

## *Oxford Summer Projects in Computational Biology*

From July 4<sup>th</sup> until August 13<sup>th</sup> 2011, a project-based summer school in computational biology will take place in Oxford in The Department of Plant Sciences.

The ideal student is strong in maths/stats/compsci/phys/chem, has studied 2-3 years of an undergraduate degree, and has an interest in moving into computational biology. However, we have also successfully had students from a pure biology background, as well as students in the process of doing their PhD. The instructors/teachers/project designers are: James Anderson, Luke Cartey, Tom Cavalier-Smith, David Gavaghan, Jotun Hein, Joe Herman, Nick Jones, Steve Kelly, Rune Lyngsø, Thomas Mailund, Istvan Miklos, Adam Novak, Bela Novak, Joe Pitt-Francis, Gail Preston, Miltos Tsiantis.

The presently planned projects are:

- Metabolic Random Fields
- Correlated Evolution in Networks
- Phylogenomic Analysis of Algae
- Stochastic Models Combining Alignment and Annotation
- Advanced Software Design for Statistical Alignment
- Evolving Dynamical Systems: the Cell Cycle as test case
- Inverse RNA Folding Algorithms
- Stochastic Models of Leaf Shape Evolution
- Comparison of parallel solution techniques for the Eikonal equation

See <http://www.stats.ox.ac.uk/research/genome/projects/currentprojects> for more details about the project and <http://www.stats.ox.ac.uk/research/genome/projects/pastprojects> for earlier project reports.

Students will work in groups of three with daily discussion with the instructors. There will be three presentations by each group and there should be a final report describing the work. Participation has in general been experienced as very demanding by students. There are no official credits for participation, but participation has been experienced as very rewarding as a research experience and in creating relationships with students/researchers in other countries.

In the work days in the above period, each day will start with a 1 hour lecture and we will hope to have given an overview of computational biology by the end of the period. But the course will strongly focus on learning 'by doing'. There will also be one lecture describing how to enter an Oxford PhD (DPhil) program. The present plan is:

Week 1: Introduction to summer school, Introduction to computational biology, Alignment of a pair of sequences, Alignment of a set of sequences, Student Presentations.

Week 2: Models of substitution I, Models of substitution II, Models of substitution III, Phylogenies I, Phylogenies II

Week 3: Statistical alignment I, Statistical alignment II, Genetic mapping I, Genetic mapping II, Networks I

Week 4: Networks II, Networks III, Integrative genomics I, Integrative genomics II, Student Presentations.

Week 5: Genome annotation I: protein genes. Genome annotation II: RNA genes, Genome annotation III: signals by machine learning, Genome annotation IV: signals by evolutionary models, Patterns in biology

Week 6: Modelling molecular reactions I, Modelling molecular reactions II, Predicting protein structure, Doing a DPhil in Oxford, Final Student Presentations.

There are presently 15 scholarships to cover housing and food, but more might be available dependent on applications under review.

**Deadline for application is February 20<sup>th</sup> per email** to Madeline Mitchell ([mitchell@stats.ox.ac.uk](mailto:mitchell@stats.ox.ac.uk)). A CV with university grades and two people who can be contacted for references is needed. If possible, please apply as soon as possible as there are a series of alternative possibilities of funding for named students.