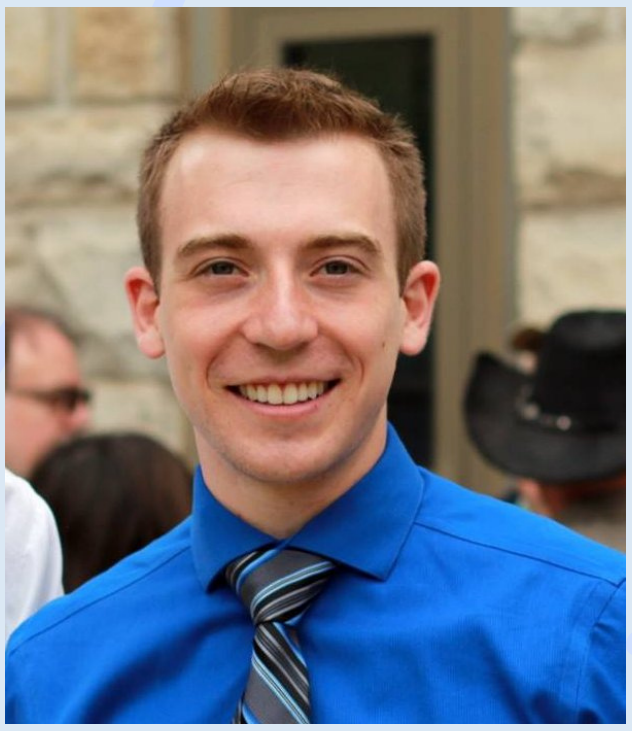
ST. OLAF PHYSICS & MATH DEPARTMENT

COLLOQUIUM SERIES

Spiking at the Edge: Excitability at interfaces in reaction-diffusion systems

Dr. Colin Scheibner ‘17

Friday, March 8th | 3:30 pm | RNS 210



Colin Scheibner received a BA in Physics and Mathematics from St. Olaf College in 2017 and recently completed his PhD in physics at the University of Chicago. His research interests typically involve using ideas from hydrodynamics, statistical physics, geometry and topology to understand matter at a coarse-grained scale. Colin is currently a postdoc at Princeton University in the Center for the Physics of Biological Function and the Center for Theoretical Science, where he is leveraging biophysical approaches to understand dynamics of the adaptive immune system.

Spiking is a general phenomenon that is crucial in the firing of neurons, beating of hearts, and spread of diseases. In homogeneous media, spiking arises from a local competition between amplifying and suppressing forces. But most real-world systems are far from homogeneous. Here, we demonstrate that inhomogeneities such as interfaces and boundaries (that spatially segregate these two forces) can promote spiking, even if the system does not spike when these forces are evenly mixed. We mathematically derive a spiking phase diagram in terms of interfacial diffusion and amplification strength. Our findings apply to chemical reactions, predator–prey dynamics, and recent electrophysiology experiments, in which localized action potentials were observed at the interface of distinct, nonspiking bioelectric tissues.