



*Portrait of Milton Elliot Wadsworth  
painted by his daughter Margaret Morrison  
during the summer of 1992.*

*Milton E. Wadsworth*

# MILTON E. WADSWORTH

1922–2013

Elected in 1979

*“Contributions in the field of hydrometallurgy.”*

BY J. BRENT HISKEY AND GARRY WARREN

MILTON ELLIOT WADSWORTH passed away at home on January 31, 2013. At the time of his death he was a distinguished professor emeritus of metallurgy at the University of Utah. He left a positive impact on thousands of people over his lifetime and during his over half century of dedicated academic service.

Milton E. Wadsworth, affectionately known as Milt, was born February 9, 1922, in Salt Lake City to Thomas Guy Wadsworth and Agnes Flockhart Wadsworth. He attended Lowell Elementary, Roosevelt Junior High, and East High School, all in Salt Lake City. After graduating from high school in 1939 he enrolled in the University of Utah and while taking a course in spring flowers of the Wasatch he met the love and center of his life, Mirian Bailey. Both in the US Army, they were the first couple married in uniform at the Fort Douglas Chapel on November 19, 1943.

After serving as an infantry officer in the US Army during World War II, Professor Wadsworth began a lifelong relationship with the University of Utah, where he received his bachelor of science degree in metallurgical engineering in 1948 and his PhD in metallurgy in 1951. His thesis supervisor was Melvin A. Cook. Another important mentor and colleague at the university was Henry Eyring.

During his graduate studies Dr. Wadsworth worked as a part-time instructor in the Department of Metallurgical Engineering and upon graduation was appointed assistant professor. One of the early courses he taught was mineral dressing for chemical engineers. Early in his career he conducted pioneering research on the hydrolytic and ion pair adsorption processes in flotation. This work was recognized by an American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) Best Paper Award in 1957. Parallel to his interests in mineral processing and flotation, his research activities included work sponsored by the US Atomic Energy Commission on properties and processing of colloidal thoria and thoria gel. At about the same time he developed an interest in the emerging field of hydrometallurgy. He is recognized as one of the first academicians to bring science and engineering fundamentals to the study of hydrometallurgy.

Dr. Wadsworth had a keen intellect and a superb ability to interpret complex processes such as chemical thermodynamics, reaction kinetics, and phase equilibria in interesting and often humorous ways that were easily understandable. He loved to share his sense of humor and could on a moment's notice break into an impromptu tap dance to the enjoyment and amazement of those watching. He had an infectious personality.

Milt was the consummate teacher, inspiring intellectual curiosity and creativity in students at all levels. His influence extended to all dimensions of life and he was especially encouraging to his former graduate students, many of whom have gained international recognition in academia, business, and government careers. His impact as an educator was acknowledged nationally by AIME in 1981 when he received the Mineral Industry Education Award. His appointment as a distinguished professor of metallurgical engineering (1983) at the University of Utah, in part, recognized his excellence in teaching and the value of his teaching to the university. In 1989 the Minerals, Metals and Materials Society (TMS) presented him with its Educator Award for his many professional contributions.

Dr. Wadsworth served the University of Utah with distinction as a dedicated administrator for many years. He performed duties as the chair of the Department of Metallurgical Engineering for two separate terms (1955–1966) and (1974–1976). During these periods, the department flourished and solidified its international reputation in mineral processing and extractive metallurgy. He also held the position of associate dean in two colleges, the College of Engineering (1973–1974) and the College of Mines and Earth Sciences (1983–1991). In addition to his distinguished professorship (1983) mentioned earlier, he was the 1986 University of Utah recipient of the Rosenblatt Prize for Excellence in teaching, research, and administration. It is equally important to recognize the respect and esteem his students, colleagues, and friends had for him. Through their efforts, the University of Utah Milton E. Wadsworth Endowed Scholarship Fund was established in 2012. Students and faculty in the Department of Metallurgical Engineering will continue to benefit from this endowment.

Milt's research achievements in hydrometallurgy are quite impressive and cover a truly amazing range of topics. His early work in hydrometallurgy featured a number of studies involving high-temperature, high-pressure liquid-solid reactions. He and Frank Forward at the University of British Columbia are considered the fathers of modern-day pressure hydrometallurgy. In 1963 he and Franklin T. Davis organized the first International Hydrometallurgy Symposium in Dallas, Texas, and edited the symposium volume, *Unit Processes in Hydrometallurgy*. This symposium sponsored by the AIME has been the flagship hydrometallurgical conference in the world ever since. To Milton's and Franklin's credit, the series of seven monographs is a living legacy of advances in hydrometallurgy theory and practice. In recognition of his contributions, Dr. Wadsworth was the honoree at the fourth International Symposium on Hydrometallurgy in 1993 sponsored by the Society of Mining, Metallurgy and Exploration (SME)/TMS of AIME in Salt Lake City.

Milt was a forerunner in the application of absolute reaction rate theory and understanding of the role of electrochemical

phenomena in hydrometallurgical reactions. Numerous seminal papers on these themes were authored by him and his students over the years. Particularly noteworthy are the papers dealing with the electrochemical nature of metal dissolution and deposition processes, especially the electrochemistry of conducting and semiconducting ore minerals. He was one of the first to recognize the importance of fundamental electrochemical processes in the dissolution of the sulfide minerals. This enhanced understanding of the leaching behavior of such economically significant minerals as chalcopyrite. During his distinguished research career, he published more than 155 technical and scientific papers and was awarded five US patents.

Dr. Wadsworth had an excellent working relationship with the minerals and metallurgical industries. He was particularly close to efforts to improve copper extraction and recovery from low-grade resources and the application of hydrometallurgical methods in the treatment of copper sulfide concentrates. During the 1970s, he served as a technical advisor for the Kennecott Copper Corporation task force on copper dump leaching. This association resulted in a number of important fundamental research projects. He was also closely involved with the development of Anaconda's concentrate enrichments process. He brought a keen understanding of the role of reaction kinetics to these industrial projects.

In 1968 Milt, Mirian, and their family began a love affair with world travel. Milton was asked by the Ford Foundation to set up a graduate program at the University of the Philippines (UP). With five unmarried daughters and the family labrador, Milt and Mirian moved to Manila for a two-year assignment. He held the position of professor of metallurgy from 1968 to 1970. Under Dr. Wadsworth's guidance the Ford Foundation project was very successful and he was presented with a Special Service Award by the UP Office of the President. The UP Department of Mining, Metallurgical and Material Engineering currently offers BS and MS degrees in metallurgical engineering and a PhD in materials science and engineering. The metallurgical engineering program is identified by the Commission of Higher Education of the

Philippines as a Center of Excellence. The University of Utah was the beneficiary of a number of outstanding students from the Philippines as a result of Milt's tenure there.

The impact and importance of his extensive research contributions were recognized during his career with numerous awards and honors. He was the recipient of four Best Paper Awards presented by the AIME. He was the recipient of the 1978 AIME James Douglas Gold Medal "For his distinguished contributions to extractive metallurgy in research and education, exemplified by his fundamental understanding and teaching of the hydrometallurgy of nonferrous metals." Other major awards include the 1984 Antoine M. Gaudin Award of SME and the inaugural Milton E. Wadsworth Award of SME given in 1993. He was recognized by the state of Utah in 1987 with the Governor's Medal for Science and Technology. He was the recipient of honorary doctorate degrees from the University of Liège, Belgium (Honoris Causa, 1979); the Colorado School of Mines (doctor of engineering, 1990); and the Central South University of Technology, China (doctor of engineering, 1995).

His professional society accomplishments were principally with AIME and its member societies TMS and SME. He joined AIME in 1947 and exhibited exemplary service to the institute throughout his career. He achieved the grade of TMS fellow in 1976 and the rank of SME distinguished member in 1978. He served as TMS president in 1983 and as AIME president in 1991. During his year as AIME president the institute completed two important projects. One was the development of a major educational activity aimed at improving the technological literacy of junior high school students through a series of videos entitled "Transformations: Science, Technology and Society." The second was the development of an AIME position paper on energy and the environment that was presented to various individuals, government agencies, and institutions. He was named an honorary member of TMS-AIME in 2009. Dr. Wadsworth was also an active member of the American Society of Metals (ASM) International, achieving the designation of fellow in 1987.

Milt's main avocation centered on his family. He loved being a father and grandfather. His travels with his family are legendary. He enjoyed a number of pursuits and hobbies. He had a passion for motorcycles, and he and Mirian would frequently ride great distances on their motorcycle to attend a meeting or just for pleasure. However, his principal creative activity was woodworking. He was a skilled carpenter, and lovingly remodeled their nineteenth-century ancestral home over the course of 30 years.

Dr. Milton E. Wadsworth will be remembered as a true intellectual and consummate teacher and for his wonderful sense of humor. He leaves a legacy of world-class scholarly research and dedicated academic service. His contributions go far beyond his impact on metallurgical engineering, beyond the fraternity of scientists and engineers. He was an excellent spokesperson for the beauty and elegance of metallurgy and science in general. All who listened benefited from his wisdom and understanding. The world is a better place because of his impact on so many people.

He is survived by daughters Kathryn Davis, Jane Wadsworth, Amy Wadsworth (David Richardson), Leslie Wadsworth-Smith (Alan Smith), Margaret Morrison (Richard), and 19 grandchildren. He was preceded in death by daughter Cristine Blanch, sons-in-law Thomas Blanch and Jon Davis, and grandchildren Collin Davis, Ellen Marie Morrison, and Laura Elizabeth Blanch. His dear wife of 70 years, Mirian Bailey Wadsworth, passed away on October 17, 2014.

