



YCCSA Seminar Series Autumn 2016

An interdisciplinary seminar series hosted by the York Centre for Complex System Analysis aimed at researchers from all disciplines

On the threshold of a gene: automata chemistries for replicator-parasite systems

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Ron Cooke Hub, RCH/204 at 13:30

Abstract:

Replicator-parasite systems are based on the RNA-world model of early biology, where molecules interact with one another to replicate themselves. Reactions involve a pair of RNA molecules, one of which taking the role of the 'copier' and the other acting as the 'template' for the created copy. Implicit in these models is the idea that acting as a copier involves altruism: whilst it is acting as a copier, a molecule is unavailable to be copied and so increase it's progeny. This scenario opens the door for the emergence of parasitic 'cheaters' - molecules that never copy, and always act as template. Mathematical models of these replicator-parasite systems show that the dynamics of the system vary dramatically depending on the binding and copying rates of the two classes of molecule. However, these models are fixed in their functionality and do not allow for the range of possible interactions that could emerge during evolution. To address this issue, we use an automata chemistry to model the same systems. Here, the function of binding to and copying a template is encoded as a linear program on the replicator sequence. Small errors in the system lead to the emergence of parasites, but the system does not go extinct: instead, new strategies for interacting emerge, giving important new clues to the link between these systems and the central dogma of molecular biology.

The seminar includes a refreshment break to fuel interdisciplinary discussion

***Ron Cooke Hub is on Heslington East Campus – accessible by free bus services
Nos. 66 and 44 running at frequent intervals from Heslington West.
The YCCSA Seminar room is on the second floor***