



## PIMS / AMI Seminar

Wednesday, October 16, 2019  
3:00 p.m.  
CAB 657

**“The role of the strain matrix in the Navier-Stokes  
regularity problem”**

**Evan Miller**  
**Department of Mathematics and Statistics**  
**McMaster University**

### **Abstract**

The regularity problem for the Navier-Stokes equation is one of the biggest open problems in nonlinear PDE. In this talk, I will use the evolution equations for the strain and vorticity to derive an identity for enstrophy growth that depends only on the strain tensor, not on the nonlocal interaction of the strain tensor with the vorticity. This identity implies a new family of scale-critical, necessary and sufficient conditions for the blow-up of a solution at some finite time  $T_{\max} < +\infty$ , which depend only on the history of the positive part of the second eigenvalue of the strain matrix. I will also prove the existence blowup for a model equation for the strain evolution equation, and as a corollary obtain a new conditional blowup result for the full Navier-Stokes equation.