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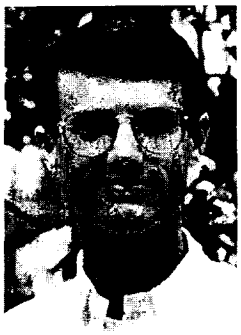

Grinstaff

Suslick

Nobel Laureate Signature Award for Graduate Education in Chemistry

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During his thesis work at the University of Illinois, **MARK W. GRINSTAFF** made landmark discoveries in the use of ultrasound for materials synthesis. He discovered new synthetic sonochemistry—the chemical effects of ultrasound—to the production of unusual inorganic materials, and he further developed techniques for making and studying the reaction mechanisms of a new class of biomaterials. Grinstaff earned his Ph.D. in 1992 under the guidance of his preceptor, **KENNETH S. SUSLICK**, professor of chemistry and of materials science and engineering at the University of Illinois, Urbana-Champaign. The first half of Grinstaff's thesis involves the use of ultrasound in the synthesis of proteinaceous microspheres; the second half deals with the sonochemical synthesis and characterization of amorphous metals.

Grinstaff used ultrasound to generate microspheres approximately 2 μm in diameter whose shells are composed solely of proteins. Because the protein shells are completely biocompatible and because nonaqueous materials such as organic liquids, pharmaceuticals, and lipid-soluble substrates can be entrapped within the microspheres, they have potential use for drug delivery and medical imaging. Grinstaff demonstrated the mechanism of formation of the protein microspheres by using a series of radical trapping experiments. Two papers were published from this work, one in the *Journal of the American Chemical Society* and the other in *Proceedings of the National Academy of Sciences*.

He also applied sonochemistry to the synthesis of unusual inorganic materials. By taking advantage of the unique physical conditions that are achieved transiently during the violent bubble collapse induced by ultrasonic irradiation, Grinstaff realized the synthesis of amorphous metal powders from volatile organometallic precursors. The cooling rates that occur during acoustic cavitation (the formation and implosive collapse of bubbles in an irradiated liquid) are so fast that the metal atoms formed do not have time to crystallize. Grinstaff found that a noncrystalline, coral-like, porous solid is formed, one whose properties are very different from normal crystalline metals. He focused his attention on iron, elucidating catalytic and magnetic properties of amorphous powder, which is both an active heterogeneous catalyst and a soft ferromagnet with potential applications for power transformers and magnetic storage devices. From this work, Grinstaff published articles in *Nature* and *Physical Review B*. In total, his work has led to more than twelve published papers and two patent applications.

This summer, Grinstaff received a National Institutes of Health Postdoctoral Fellowship. While at the University of Illinois, he won the award given for the best thesis work in inorganic chemistry. He also won the American Chemical Society Fellowship of the Colloid & Surface Division (1990–91). As a different measure of his success, Grinstaff's work has been described in various news and science news periodicals, including C&EN (Oct. 15, 1990, page 26, and Oct. 7, 1991, page 18).

He is currently a postdoctoral research associate in the laboratory of Harry B. Gray at California Institute of Technology, where he is investigating the activation of oxygen molecules by metalloporphyrins and long-distance electron transfer in heme proteins. In 1987, he received an A.B. degree, with chemistry honors, from Occidental College, Los Angeles. He is a member of Sigma Xi.

Grinstaff conducted his wide-ranging research with Suslick, with whom he shares the award. Suslick received a B.S. degree, with honors, from California Institute of Technology in 1974, and a Ph.D. degree from Stanford University in 1978. He joined the faculty of the University of Illinois, Urbana-Champaign, in 1978.

Suslick's awards include a National Science Foundation Special Creativity Extension Award (1992–94), an NIH Research Career Development Award (1985–90), and an A. P. Sloan Foundation Fellowship. He is a fellow of the American Association for the Advancement of Science and of the Royal Society for the Arts, Manufactures, & Commerce (London).