Modern Mathematics Workshop 2018
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SPEAKER TITLES/ABSTRACTS

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Bio:

Jo Nelson received her PhD in 2013 from the University of Wisconsin - Madison under Mohammed Abouzaid. She previously held concurrent appointments, in part as an NSF postdoctoral fellow, at the Institute for Advanced Study (2013-2016), the Simons Center for Geometry and Physics (2014), and Columbia University (2013-2018). Jo studies symplectic and contact topology, a field, which has its origins in the study of classical mechanical systems. Understanding the evolution and distinguishing transformations of these systems necessitated the development of global invariants of symplectic and contact manifolds. Her research primarily concerns providing foundations and applications for contact invariants stemming from nonequivariant and (circle) equivariant constructions of contact homology. Contact homology is built out of closed orbits of Reeb vector fields and counts of solutions to a nonlinear Cauchy-Riemann equation, which interpolates between closed Reeb orbits. Reeb vector fields are Hamiltonian-like vector fields, whose flow lines are solutions to Hamilton's equations of motion, as they conserve energy. Closed Reeb orbits are of particular interest because they can be used to describe local distance minimizing "loops."

Abstract:

"Contact Invariants and Reeb Dynamics"

Contact geometry is the study of certain geometric structures on odd dimensional smooth manifolds. A contact structure is a hyperplane field specified by a one form which satisfies a maximum nondegeneracy condition called complete non-integrability. The associated one form is called a contact form and uniquely determines a Hamiltonian-like vector field called the Reeb vector field on the manifold. I will give some background on this subject, including motivation from classical mechanics. I will also explain how to make use of J-holomorphic curves to obtain a Floer theoretic contact invariant, contact homology, whose chain complex is generated by closed Reeb orbits. This talk will feature numerous graphics to acclimate people to the realm of contact geometry.