YCCSA Seminar Series
Spring 2016

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

DNA Minicircles for Synthetic Biocomputing

Dr Sarah Harris
Astbury Centre for Biophysics, University of Leeds

6 May 2016
Ron Cooke Hub, RCH/204 at 13:30

The genomes of even the simplest bacteria function as highly sophisticated computing units capable of changing their output (e.g. the type and number of proteins produced) in response to changes in the environment. This has led to the idea that organisms could be used as bio-computers. However, there are a number of disadvantages inherent in using existing organisms to provide circuits for bio-computing. Therefore, an entirely synthetic bio-computer which operates in cell extract but which is capable of the same wealth of logical operations as a living genome would be highly desirable. Our design uses synthetic, minimal genomes which perform logical operations using closed circular DNA loops which can be supercoiled. DNA supercoiling is able to control the output of a genome because it changes the shape of the DNA, which in turn influences DNA recognition by proteins such as transcription factors or repressors which switch gene expression on or off. Supercoiling is far more efficient for information transfer than using coupling between the production of transcription factors or repressor proteins, because it uses the DNA itself as the conduit, and is almost instantaneous. We will discuss the feasibility of using DNA minicircles containing 500 to 5000 base pairs as synthetic DNA logic gates.

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