

# Julia Randall Weertman (1926–2018)

Pioneering materials scientist and inspiring mentor.

Julia Randall Weertman, on receiving the Materials Research Society's highest honour, the Von Hippel Award, in 2003, gave a lecture entitled 'The Pursuit of the Small', referring to her groundbreaking work on grain boundary cavities and nanocrystalline metals. How satisfying that this pioneering materials scientist, in pursuit of the small, had such a larger-than-life career. Weertman passed away on 31 July 2018 in Evanston, Illinois.

Urged to study physics by Frederick Seitz, Weertman earned all three degrees at the Carnegie Institute of Technology (now Carnegie Mellon University). She went on to do postdoctoral work at the École Normale Supérieure in Paris, before joining the US Naval Research Laboratory as a solid-state physicist. When spouse Johannes (Hans) Weertman joined Northwestern University's fledgling materials science and engineering department in 1959, Julia's CV states that she spent the next 13 years 'raising family'. Yet this only describes a portion of her bandwidth. The famous Weertman and Weertman text on dislocations, *Elementary Dislocation Theory* (Oxford Univ. Press, 1964), was written on the dining room table over this period. Their two children, Bruce and Julia, recall playing under the same table as their mother typed away, engrossed in dislocation theory or in the review of a paper. During this same timespan, Weertman, on trips to Los Alamos, developed her love for Southwestern Pueblo and Hopi pottery. These collections graced the Weertman home and offices, and were sometimes gifts to lucky recipients.

Morris Fine encouraged Weertman to join Northwestern in 1972, first as a lecturer to cover some teaching needs. Northwestern then realized what a gem it had. She worked her way through the tenure process, establishing a research programme on deformation and creep of metals and alloys. On the suggestion of X-ray expert and colleague Jerome Cohen, she broke new ground by using neutrons to study cavitation and damage during the deformation of metals. These small-angle neutron scattering techniques afforded a new view of cavitation, providing size and shape information on micrometre-sized cavities in a non-destructive manner. The importance of the experiments, and the understanding of creep they provided, led Weertman to become an important voice in National Academy studies, and on Department of Energy (DOE) and National Science



Julia Randall Weertman. Credit: George William Nieman

Foundation (NSF) review committees for the support of neutron scattering facilities and the establishment of new neutron sources.

Weertman then moved to a new research area — nanocrystalline metals — long before 'nano' had cachet. She again proved to be a pioneer in studying the unique mechanical behaviour of solids where grain boundaries dominate strength and deformation. Collaborating with Argonne National Laboratory scientists Richard Siegel and Jeffrey Eastman, her work on nanocrystalline Cu and Pd is among the most highly cited work on mechanical behaviour of nanocrystalline solids, defining the limits of Hall–Petch behaviour. Her illustrious scholarly career was highlighted by her election to the National Academy of Engineering in 1988 and to the American Academy of Arts and Sciences in 1997. Despite official retirement in 1999, Weertman's research continued unabated, and focused on fatigue and twinning/detwinning phenomena in nanocrystalline Cu.

Weertman's role at Northwestern went far beyond that of an educator and scholar. In 1987 she was named Department Chair of Materials Science and Engineering, the first female in the nation to hold that title. During her tenure as chair, the department went through construction of a new building and grappled with the associated space negotiations and moves. Weertman could often be found on Sunday afternoons tackling those challenges in her office listening to her favourite programme on Chicago Public Radio, *Jazz with Dick Buckley*.

In the materials community at large, Weertman was recognized as one of its premier leaders. Universities from MIT to Caltech often sought her counsel on advisory and visiting committees. Through the years she served on a variety of high-level committees, including the

National Academy of Engineering Council, the National Research Council (NRC)'s National Materials Advisory Board, the National Academy of Science/NRC Solid State Sciences Committee, and the Board of Reviewing Editors for *Science*. In recognizing her important role in materials policy at the national level, The Minerals, Metals & Materials Society (TMS) awarded her its 1997 Leadership Award. In her later years, Weertman was also letter-writer extraordinaire, with her generosity of spirit and praise, supporting the election of many to the National Academy of Engineering, the American Academy of Arts and Sciences, and in the awarding of MacArthur, Packard and other such prizes. When Weertman was asked to make career-related presentations to students, she often emphasized the obligations we have as scientists to take on leadership roles in our professional societies and in public education. She would write letters on behalf of persecuted scientists in faraway lands, taking her responsibility as a global scientist seriously. There were few stronger advocates of professional involvement in the materials community.

Weertman was an inspiration to materials scientists, especially female materials scientists. The impact that she has had on diversity in the materials science and engineering field is incalculable, and was duly recognized by the Society of Women Engineers. Northwestern's McCormick School of Engineering and particularly its Department of Materials Science and Engineering have long benefited from healthy enrolment of female students, in part due to Weertman's tireless participation in career days, department tours and seminars. Her concern for women went far beyond the materials science and engineering field. She was an advocate for women in all walks of life, and at one point became involved in Planned Parenthood and the healthcare it afforded, ultimately presiding over the Evanston, IL, section of the organization.

Julia Weertman was the 'mentor's mentor' — an outstanding role model of a scholar, educator and good citizen. We have benefited, and can still learn, from her example. □

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