

# PHYSICAL MATHEMATICS SEMINAR

## THE WORLD IN A BOWL OF MUSH: SOLIDIFICATION FROM THE INNER CORE TO THE ARCTIC OCEAN

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### ABSTRACT:

The processes of solidification play a significant role in a whole host of geophysical systems - from solidification of the Earth's core, to the formation of ice in the polar oceans. The presence of impurities in these systems changes not only the crystal structure of the solid formed, but can also drive large scale flows through segregation of the impurity upon solidification. In this seminar, we will investigate the coupling of external hydrodynamics with the growth of a dendritic array of crystals, termed a mushy layer. We show how the natural buoyant modes of convection can be superseded by a forced mode of convection for sufficiently vigorous external flows. In the case of an ammonium chloride mush grown in a laboratory flume, these forced flows give rise to dramatic changes in the local solid fraction of the crystal network. The physical mechanisms coupling crystal growth and external hydrodynamics are investigated theoretically by means of a full linear stability analysis and are compared with experimental results.

**TUESDAY, FEBRUARY 6, 2007**  
**2:30 PM**  
**Building 2, Room 146**

*Refreshments at 3:30 PM in Building 2, Room 349  
(Applied Math Common Room)*



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