Biological Science
Academic track in the major

MATHEMATICAL AND COMPUTATIONAL BIOLOGY (HUGHES FELLOWSHIPS)

Mathematical and computational approaches are being increasingly utilized in all areas of biological science, whether in basic research or in the many areas of applied biology. The Mathematical and Computational Biology track provides students majoring in biological science a variety of coursework and research experiences to help prepare them for careers in biology utilizing computational approaches. This track also confers eligibility to apply for financial support through Hughes Fellowships (see page 28).

CURRICULUM: Students on this track fulfill the normal core and collateral requirements for the biological science major, as well as 19 hours of electives in biology, including 2 elective lab or field courses and 2 area courses.

Specific courses necessary for mathematical and computation emphasis should include:

•Both Statistics for Biology (STA 2171) and Calculus II (MAC 2312).
•Physics with calculus treatment (PHY 2048C, PHY 2049C) to fulfill the collateral requirement.
•Two semesters of directed individual study (BSC 4900) in computational biology to fulfill BSC 3402L requirement.

The following specific Biology Electives:

Biological Modeling (offered by the Mathematics Department) (3 hrs)
Introduction to Bioinformatics (3 hrs)
Programming Skills for Computational Biology and Bioinformatics (3 hrs)

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with students and encourage individual discussion and research projects. The following faculty have expertise in mathematical and computational biology

P. Bryant Chase	Biomechanics of cardiac and skeletal muscle
Piotr Fajer	Molecular simulations
Betty Gaffney	Magnetic resonance of proteins
Thomas Hansen	Theoretical evolutionary genetics
David Houle	Theoretical population genetics
Thomas Houpt	Custom software to analyze patterns of eating and drinking, spatial patterns of gene expression in the brain, and sequences of genes related to brain and nerve function.
Brian Inouye	Theoretical ecology and population dynamics
Thomas Roberts	Dynamics of cell motility
Thomas Miller	Mathematical modeling of community ecology
David Swofford	Computational approaches in phylogenetics
Kenneth Taylor	Image processing of electron micrographs to produce 3-D images of biological macromolecules.
Joseph Travis	Mathematical models for structured populations
Nora Underwood	Theoretical population dynamics

Faculty mentors for mathematical and computational biology are also available in the following departments: Computational Science and Information Technology, Chemistry, Chemical Engineering, Computer Science, Mathematics, Physics, and Statistics. Mentors are also not restricted to this list and the Committee can work with Hughes Fellows to identify additional faculty to serve as research sponsors. The Committee anticipates that many Hughes Fellows will interact with more than one mentor over the one-year period of research, for example in cases where data are collected in one laboratory and then computationally evaluated in a second laboratory.

FACILITIES: Computer facilities have been dramatically enhanced by the Howard Hughes funds. The FSU central bioinformatics server has been replaced with a modern quad-cpu platform capable of providing fast and powerful analyses to any size undergraduate laboratory course. This server is also available to the FSU research community at large for computational biology analyses. It is loaded with the Accelrys GCG Wisconsin Package for sequence analysis, the PAUP* and PHYLIP packages for phylogenetic inference, and a whole suite of public-domain sequence analysis programs. Joint-use computer laboratories have also been created and expanded with Howard Hughes funding. The existing Biology Department joint-use computer laboratories have been expanded and new Statistics Department, as well as Mathematics Department, joint-use computer laboratories will be established.