

Strategic Plan for “Mathematical Sciences and Applications Initiative”

Many important problems in the physical and biological sciences, including the fields of medicine, molecular and evolutionary biology, material sciences, behavior, and other fields in the sciences, are complex and require interdisciplinary approaches for their solutions. Examples include the analyses of images and other types of data from various areas in the biomedical sciences (medical research, genomics, and proteomics), the environmental sciences (global climate change, restoration of the Everglades), nano-science, and the physical sciences (ranging from the largest scales with astronomy and space sciences to the smallest scales with elementary particles).

Programs building strong bonds among the mathematical sciences and their applications exist at many of the best research institutions in the U.S. and abroad. These programs include the Beckman Institute at the University of Illinois, the Institute of Mathematics and its Applications at the University of Minnesota, and the Institute of Pure and Applied Mathematics at UCLA. These programs leverage significant funding and provide the resources required to solve large and complex problems.

An academic culture and infrastructure is needed at the University of Florida to identify important problems, build teams with required expertise, and provide timely solutions. In CLAS we are fostering interdisciplinary collaboration among physical and biological science faculty that have mathematics, statistics, and computation as major parts of their research foci, bridging existing programs such as the Center for Applied Math and the Quantum Theory Project. An example of this type of cross-disciplinary interaction that has already taken place is the use of the Early Bird project to examine avian evolution as an additional rationale in a request for computational resources that was part of a successful Major Research Instrumentation grant to principal investigators associated with the Quantum Theory Project. To foster more connections of this type and build truly interdisciplinary teams of faculty, we are exploring more formal organizational structures for the mathematical sciences.

Dean Sullivan charged the Mathematical Sciences Committee in January 2004, to constitute an interdisciplinary task force to consider opportunities and ways forward in the areas of overlap between mathematics and computationally oriented physical and biological sciences. The committee drafted a mission statement that has guided committee activities:

The mission of the Mathematical Sciences Committee is to identify emerging scientific fields that have strong mathematical components; promote education in these fields; encourage and support collaborative research; coordinate responses to interdisciplinary proposal solicitations; and explore more formal organizational structures that will bridge the mathematical sciences and their applications.

The “Math Sci” committee meets on a bi-weekly basis and has considered short, mid, and long-term objectives that form the basis of the strategic plan given below. The strategic plan is formed on two levels, a “local” or grassroots level that focuses on promoting interdisciplinary research among University of Florida faculty, and a “global” level that focuses on connection of the University of Florida faculty to researchers of national and international prominence.

Short-term objectives:

1) Identify simple, readily implementable steps that would foster longer term interdisciplinary collaboration among mathematics, statistics, and computational oriented physical and biological science faculty.

Strategies:

- Establish a “Math Sci” website (<http://msc.clas.ufl.edu/>) that will be used to provide information about mathematical science activities at the University of Florida, host a message board where researchers can post questions for experts in other fields, and provide links to university wide resources
- Develop a “Math Sci” database of faculty expertise akin to COS (Community of Science) so that researchers may identify appropriate local expertise regarding potential collaborations, proposal development, or for advice on specific problems.
- Set up a list serv of faculty in the mathematical sciences so that departmental seminars, workshops, and conferences are announced to a broad audience
- Establish a “Math Sci” lecture series that will include both invited and local speakers organized around themes. Proposed themes for 2004/2005 are
 - Promoting Interdisciplinary Research in the Mathematical Sciences at the University of Florida (speaker, Tony Chan, founder of IPAM)
 - Mathematical Sciences Applications to Everglades Research
 - Building Connections between UF Mathematical Sciences and Scripps
 - Promoting Imaging Research at UF
 - Promoting Bioinformatics Research at UF
 - Simulation and Modeling of Complex Materials and Biological Systems

2) Identify mechanisms to orchestrate responses to or help enhance responses to program solicitations.

Strategies:

- Form interdisciplinary faculty committees
- Use Math Sci faculty database to identify expertise and experience of UF faculty

Mid-term objectives:

1) Establish permanent Mathematical Sciences Committee with mechanism for faculty input on constitution and representation.

Strategies:

- Develop and implement governance plan for Mathematical Sciences Committee

2) Establish and maintain relationships between Math Sci faculty and faculty in other colleges (e.g., Engineering, Medicine, Public Health and Health Professions) that require expertise in mathematical sciences for applications

Strategies:

- Develop and implement plan for maintaining relationships

3) Establish relationships with public and private entities (such as Scripps Florida) that overlap with research interests of UF Math Sci faculty.

Strategies:

- Identify appropriate public and private entities
- Create opportunities for interface (e.g., lectures and presentations, funded research, student internships)

4) Evaluate the feasibility of certificate programs, minors, and Masters Degrees to make computational physical and biological science and mathematics a significant enhancement to existing Ph.D. programs.

Strategies:

- Identify benchmark programs
- Convene task force to develop UF program

5) Develop mechanisms to identify gaps in available University of Florida expertise required to conduct world class research in emerging scientific fields

Strategies:

- Identify and prioritize UF research programs in emerging scientific fields
- Convene task force to identify UF strengths and gaps

Long-term objective:

Create an academic culture that balances and rewards excellence in both interdisciplinary and discipline-specific research; identify emerging scientific fields that have strong mathematical components; and promote education in these fields.

Strategies:

- Identify key indicators and develop an evaluation plan to measure progress
- Create an institute for mathematical sciences and applications at the University of Florida. While this institute may be similar to other such structures (e.g., the Institute of Pure and Applied Mathematics (IPAM) at the University of California at Los Angeles, the Institute of Mathematics and Applications (IMA) at the University of Minnesota, and the Beckman Institute at the University of Illinois), this institute will be based on the vision of our faculty and the many strengths unique to the University of Florida.
 - Explore successful models at other institutions
 - Establish relationships with leaders at benchmark institutions
 - Identify funding opportunities
 - Write proposals for phased implementation of institute