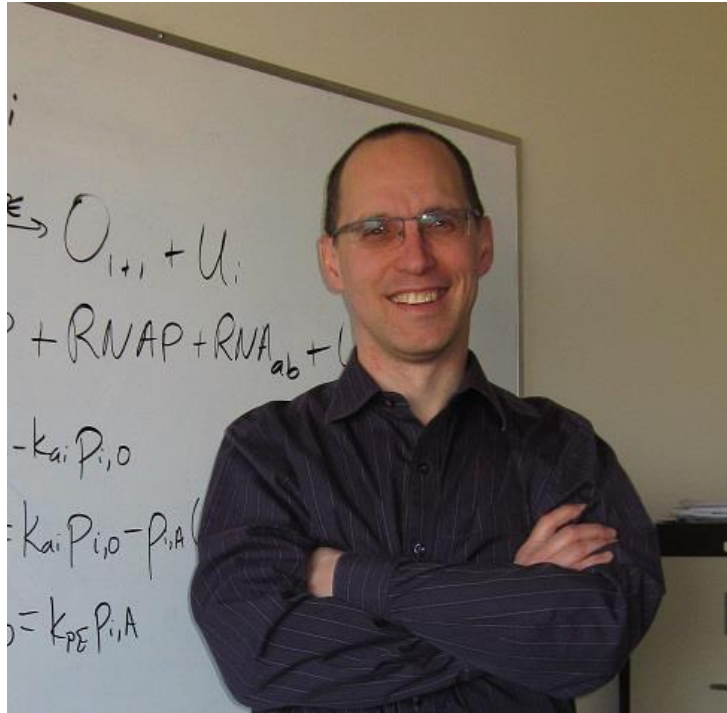# DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
COLLOQUIUM
Friday – November 18, 2016
12:00 – 12:50 pm in D634

Marc R. Roussel

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Biography:
Marc Roussel obtained his Ph.D. from the University of Toronto in 1994, where he worked on invariant manifold theory as a tool for understanding chemical dynamics. In 1994--95, he was a postdoc in the Physiology Department at McGill University, where he developed a theory of chemical reactions with delayed effects. He was has been at the University of Lethbridge since 1995, where he has been working on a variety of problems in chemical and biochemical dynamics. In recent years, his work has revolved in large part around the dual themes of delays and stochasticity.

Title: Models of gene expression with delays

Abstract:
Modeling the expression of a gene network raises a number of challenges: ``Sensible'' models usually incorporate delays to represent the time required to transcribe a gene from DNA to RNA, and to translate the RNA to protein. The time scales of the relevant biochemical processes (initiation of transcription and translation, enzyme catalysis, etc.) span many orders of magnitude, so the governing equations are almost always stiff. The ``obvious'' modeling approach leads to delay-differential equations, requiring an initial function whose physical interpretation is often problematic, and all the more so given that there are often multiple coexisting attractors reached from different initial functions. Mass conservation in these delay-differential equation models is a nontrivial issue, particularly from the point of view of numerical algorithms for their solution. Moreover, methods of analysis for large systems of delay-differential equations are still in their infancy. Differential equation modeling is, moreover, not well grounded because many species, notably the genes themselves, are present in low copy numbers, requiring a stochastic model with delays. This talk will discuss a selection of these problems and some emerging techniques for dealing with them.

There will be snacks and refreshments.
Everyone is welcome!