
Understanding ice flow, in particular its slip over rock, is critical to a wide range of scientific problems with big societal impact—from predicting sea-level rise to assessing the health of mountain glaciers. Unfortunately, processes taking place at the glacier-bedrock interface, including erosion of the bedrock and the role of evolving bed roughness on friction, remain poorly constrained by observation, and many long-held theories have yet to be confirmed by experiment. To remedy this omission, this interdisciplinary team will design and build a novel centrifuge-based experimental apparatus to explore glacier-bedrock processes at natural spatial scales. The goal is to use enhanced gravity to study: (1) interaction between subglacial debris and bedrock, including rock abrasion and melt channel formation, and (2) interaction between basal melting and cavity formation in the lee of basal bumps. The results will contribute to the improved understanding of complex glacier dynamics and provide better parameters for future projections of glacier flow and mass balance.