Western University
Department of Physics and Astronomy

PHYSICS & ASTRONOMY COLLOQUIUM

Date: **Thursday, 13th April 2017**
Time: **1:30 p.m.**
Location: **Physics & Astronomy Seminar Room 100**

Dr. Paul G. Higgs

Department of Physics & Astronomy
McMaster University

"Understanding the RNA World: How to get from Chemistry to Biology using some Physics"

ABSTRACT

According to the RNA World theory for the Origin of Life, the first replicating molecules were nucleic acids that had the ability to act as both a gene and a catalyst. We are studying the way that a self-replicating biological system can emerge from a non-living chemical system that is able to synthesize a mixture of random sequences. This involves some interesting physics questions. What physical conditions are needed to enable the formation of long RNA sequences? What role do wetting and drying cycles play in this process? We will show that understanding the influence of limited diffusion on polymerization and hydrolysis helps to explain recent experiments on RNA synthesis. Biological RNA shows several kinds of ordered properties—it uses only "right-handed" nucleotides rather than a mixture of both chiralities, it uses regular 5'-3' bonds between ribose sugars rather than a mixture of different bond types, and it uses a specific set of four nucleotides rather than a mixture of many other similar molecules. We will show that if template-directed replication is important, we can explain the emergence of all these ordered properties by the same mechanism in terms of symmetry breaking phase transitions.

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