Western University
Department of Physics and Astronomy

PHYSICS & ASTRONOMY COLLOQUIUM

Date: **WEDNESDAY, 16 October 2019**

Time: **1:30 p.m.**

Location: **Physics & Astronomy Seminar Room 100**

Dr. Cameron Hopkins

Micro/Bio/Nanofluidics Unit
Okinawa Institute of Science and Technology

"Elastic Flow Instabilities in Microfluidics"

ABSTRACT

For the flow of simple Newtonian fluids (like air or water) it is well known that the flow becomes unstable beyond critical conditions in which inertia becomes significant. A well-known example of this occurs for flow around a cylinder. Above a critical Reynolds number (the dimensionless ratio of inertial stress to viscous stress) the flow destabilizes, and inertia drives the formation of vortices in the wake of the cylinder that shed periodically from either side of the cylinder. If the cylinder is free to move, the vortex shedding drives oscillations of the cylinder, which may lead to destructive large-amplitude oscillations if near resonance.

Viscoelastic liquids, such as many biological liquids and industrially-relevant polymer or surfactant solutions, possess a combination of viscous (liquid-like) and elastic (solid-like) properties. The flow of a viscoelastic liquid can become unstable at negligible inertia (Reynolds number << 1). Instead, above a critical Weissenberg number (the dimensionless ratio of elastic stress to viscous stress), elasticity destabilizes the flow. Microfluidic techniques are required for studying elastic flow instabilities due to the very small length scale required to achieve low Reynolds number but high Weissenberg number. In this talk I will present our recent work on the flow of a viscoelastic fluid past a microcylinder, the very counter-intuitive purely-elastic flow instability that occurs, and the resulting viscoelasticity-driven flow-induced vibrations of a flexible microcylinder.

HOST: J. de Bruyn

COFFEE + light snacks will be available in the Atrium, 2nd floor, at 1:15 p.m.