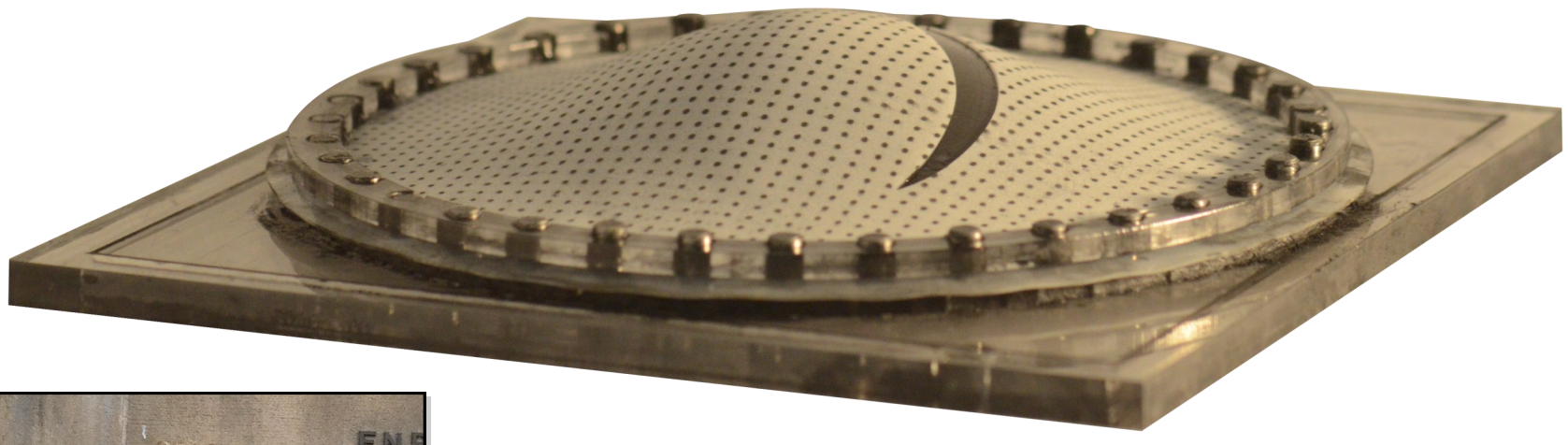
PHYSICS COLLOQUIUM SERIES

Guiding Cracks with Geometry

Fracture mechanics has not only been essential for technological advance, but also represents an important class of problems in physics and fundamental science. Recent advances in understanding the instabilities of cracks have generated new ideas for controlling fracture morphology. In this talk, I will present curvature as a purely geometric tool for guiding the behavior of cracks. When a flat elastic sheet conforms to a surface with Gaussian curvature, the geometry of the surface redistributes stresses in the sheet, producing new fracture behavior which cannot be achieved by boundary forces alone. Using experiments of rubber sheets frustrated on 3D-printed surfaces and analytical modeling, I will demonstrate that curvature can stimulate or suppress fracture initiation, steer the path of a crack as it propagates, and can even arrest cracks which would otherwise continue to propagate in flat space.



Wednesday, April 29
2:00 - 3:00 p.m.
RNS 210

Cookies and Apple Cider Served!

Noah Mitchell ‘12

Ph.D. Candidate, University of Chicago Department of Physics

Noah Mitchell graduated from St. Olaf with distinction in 2012. As an undergraduate, he conducted atomic research with Dr. Nitz and studied astrophysical flows in dwarf galaxies with Drs. Evan Skillman and Kristen McQuinn at the University of Minnesota. The bulk of his undergraduate research focused on brief bursts of intense star formation in dwarf galaxies in the nearby universe and how these events changed the evolution of the host galaxies. After moving to the University of Chicago in 2012, he worked briefly in a dark matter lab before switching to soft condensed matter physics as a PhD student in the Irvine Lab. He was a McCormick Fellow from 2012-14 and a Robert Sachs Fellow in 2013. Beyond his research in elasticity and fracture mechanics, he enjoys teaching as a TA for graduate and undergraduate courses and as an Instructor with the Science and Technology Outreach and Mentoring Program.