

Mentor Lecture Series

Organizer(s): Shaowei Lin & Diogo Oliveira e Silva

Monday, 4:10–5:00pm, 60 Evans

Mar. 17 **James A. Sethian**, UCB & Lawrence Berkeley National Lab
*Advances in Advancing Interfaces:
Building Semiconductors, Inkjet Plotters,
Medical Scanners, and Robotic Devices*

Propagating interfaces occur in a wide variety of settings, and include ocean waves, burning flames, and material boundaries. Less obvious boundaries are equally important, and include iso-intensity contours in images, handwritten characters, and shapes against boundaries. In addition, problems not thought of as moving interface problems often can be recast as advancing fronts, including robotic navigation and finding shortest paths on contorted surfaces.

One way to frame moving interface problems is by casting them as solutions to partial differential equations, and this has led to Fast Marching Methods and Level Set Methods. There are some advantages to this view; in particular, they easily accommodate merging boundaries, problems in three dimensions, and very subtle motions of boundaries. In many settings, they have been proven valuable. The speaker will try to provide an overview of these approaches, with an eye towards fundamental mathematical ideas and their geometric and algorithmic interpretation.

Along the way, we will discuss a large collection of applications, with a particular emphasis on industrial engineering collaborations which have led to robust codes for semiconductor manufacturing, the manufacturing of inkjet plotters for building plasma displays, image segmentation and tracking in cardiac scanners, robotic navigation around obstacles, and seismic imaging in oil recovery.

The Mentor Lecture Series is designed for first and second year graduate students. The series aims to acquaint beginning graduate students with potential dissertation supervisors whom they might not otherwise closely encounter, and to impart a taste of research activity in the mathematics department in order to help beginning students choose fields of specialization.