Public Lecture
Conférence publique

MANUEL A. BÁEZ, Carleton University
Pattern Resonance: The Morphology of the Amorphous

The exhibition and lecture will presents the work and research produced through an on-going architectural project entitled The Phenomenological Garden. The project seeks to investigate the morphological and integrative versatility of fundamental processes that exist throughout Nature. Works by Manuel A. Báez will be exhibited as well as those produced by students in workshops incorporating educational methods and procedures derived from this research. This evolving project is a systematic investigation of the versatile and generative potential of the complex processes found throughout systems in Nature, biology, mathematics and music. As part of the De-Formation Studies Unit at the Azrieli School of Architecture and Urbanism at Carleton University, the work seeks to investigate how complex structures and forms are generated from initially random processes that evolve into morphologically rich integrated relationships. The morphological diversity revealed by this working and teaching method offers new insights into the complexity lurking within nature's processes as revealed by such modern theories of Chaos, Complexity and Emergence. The implications of these developments are relevant to the study of morphology, architecture and other disciplines at a time when the ideas emerging out of our deeper understanding of complex phenomena are being embraced for conceptual inspiration.

JOHN CONWAY, Princeton
From Games to Numbers

How playing childish games led to an enormous extension field of the reals.

DAVID SANKOFF, University of Ottawa
A bunch of flower problems

Models of evolution of genome structure incorporate operations that change the order of genes on chromosomes. The phylogeny problem becomes the inference of the minimum number of rearrangement operations to account for a set of given genomes, assuming they evolved along the branches of an given evolutionary tree, as well as the "ancestral" genomes. The evolution of flowering plants is characterized by a particular pattern of genomic change, involving a duplication or "polyploidization" of the entire genome, followed by "fractionation", the random loss over time of one or other of each duplicate gene pair. New phylogenetic inference problems arise due to genome duplication and fractionation, involving the comparison of subgenomes within a single genome and the scrambling of gene order due to random loss of one copy or the other. One of these is the "consolidation" problem, trying to recover the pattern of fractionation in reconstructing ancestral genomes. Another is "genome aliquoting", piecing together the rearranged parts of subgenomes, and still another is trying to find the distribution of runs of deleted versus retained genes on chromosomes of fractionated genomes. We illustrate with recently published genomes of flowering plants.

ROBERT SMITH?, The University of Ottawa
When Zombies Attack! Mathematical Modelling of an Outbreak of Zombie Infection

Zombies are a popular figure in pop culture/entertainment and they are usually portrayed as being brought about through an outbreak or epidemic. Consequently, we model a zombie attack, using biological assumptions based on popular zombie movies. We introduce a basic model for zombie infection, determine equilibria and their stability, and illustrate the outcome with numerical solutions. We then refine the model to introduce a latent period of zombification, whereby humans are infected, but not infectious, before becoming undead. We then modify the model to include the effects of possible quarantine or a cure. Finally, we examine the impact of regular, impulsive reductions in the number of zombies and derive conditions under

which eradication can occur. We show that only quick, aggressive attacks can stave off the doomsday scenario: the collapse of society as zombies overtake us all.