

UC SAN DIEGO NE/MAE/MATS SEMINAR

Wednesday, December 5, 2018

Seminar Presentation: 11:00am – 12:00pm

SME 248

“Biological Materials: Challenges and Opportunities”

Dr. Marc Meyers

University of California, San Diego

Distinguished Professor of Materials Science

Abstract: Biological materials science is a new and vibrant field of materials science and engineering. Although biologists have been studying organisms for centuries, it is only recently that materials scientists have started to use their fabulous experimental, computational, and analytical arsenal of tools to reveal new features. We present the Arzt heptahedron, which defines seven unique and defining characteristics of biological materials. The plethora of different structures and mechanical properties of biological materials is systematized through a new paradigm proposed by us: eight structural design elements, which are motifs appearing on different species and scales, and which enable analytical treatment and lead to enhanced understanding. We have applied this approach to approximately twenty different organisms. We illustrate our approach by applying this knowledge to seashells, arthropods, the toucan beak, rabbit and pig skin, fish scales, pangolin scales, hair, whale baleen, and feathers. Current efforts at bioinspired materials and designs, including feathers, whale baleen, seahorse tail, and gar scales, are also discussed.

Biosketch: MARC A. MEYERS is a Distinguished Professor of Materials Science at the University of California, San Diego. His research field is the mechanical behavior of materials. Within this field, he has focused on three areas: dynamic behavior of materials, nanocrystalline materials, and biological materials. In the dynamic behavior of materials, the common theme is the high rate at which events occur. He initiated this work in 1972 and has dedicated forty-five uninterrupted years to it, unifying it by emphasizing the physical and chemical phenomena. This has been defined in his now classic book, *Dynamic Behavior of Materials* (1994, ~3,000 citations in google scholar; translated into Chinese). His honors include Fellow, TMS, APS, and ASM, as well as awards in the US (ASM Charles Barrett, Albert White, and Albert Sauveur Awards, TMS Mehl, Morris Cohen and Educator (Weertman) Awards, Acta Materialia Materials and Society Award, SMD/TMS Distinguished Engineer/Scientist and Service Awards, APS Shock Compression Science Award), Europe (Humboldt, DGM Heyn, and DYMAT Rinehart Awards), and China (Lee Hsung Award). He was co-founder of the Center for Explosives Technology Research, New Mexico Tech, and of the EXPLOMET conference series (1980-2000). He is also the co-author of *Mechanical Metallurgy*, *Mechanical Behavior of Materials* (both translated into Chinese), *Biological Materials Science* (Cambridge U. Press), and approximately 460 papers. He is corresponding member of the Brazilian Academy of Sciences and of the Institut Grand Ducal (Luxembourg). In 2014 he completed the kayak descent of the River of Doubt in honor of the 1914 Amazon expedition co-led by Theodore Roosevelt and the Brazilian explorer Col. Rondon. He also writes fiction, and is the author of *Mayan Mars*, *Chechnya Jihad*, *D’amour et d’acier*, and *Yanomami*.