

Physics Colloquium

Thursday, April 19, 2007

3:30 - 5:00 pm

Room 139, Fisher Hall

Senior Research Presentations

Exploring Boron Nitride Thin Films and Nanostructures

Adam DeConinck

Boron nitride (BN) is a material of great interest for nanotechnology applications, owing to its desirable electrical and thermal properties as well as bonding structures similar to carbon. In this project we explore two new synthesis routes for BN structures: a high-rate method for the deposition of diamond-like amorphous BN thin films, and the use of new substrates and catalyst films for the growth of BN nanotubes (BNNTs). These methods are evaluated based on characterization of resulting samples by FTIR and Raman spectroscopy, as well as observation by scanning electron microscopy.

Improving Atomic Number Resolution at the National Superconducting

Cyclotron Laboratory

Joe Grochowski

Heavy ion beams are studied at MSU's National Superconducting Cyclotron Laboratory using a magnetic spectrometer. A specific detector in the device, the ionization chamber, measures the atomic numbers of particles. The operation of such a detector as well as its atomic number resolution limitations will be discussed. In addition, a method of improving the resolution will be explored. This method includes improving the mathematical sophistication of the ion chamber's data analysis technique (how electronic data is translated into a measurement).

Waiting Times for Heterogeneous Nucleation of Ice

Carly Robinson

Cirrus clouds interact with sunlight and terrestrial radiation. The number of ice crystals affects the cloud's interaction with both. Understanding the microphysical mechanism of the process will give insight into cloud droplets. Ice nucleation has classically been thought to be a one-step process, but there are suggestions in my research that implicate otherwise.

Weather Trends and Record Statistics

Katie E. Schalk

Can a weak trend in a time series of temperature measurements be detected by examining the number of records in the series? We examine this question in the context of record-breaking daily high temperatures for 115 years in Hancock, MI. The observations are compared to MATLAB simulations (courtesy of Amalia Anderson). Specifically, the expected number of record highs for a given number of years is determined according to the statistics of extremes. This is then compared to the actual number obtained from the data sets. Simulations are also examined for a variety of trends in the mean and variance of the data set. Tentatively, it is found that an increasing trend in the mean could be detected given a moderate (on the order of 100) number of available time series.

Bi-Slug Flow in Microchannels of Differing Cross Section

B. Justin Scholfield

In small diameter channels in which surface tension effects dominate it has been found that a pair of drops of different liquids will spontaneously move due to surface tension effects and that the cross section of the channel has a significant effect on the propagation speed.

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