

Pupa Gilbert

“Physical Principles of Skeletal Minerals Revealed with Spectromicroscopy”

Skeletal elements of marine and terrestrial organisms have the most fascinating nano-to-macrostructures, attracting the attention of physicists, biologists, chemists, and materials scientists. Using X-PEEM spectromicroscopy we revealed some of the fundamental mechanisms leading to the formation of these biominerals.

Specifically, we addressed the questions, and provided the answers below:

Q: How do teeth, bones and echinoderm and mollusk shells acquire their unusual, curved and complex morphology, if they are composed of single crystals?

A: Via amorphous precursor phases.

Q: How does crystallinity propagate through the amorphous precursor phases, in sea urchin spicules and teeth?

A: By secondary nucleation, following random walk patterns.

Q: How does iridescent mother-of-pearl become ordered?

A: Gradually, through a kinetic mechanism in which fastest growing single-crystals win the competition for space, thus end up being approximately co-oriented.



Pupa Gilbert (née Gelsomina De Stasio) received her Doctoral Degree in Physics (Laurea), from First University of Rome "La Sapienza," in 1987. From 1988-2000 she was a Staff Scientist at the Institute for the Structure of Matter of the Italian National Research Council, where she achieved the top level (Primo Ricercatore). From 1994 to 1998 she was a part-time

(50%) Staff Scientist at the Institut de Physique Appliquée of the Ecole Polytechnique Fédérale de Lausanne. From 1999 to 2001 she was a Distinguished Visiting Scientist at the California Institute of Technology Jet Propulsion Laboratory, and a Full Professor of Physics at the University of Wisconsin-Madison from 1999 to the present. From 2002 to 2006 she served as the Research Director of the University of Wisconsin Synchrotron Radiation Center. Gilbert has published 1 book and 115 peer-reviewed articles, and

holds two patents for cancer treatments using gadolinium. In 2001 she was appointed a Knight of Italy by Italian President Carlo Azeglio Ciampi for her contributions to cancer research. Gilbert received the 1997 Outstanding Young Persons of the World Award for Scientific and Technological Development from the Junior Chamber International, and she was the recipient of an American Competitiveness and Innovation Award in 2008. Since 2004, her sole research interest has been in the field of biomineralization.

Wednesday, August 5, 2009

3:00 p.m.

Bldg. 402 • APS Auditorium
Argonne National Laboratory

CAPS
COLLOQUIUM