WALTER SHEPARD OWEN

1920–2007

Elected in 1977

"For leadership in research on structure/property relationships in metals and in the extension of such concepts to the educational basis of materials science and engineering."

BY ALI S. ARGON

WALTER SHEPARD OWEN was born on March 13, 1920, in the West Derby district of Liverpool and died on October 13, 2007, in Cambridge, Massachusetts.

His distinguished career as a metallurgist, an academic, and a university administrator was shaped in nearly equal parts in the United Kingdom in Liverpool and in the United States at Cornell University, at Northwestern University, but most fully at the Massachusetts Institute of Technology (MIT).

His father, a shipping clerk, gave him his Welsh name and early bearing while his mother, a teacher, gave him his intellectual skills and his deep socialist convictions. In later years he remarked, "If you are not a socialist by the time you are 19, you are stupid, and if you are still one at 39 even more so."

Owen joined the metallurgy department at the University of Liverpool and graduated in 1940 with a first-class honors degree (B. Eng.). He spent much of the World War II years as a metallurgist at the research laboratories of the English Electric Company. During that tenure he continued to broaden his experience as a practicing metallurgist and even earned an M. Eng. degree from the University of Liverpool in 1942. After the war he returned to the University of Liverpool as an assistant lecturer in the metallurgy department and in the process obtained his Ph.D. degree in 1950 with a thesis entitled

"The Carbide Constituent in Iron-Carbon-Silicon and Related Alloys." This work provided the enduring stimulus for his lifelong interest in the thermodynamic and kinetic aspects of ferrous metallurgy and particularly in the study of martensite, its formation, and the source of its extraordinary hardness.

After his Ph.D. award and a faculty appointment as lecturer at Liverpool, Owen made his first of many moves to the United States in 1950 as a postdoctoral visitor at the metallurgy department at MIT for one year with a Commonwealth Fund Fellowship. There he joined Professor Morris Cohen, his professional hero, to work on diffusion-controlled bainite transformations and diffusionless massive martensitic transformations in steel. This was followed in 1953 with a longer stay at MIT as a research staff member, where he led a study of the brittle fracture of steels.

In 1957 Owen was lured back to Liverpool with an offer to become the head of the metallurgy department as the Henry Bell Wortley Professor of Metallurgy. At that time the department was small and housed in an old work house. During his nine-year tenure as head, the department was transformed into a large and vigorous research-oriented department relocated in the fully refurbished George Holt laboratories, previously the home of the physics department. Owen's new office was previously that of Nobel laureate James Chadwick, discoverer of the neutron. This was an exciting period in the department's history as many gifted teachers, researchers, and students were attracted to Liverpool, with Owen making much use of his links with industry in the United Kingdom and the United States to obtain funding for large and ambitious research programs. Another of his major transformative achievements was the introduction of new undergraduate courses to attract students from the physics and chemistry departments to study metallurgy in their final year.

Although in those days materials science as a branch of study was only a dream in the minds of a few physical metallurgists, Owen persuaded the university in 1964 to establish a new chair of physical metallurgy, which soon after changed to one of materials science.

Owen's professional interests developed in many directions. He had a real gift as a communicator and an administrator and took leading roles within the university, particularly later as dean of engineering. He also developed many consulting activities and joined Robert Maxwell of Pergamon Press to stimulate broader-based publishing in the fields of metallurgy and materials science.

After nine years in departmental and university administration at Liverpool, Owen, with his new American wife, moved back to the United States to become head of the Department of Materials Science and Engineering at Cornell University as the Thomas R. Briggs Professor of Engineering. This was followed by a move to Northwestern University, where he became first dean of the Technological Institute and later vice president for science and research.

In 1973 Owen joined MIT as the head of what was soon to transform from a metallurgy department into the Department of Materials Science and Engineering. During his tenure as head until his retirement in 1982, he led a major effort to broaden and diversify the research of the department into areas such as ceramics and polymers while retaining the historical strength of the department in metallurgy. His stewardship of this department was critical to maintaining its top-ranked position in metallurgy in succeeding decades.

After his retirement he continued to be active in consulting and other academic and scientific policy activities both nationally and internationally but divided his time nearly equally between residing in Cambridge, Massachusetts, and in Porthmadog, Wales, where he purchased a house overlooking the sea and the Welsh mountains.

Owen's professional career was centered on a long-term study of martensitic transformations, which while being of central importance in the use of steel remained ill understood until the latter part of the 20th century. In his relentless pursuit starting at Liverpool and continuing at Cornell and finally at MIT, Owen considered the complex aspects of the sources of the remarkable hardness of martensite. This pursuit combined structural studies in the purely thermal aspects

of the transformation from austenite to different forms of martensite in iron-nickel alloys, ranging from the "virgin" tetragonal, internally twinned variety of Fe-Ni-C martensite with Ms transformation (start) temperatures of around 250K, first studied by Morris Cohen and co-workers at MIT, to those with Ms temperatures of 300K of partly aged cubic structure. His research also encompassed the stress-directed transformations in which the key role is played by nucleation of the martensite lamellae and the mechanistic details of their broadening by interface translations where interstitial carbon in solid solution strongly affects both the rate of such interface translation and the subsequent dislocation glide inside the twinned lamellae.

With his many gifted students and through his collaboration with Morris Cohen's group at MIT, Owen's research using a variety of theoretical, experimental, and even some computational modeling approaches made key contributions to the understanding of mechanisms governing martensite. Owen's technical journal publications numbered in the nineties.

In 1977, when Owen was elected to membership in the National Academy of Engineering, his citation read: "For leadership in research on structure/property relationships in metals and in the extension of such concepts to the educational basis of materials science and engineering."

Walter Owen's unique talents as a researcher but also as an educator and a mentor of students are well represented by the following tribute by Frederick Schoen, one of his graduate students at Cornell University:

> "I was one of the first doctoral students doing graduate study under Professor Walter Owen's tutelage at Cornell University, beginning in September 1966, shortly after he arrived from Liverpool. It was clear that Professor Owen derived immense satisfaction from his teaching, mentoring, and association with young people, as well as his research in physical metallurgy. It was also apparent that he had a high commitment to excellence in a model

of learning that shared responsibility between students and teachers, where he was always eminently respectful and caring of the professional and personal needs of both students and faculty colleagues. I remember best his friendly, encouraging, and optimistic manner that gently pushed me and my colleagues to do our best work, as much of it as possible, and as rigorously as possible.

He was extremely generous with his time and energy, making a key contribution to my career and I'm sure the careers of my fellow students, accrued from the relaxed but focused technical sessions he held for his entire group of graduate students and postdoctoral fellows at his home in Ithaca, one evening per month. At these work-in-progress sessions we learned how to thoughtfully prepare a technical talk, communicate ideas to a scholarly group of peers, and vigorously defend our thinking on our feet, skills I continue to benefit from today. As we had learned the art of preparation for a scientific presentation through these sessions, I was appalled one day when I saw him depart for a major out-of-town talk and grab his box of slides (in those days a several-pound mass of glass), not yet organized for the talk, and proceeded to the airport. Little did I realize that that was often the modus operandi of a seasoned professional (and a style that I and many colleagues regrettably adapted later as our careers matured).

Walter was a truly good mentor, and he taught me how to think critically about science in general. I shall always be grateful that he supported and followed (and I believe even relished) the evolution of my career from martensite metallurgy (the area he loved) as a Ph.D. student, into my present occupation in biomaterials, biomedical engineering, and medicine, areas he knew much less about. Only in preparation for these remarks did I uncover an article in the Cornell Engineering Quarterly in 1970 in which he predicted that the field of biomaterials would be a 'growth area' to which materials science would contribute immensely (and how correct he was).

When he came to Cornell in 1966, Owen took over a young department, which became a separate materials science and engineering department only the previous year. Within a year there were approximately 40 students doing graduate materials study at Cornell. Through his leadership, Professor Owen established materials science and engineering at Cornell as one of the few leading departments of its kind, composed of a distinguished group of materials specialists and strong academic programs. He developed excellent and synergistic collaborations with groups doing physics, chemistry, and mechanics, thereby creating a highly interdisciplinary and intellectually stimulating environment. Through his leadership of the department at Cornell, Walter contributed greatly to the development of materials science as a systematized science and academic discipline. Owing to his contributions then and subsequently, materials science has flourished, increasing in sophistication and contributing to many important scientific and engineering advances. It was a privilege and an honor to be his colleague and friend for over 40 years."

Owen's memberships, honors, and awards included the following: member of the National Academy of Engineering, fellow of the American Society for Metals, Harold Moore Lecturer of the Metals Society, member of the New York Academy of Sciences, trustee of the American Society of Metals, and member of the National Materials Advisory Board.

Acknowledgments

In preparing this tribute to Walter Owen, I received much help from many colleagues, including Samuel Allen of MIT, Gregory Olson of Northwestern University, Derek Hull of the University of Liverpool, Mica Grujicic of Clemson University, and Frederick Schoen of the Brigham and Women's Hospital in Boston.