Dresden Memorial Lecture Series
Swarthmore College

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Thursday, October 23, 2025
4:15PM– Refreshments, 4:30PM Lecture

Mathemagic of sea ice, semiconductors, and Harry Potter

Graphene, osteoporosis, and invisibility cloaks may seem unrelated. However, through the unifying lens of mathematics, problems from disparate fields can be viewed in the same light and solved with the same math. For example, sea ice plays a critical role in Earth's climate system yet shares striking similarities to many other composite materials. We'll illustrate how our sea ice studies advance medical imaging and twistronics, as well as climate science and polar ecology. After all, the math doesn't care if it's sea ice or bone. We'll conclude with a brief video from our Arctic and Antarctic expeditions featuring math students, and a few penguins!

Friday, October 24, 2025
4:15PM– Refreshments, 4:30PM Lecture

From micro to macro in the physics and biology of sea ice

Precipitous sea ice losses are impacting Earth's polar marine environments and their ecosystems, with ripple effects felt far beyond. A central challenge in modeling sea ice is how to use information about its microstructure to predict the effective properties on larger scales relevant to climate and ecological models. From tiny brine inclusions to ice pack dynamics on oceanic scales, and from microbes to polar bears, we'll tour recent advances in modeling sea ice and the ecosystems it hosts. Along the way we'll encounter fractals, percolation, random matrices, topological data analysis, diffusion, and uncertainty quantification.

Chang Hou Hall (Science Center 101)