

# Colloquium

Thursday, May 21st, 2026 at 4 p.m.  
Physics & Astronomy Building (PAB) 1-434

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## The Statistical Physics of Ice Sheets and Sea Level Rise

Melting of the Antarctic and Greenland ice sheets will contribute to an increasing rate of sea level rise over coming decades and centuries. Predicting such ice sheet changes far into the future requires looking beyond current deterministic approaches to modeling ice sheet flow and fracture. In this talk, I will discuss how we can use ideas from statistical physics to understand and model ice sheet changes. In the first part, I use stochastic perturbation theory to transform a simple dynamical model of marine ice sheet collapse into the Fokker-Planck equation, providing predictions for the evolution of leading order moments of the uncertain future distribution of ice sheet states and corresponding sea level rise predictions. I then discuss how these ideas have been extended to higher complexity models. In the second part, I describe how models for melt pond behavior on ice are mathematically related to the non-Abelian sandpile (a relative of the classical Ising model), placing firm constraints on the speed at which the floating parts of ice sheets can collapse with warming. I describe how we also use extensions of percolation theory on correlated potential landscapes to predict the maximum size of melt ponds on ice sheets. This theory is of direct use in predicting how dark we expect ice sheet surfaces to become under future warming and the role of melt in driving ice fracture. Throughout I will argue for the exciting overlap between glaciology and statistical physics, and how both can be combined to answer consequential questions about future sea level rise.

Hosted by Seth Putterman