for his work on nonlinear shell theory carried out at Harvard. For a layperson, the use of the word "nonlinear" in this context can be illustrated by imagining stacking books

centered on top of an empty soda can. The can will easily support a two-foot stack—it is behaving linearly. However, at some point, one book too many will have been added to the pile such that the can buckles and collapses catastrophically—that is nonlinear behavior. The mathematics underpinning nonlinear shell behavior is surprisingly rich sharing common tools with the general theory of relativity. Lyell's classic paper "Nonlinear Theories for Thin Shells" laid out the complete theory and, most importantly, clarified the status of approximate theories. This paper, like everything Lyell wrote, is notable for its spare, readable style. Today, Sanders' equations are employed in the large commercial computer codes used for analyzing and designing shell structures. In collaboration with graduate students, Lyell also conducted highly cited work addressing more applied problems such as the stress analysis of plates and shells containing cutouts and cracks or reinforced by stiffeners.

Lyell was part of Harvard's tightly-knit group in applied mathematics and mechanics, which in addition to Budiansky, included fluid mechanicians, Fred Abernathy, George Carrier, Howard Emmons, and Sydney Goldstein; astrophysicist, Max Krook; and bio-mechanician, Richard Kronauer. These individuals were known for their prowess in applying mathematics to problems in engineering and the applied sciences—establishing one of Harvard's strengths that continues to the present day. This group, together with younger colleagues who would later be appointed, greatly enjoyed and profited from each other's company. There seldom was a day in the period extending from the 1960s through the 1980s that the whole group did not take lunch together. On one such occasion at the Faculty Club, Henry Rosovsky, the Dean of the Faculty at the time, remarked that he was fairly sure this was the largest group of Harvard faculty members ever to assemble of their own free will.

Lyell often served as a consultant on mathematical matters for his colleagues, and many a former student eased their way into teaching their first graduate course with the aid of Lyell's meticulous class notes. In the classroom, Lyell was famous for careful preparation peppered with dry wit. One former student tells the story of being asked by Lyell to be patient about a question that he had raised, receiving the answer in class three weeks later. Lyell's interests extended to fishing and American history. He met his wife, Mary Jane Wade, a '52 Radcliffe graduate, shortly after he arrived at Harvard. They had three children, Alice, William and Jeanne. Lyell is survived by Mary Jane, his three children and five grandchildren.

Respectfully submitted,

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