

ALGEBRAIC BIOLOGY IN THE CRM

While mathematical biology in general models biological processes mathematically, the emerging specialization of algebraic biology uses mathematical tools from algebra to study such processes. The Centre for Research in Mathematics at UWS has a group of researchers working in this area, focussing in particular on problems related to evolutionary processes in bacterial DNA, using group theory.

Algebra is a discipline within Pure Mathematics, normally considered a long way from applications to biology. However group theory is the study of sets with a structure designed to model symmetries, and there are a range of processes that occur on bacterial genomes that have symmetry well-suited to a group-theoretic approach. For instance, the

group within CRM uses the theory of Coxeter groups to study inversion processes on bacterial DNA, with different modelling assumptions giving rise to different group-theoretic problems, often not previously considered by algebraists. Some of these are described in a recent paper from the group, "Group-theoretic models of the inversion process in bacterial genomes", by A. Egri-Nagy, V. Gebhardt, M.M. Tanaka and A.R. Francis, to appear in the Journal of Mathematical Biology.

The group within CRM working in this area includes Professor Andrew Francis, Dr Attila Egri-Nagy, Sangeeta Bhatia, Stuart Serdoz and Tanzila Choudhury at Parramatta, and Dr Volker Gebhardt at Penrith campus. Their research is supported by the Australian Research Council in grants listed below.

- FT100100898 Algebraic evolution and evolutionary algebra, Andrew R Francis, 2010-2014.
- DP130100248 Algebraic algorithms for investigating the space of bacterial genomes, Andrew R Francis and Volker Gebhardt, 2013-2015.

