PHYSICAL MATHEMATICS SEMINAR

Controlled Morphogenesis of Precipitating Microsculptures

C. NADIR KAPLAN

Harvard University

ABSTRACT.

Harnessing the mineralization of natural materials into complex microarchitectures holds the potential for functional structures. One elegant model system is the combined precipitation of barium carbonate nanocrystals with amorphous silica, which yields thin-walled aggregates amenable to sculptural control by rational modulations of ambient conditions in a dynamic reaction- diffusion environment. To explain the resulting morphospace, we have developed a geometrical morphogenesis framework based on the kinetics of the growth front, a curve which lays down a surface in space as it evolves over time. Our theory explains the observed range of precipitate morphologies, including vases, petals, and helices. It also defines environmental protocols to engineer architectures which we verify by growing mineralized shapes with proven optical properties. Altogether, our approach allows for the bottom-up control of precipitation-based mineralization patterns.

TUESDAY, MARCH 15, 2016
2:30 PM – 3:30 PM
Building 2, Room 136

Reception following in Building 2, Room 290
(Math Dept. Common Room)

http://math.mit.edu/pms/

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