

#### Interdisciplinary Mathematics

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- Most math majors do not end up doing math for their careers;
- Employers who hire math majors do so knowing they must be retrained;
- Most likely, math graduates will be a) part of a team; b) working on problems that are not well formulated; c) working with people with greatly different training, background, vocabulary, and expectations.



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Remark: The professional schools (law, medicine, business, engineering) have figured out how to maintain their academic discipline and yet train students the vast majority of whom do not end up in academics.



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- If not Mathematics, then where?



Biology in the 21st Century will be for Mathematics what Physics was in the 19th and 20th Centuries.





The increase in computer power and in the size and number of databases has resulted in a tremendous need for mathematically trained individuals to attack problems in the biological/ life sciences.



#### **One Attempt at Change**



#### Mathematical Biology at the University of Utah



Program of Study

IGERT

RTG

Weekly Schedule

Math Biology Seminar

Journal Club

Special Events

Faculty

Post-Docs

Students

Alumni

Opportunities

Links

Contact Us



#### Program Overview:

The Department of Mathematics at the University of Utah has a research group consisting of 5 faculty, 8 postdoctoral fellows, and 23 graduate students, whose work is at the forefront of mathematical biology research and education.

Research in Mathematical Biology is in four broad areas: Biofluids, Ecology and Evolutionary Biology, Neuroscience and Physiology. The goal of this effort is to use mathematical reasoning and techniques to gain insights into complex biological phenomena.

A more complete description of the program is given in the links listed on the right.

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Math Biology Graduate Program at the University of Utah

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• What the grants do:

IGERT: Supports beginning students for two years to begin interdisciplinary training and research.

RTG: Supports REU's, advanced students, and postdocs for interdisciplinary research.



## Unique features of our program.

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- Summary: We are deliberately trying to change graduate education and the research culture.



# **Preliminary Results**

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- Graduates get jobs.
- Modern biology is exciting. Students work on cool stuff (that they can talk about at parties).



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- It is difficult to find committed advisor/mentors. Few want to supervise an interdisciplinary student - a student that is not their own.
- Biologists don't know what to do with a math graduate student.



### A few words about words

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Examples:

• to divide -



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• to divide - find the ratio of two numbers (Mathematician)



Examples:

 to divide - replicate the contents of a cell and split into two (Biologist)



- to divide replicate the contents of a cell and split into two (Biologist)
- to differentiate -



- to divide replicate the contents of a cell and split into two (Biologist)
- to differentiate find the slope of a function (Mathematician)



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- a PDE Partial Differential Equation (Mathematician)



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- a PDE Phosphodiesterase (Biologist)



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- to differentiate change the function of a cell (Biologist)
- a PDE Pennsylvania Department of Education (Google)

And so it goes with words like germs and fiber bundles (topologist or microbiologist), cells (numerical analyst or physiologist), complex (analysts or molecular biologists), domains (functional analysts or biochemists), and rings (algebraists or protein structure chemists).



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- 3. Problem solving tools;
- 4. Mathematical Experimentation;
- 5. Theorem/Proof (only a small part of what makes a mathematician!)



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