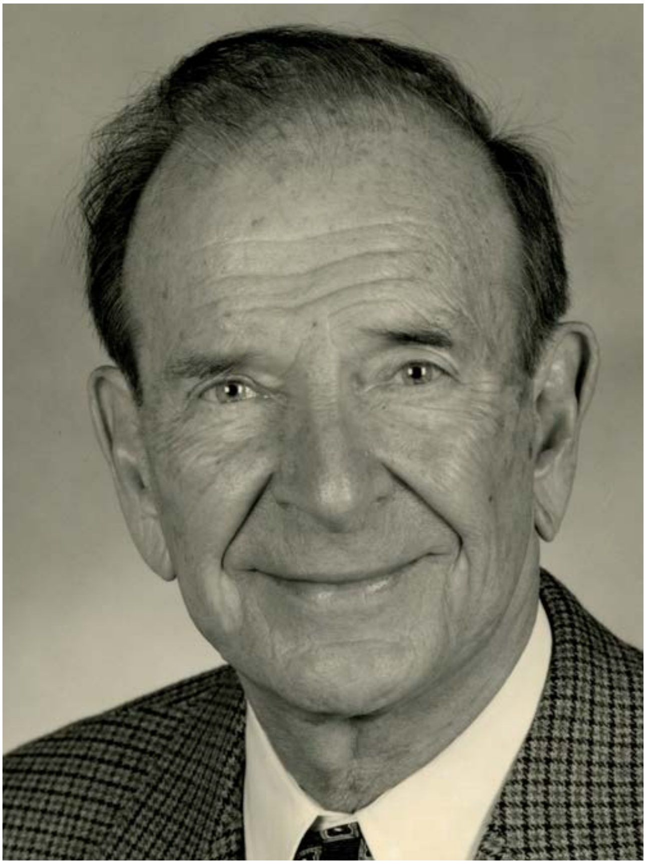

Oleg D. Sherby

# OLEG D. SHERBY

*1925–2015*

Elected in 1979

*"Research to improve the understanding of high-temperature deformation of metals and technical materials leading to their improved performance."*

BY JEFFREY WADSWORTH AND WILLIAM D. NIX

OLEG DIMITRI SHERBY, a pioneer in the high-temperature deformation of complex materials, died at his home in Menlo Park on November 9, 2015, at age 90. He was an emeritus professor at Stanford University in the Department of Materials Science and Engineering.

He was born in Shanghai on February 9, 1925. His parents had earlier fled Vladivostok to escape the impending communist Russian Revolution—in 1923 his father had walked 200 miles to reach a railroad station in China so he could be reunited with his wife in Shanghai. Oleg had vivid memories of being raised there, and in the 1980s revisited the apartment where he had lived.

When he was 13 the family again moved, this time to avoid the Japanese bombing of Shanghai, and came to the United States, where they settled in the San Francisco Bay Area. Oleg attended the University of California at Berkeley to study chemical metallurgy. His undergraduate studies were interrupted for military service in the Infantry and Corps of Engineers in 1944, and he was honorably discharged in 1946. He returned to Berkeley, changed his major to physical metallurgy, and went on to earn undergraduate and PhD degrees.

At a Berkeley dance in 1948 he met Juanita Slater. They wed the following year and were happily married for 40 years until Juanita's death in 1989. Together they raised four children.

Oleg was a research metallurgist at the UC Institute of Engineering Research from 1949 to 1956, working closely with his PhD advisor John Dorn (after Dorn's death, Oleg referred to him as the "late, great John Dorn").

In 1956 he was awarded a National Science Foundation Fellowship to study at Sheffield University and spent the following year as scientific liaison officer in metallurgy with the US Office of Naval Research in London. At this stage he had already published significant work, and senior Sheffield professors were confident that in the future he would deserve an earned doctorate of metallurgy from the university for published work. To be presented for this doctorate requires a Sheffield degree, so he was asked to submit his one year of work at Sheffield as a master's thesis. He did so, and it is still considered both the shortest and best master's thesis in the department's history. As Oleg liked to relate, when he returned to Berkeley John Dorn was not at all pleased, pointing out that it looked like a master's at Sheffield was an advance on the PhD from Berkeley.

Oleg joined the Stanford faculty in 1958 as an associate professor of metallurgical engineering with a joint appointment in aeronautical engineering. He was promoted to full professor in 1962, a position he held until 1988, when he decided to take professor emeritus status to tend to his ailing wife. He never stopped working, however, remaining actively involved with a number of his colleagues and publishing research up to the time of his passing.

His early reputation was built on his discovery of the intimate relation between lattice self-diffusion (the movements of individual atoms) and high-temperature deformation of crystalline materials. Until then, the important problem of creep—the slow deformation of metals at high temperatures—had received much attention because of its relevance for gas turbine engines, nuclear reactors, and other generating systems. But the atomic processes controlling creep had not been identified.

In the early 1950s, as a research engineer at UC Berkeley with Dorn, Oleg began to draw correlations between the rate of high-temperature creep of different metals and the rate of self-diffusion in those metals. He soon discovered that for a wide variety of metals the rate of creep could be accurately predicted with knowledge of the self-diffusion and a few other physical properties. It was only after this that theorists started to catch up and identify the microscopic reasons for the correlations that Oleg had found. By the mid-1960s he had developed a complete phenomenology for high-temperature creep of metals that served not only as a guide for designing heat-resisting alloys but also as a solid body of facts about high-temperature creep to which modern theories must conform.

He was a master at developing phenomenological relations among physical properties of materials. He may have been inspired by Trouton's rule, a phenomenological rule stating that the entropy of vaporization for all liquids is nearly the same at their boiling points. His findings that the rate of steady-state creep of metals is directly proportional to the rate of lattice self-diffusion, and that seemingly unrelated properties such as high-temperature strength of metals could be predicted accurately from a knowledge of atomic self-diffusion, are examples of his mastery of phenomenology.

He was fond of saying that he had found "all the data in the world" in reaching his conclusions. Indeed, by finding "all the data" he was able to develop his impressive account of high-temperature creep of metals that has stood the test of time and has led to the development of new alloys.

In the late 1960s he was one of the first to explore the phenomenon of superplasticity, the ability of some metallic alloys to be stretched several times their initial lengths without breaking or, as Oleg would say, "like well-chewed chewing gum." He showed how these properties could be used in metal forming and was soon leading that field by identifying the various ways that alloys could be made superplastic.

A race began to demonstrate this property in steel. Oleg determined that superplasticity could be developed in steel by raising the carbon content to very high levels where conventional wisdom held that such compositions were impractical. The steel families he developed, now called ultra-high-carbon steels, not only could be made superplastic, and thus formable by the right kind of processing, but also had remarkable room-temperature strength and ductility.

His work on superplasticity extended to certain ceramic materials, which are often assumed to be completely brittle, and his work on ultra-high-carbon steels revealed that they had similar compositions to the famous steel swords of Damascus. This in turn led to a rediscovery of how the ancient patterns on the swords were made and stimulated research into other ancient laminated steels and their similarity to contemporary materials. This aspect of Oleg's work was described in a 1981 *New York Times* article that described how the Stanford team's modern methods produced the same carbon-rich steel used during the Crusades. As *Times* science writer Walter Sullivan wrote, "Swords of this metal could split a feather in midair, yet retain their edge through many a battle."

Oleg was the coholder of eight US patents; author or coauthor of 340 publications on mechanical behavior, materials processing, and diffusion in materials and metal-laminated composites; coauthor of a text on superplasticity in metals and ceramics; and technical editor of two books. His 1968 paper, "Mechanical Behavior of Crystalline Solids at Elevated Temperature," coauthored with Peter M. Burke and published in *Progress in Materials Science* (vol. 13, pp. 325–390), was declared a Citation Classic in *Current Contents* (April 19, 1987).

He received numerous awards and distinctions during his career: NSF fellow (1956–1957); Charles B. Dudley Medal of the American Society for Testing and Materials (1958); Senior NSF Fellowship at the Centre d'Études Nucléaires de Saclay, France (1967); earned doctorate, D.Met., Sheffield University (1968); fellow, ASM International (1970); first John E. Dorn Memorial Lecturer, Northwestern University (1970); Centenary Medal of the American Society of Mechanical Engineers (1980); fellow, American Institute of Mining and Metallurgical Engineers (1985); Charles S. Barrett Silver Medal of the ASM Rocky Mountain Chapter (1987); honorary member, Japan Institute of Metals (1996) and Iron and Steel Institute of Japan (1999); ASM Gold Medal (considered ASM's highest annual award) (1985); Yukawa Silver Medal (1988 and 1999); ASM Albert Easton White Distinguished Teacher Award (1988), Campbell Memorial Lecture Award (1998), and Albert Sauveur Achievement Award (2000); Lifetime Achievement Award in Superplasticity (2000) presented by the International Conference on Superplasticity in Advanced Materials; and Thermec 2000 Distinguished Award.

He was elected to the National Academy of Engineering in 1979, and from 1983 to 2003 served on committees on lightweight materials for 21st century trucks, Office of Naval Research opportunities in materials science, and hydrofracture techniques for the disposal of radioactive waste.

Throughout his life Oleg supported young people, helping them to develop their own careers, and he is remembered by his colleagues as a superb teacher. He taught undergraduate and graduate courses in metallurgy and materials science and supervised 40 students for their PhD at Stanford and an additional 21 master's research thesis students. He was a mentor to 15 postdoctoral fellows and visiting scholars.

The enthusiasm he exuded in his dealings with people came through in his teaching and his students appreciated that. He once thought that his teaching scores were better if he wore a tie, so he regularly wore a tie when he taught. But it was not the tie: it was his warm, enthusiastic personality that made him exceptional.

Oleg was also passionate about sports and athletics, having competed successfully in middle distance running as a young man. He ran track and played soccer at Berkeley—and noted that he combined these skills in one particular soccer game when a fight broke out among the players. He organized noon volleyball games for Stanford faculty and students alike, getting everyone out to the volleyball court at least twice a week. Even distinguished international visitors to the department were encouraged to join in, so that the rosters included some of the who's who of materials science. He continued this vigorous activity well into his 50s. In addition, he was an enthusiastic and frequent participant in after-work ping-pong games that students organized in the department. Colleagues also remember him as someone who enjoyed an occasional poker party.

Anyone who met Oleg will remember his joie de vivre. He was the most enthusiastic, positive, and upbeat person many of us will ever meet. He was always excited about the work he and his students were doing, and never boasted about something he had done. It is what made him such a wonderful colleague.

Oleg is survived by his four children—Lawrence and Pamela of Palo Alto, Stephen of Roseville, and Mark of San Jose—and by nine grandchildren and three great-grandchildren. He was followed in death by his second partner, Marilyn Kazimi, and they are survived by her daughter, Leila, of Roseville, and her two children.

He was a great man and is deeply missed by all who were fortunate enough to have known him.