

Ph.D. Program in Mathematical Modeling

Dr. Nathan Cahill, Director

Overview

- **RIT is pleased to offer its 8th Ph.D. program in Mathematical Modeling, which began in Fall 2017.**



- **The program admits 5-6 students per year.**

Overview: Today

- **What is mathematical modeling?**
- **What does a degree in mathematical modeling prepare students to do?**
- **What skills do students develop?**
- **What courses are required?**
- **What project and internship opportunities are available?**
- **What research opportunities are available?**
- **How are students supported?**
- **What are the admission requirements?**

What is mathematical modeling?

- **Mathematical modeling: science of using mathematics, logic, and computing power to represent real systems and to predict future behaviors**
- **Essential component of research in all STEM disciplines**
- **Inherently cross-disciplinary and promotes collaboration**

Why mathematical modeling?

- **Projected growth in the need for those with advanced mathematical training to address open-ended, real-world problems**
- **Many career paths:**
 - Business & industry
 - Academia
 - Government

What skills do students develop?

- **Transferrable skills: mathematical consultant**
- **Students become experts in**
 - describing complex real-world systems mathematically
 - integrating data with models
 - devising and implementing algorithms
 - analyzing and interpreting solutions
 - making and justifying predictions
 - communicating with experts in other areas

What skills do students develop?

- **Mathematical modeling**
- **Scientific computing**
- **Numerical analysis**
- **Computational modeling**
- **Applied mathematics**
- **Statistics**
- **Sensitivity analysis**
- **High-performance computing**
- **Dynamical systems**
- **Mathematical biology**
- **Discrete mathematics**
- **Fluid dynamics**
- **Inverse problems**
- **Uncertainty quantification**

Courses and plan of study

- **Three core courses:**
MATH-602 Numerical Analysis I
MATH-622 Mathematical Modeling I
MATH-722 Mathematical Modeling II
- **Research skills: graduate seminar (1 sch each)**
MATH-606 Graduate Seminar I
MATH-607 Graduate Seminar II
- **High-performance computing (one course; options)**

Courses and plan of study

- **Three courses from chosen concentration:**
 - Applied inverse problems
 - Biomedical mathematics
 - Discrete mathematics
 - Dynamical systems and fluid dynamics
 - Geometry, relativity and gravitation
- **Three electives**

Courses and plan of study

- **Qualifying exams**
- **Second-year research project**
- **Dissertation and defense**
- **Other noteworthy elements:**
 - Focus on the full process of mathematical modeling
 - Personalized program (concentration and electives)
 - Interdisciplinary internship required

Projects and internships

- **Interdisciplinary internship:**
 - Co-op or internship at a company
 - Internship at a national lab
 - Research opportunities in other labs
- **Teams of students are available to solve challenging issues for companies and organizations during the academic year.**
 - Clarifying the problem
 - Designing a solution
 - Building a working system

Internship examples



Nicole Rosato, NASA Goddard Space Flight Center

“Interns worked on projects under civil servant mentors, who we were required to regularly communicate with and provide regular progress updates to. I continued a project begun last semester that attempts to improve current techniques for calculating gravitational radiation from merging black holes. The researchers I worked with at NASA were experts in this particular area.”

Internship examples



Bridget Torsey, Ortho Clinical Diagnostics

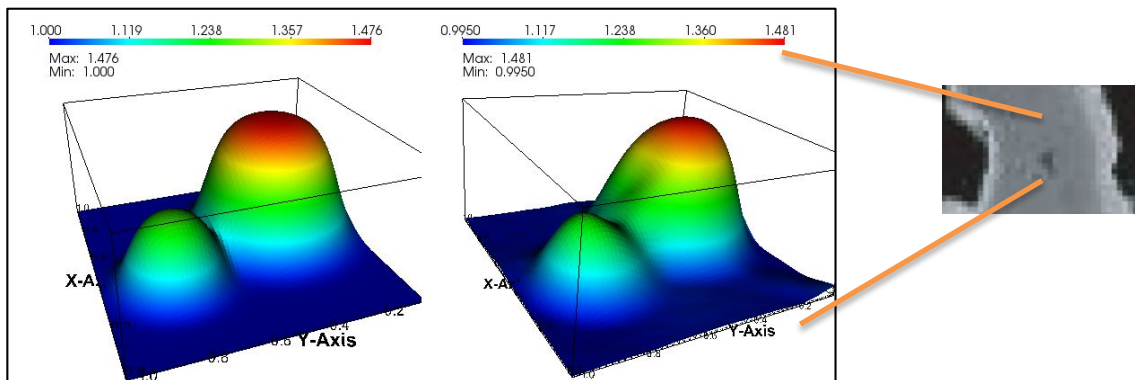
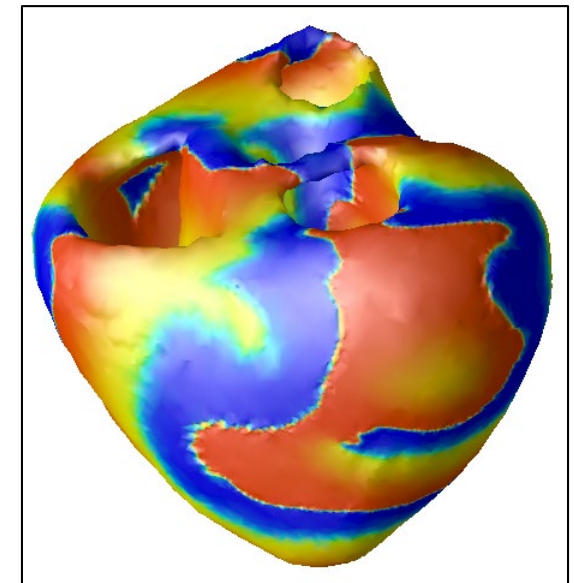
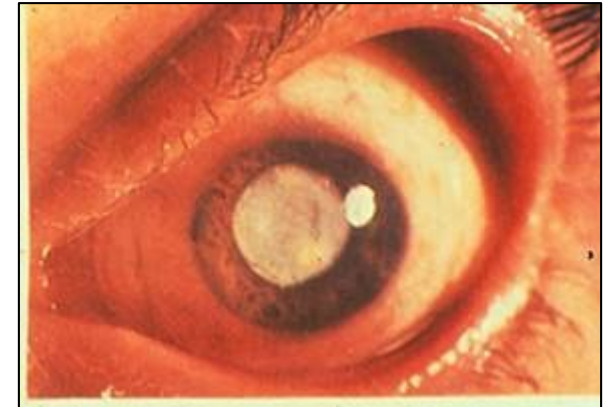
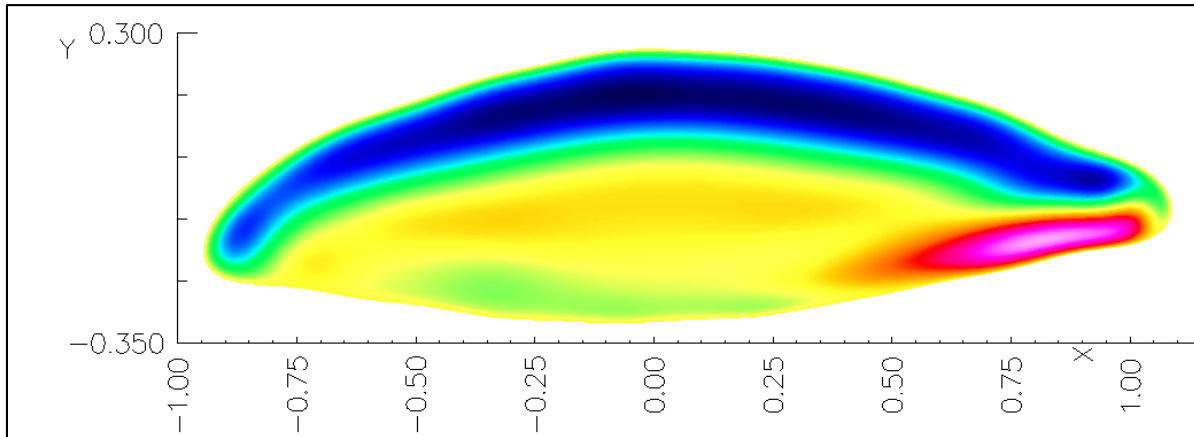
“I created an interface to expedite curve fitting. I provided input on mathematical model decisions and wrote technical reports. I really enjoyed the coding aspect and applying what I have learned to real-world problems. It was exciting to see other people utilize the tools I created.”

Projects and internships

- **Contact Kris Stehler in Career Services**
(www.rit.edu/recruit) for any hiring/recruiting needs.
Phone: 585-475-5468 Email: kwsoc@rit.edu
 - Internships.
 - Co-ops.
 - Full-time opportunities.
 - Student projects.

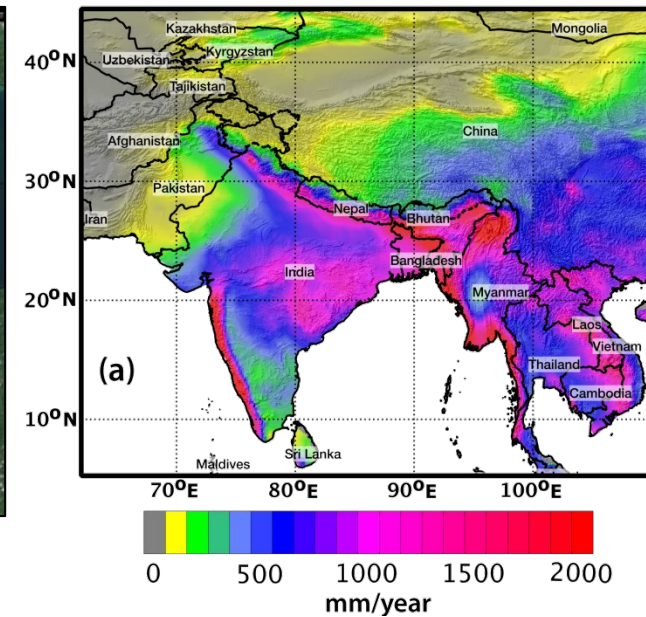
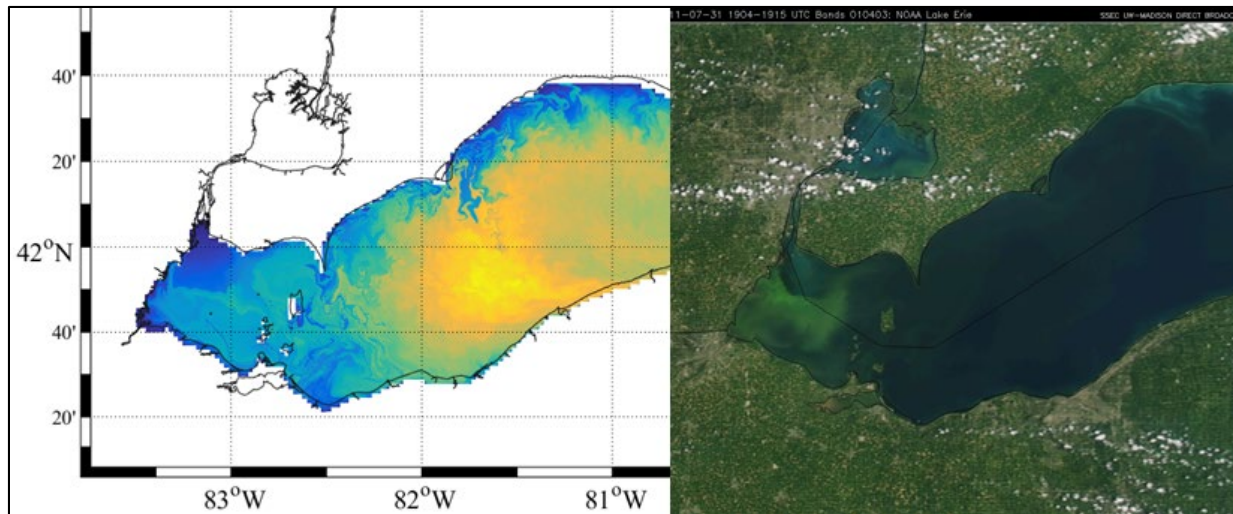
Research opportunities

- **Biomedical applications**



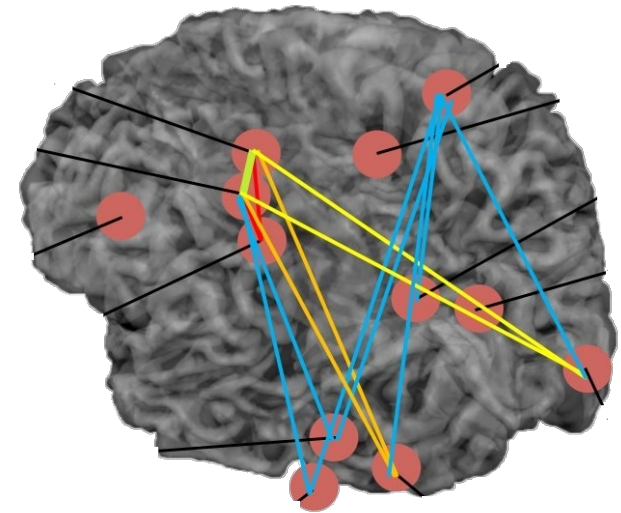
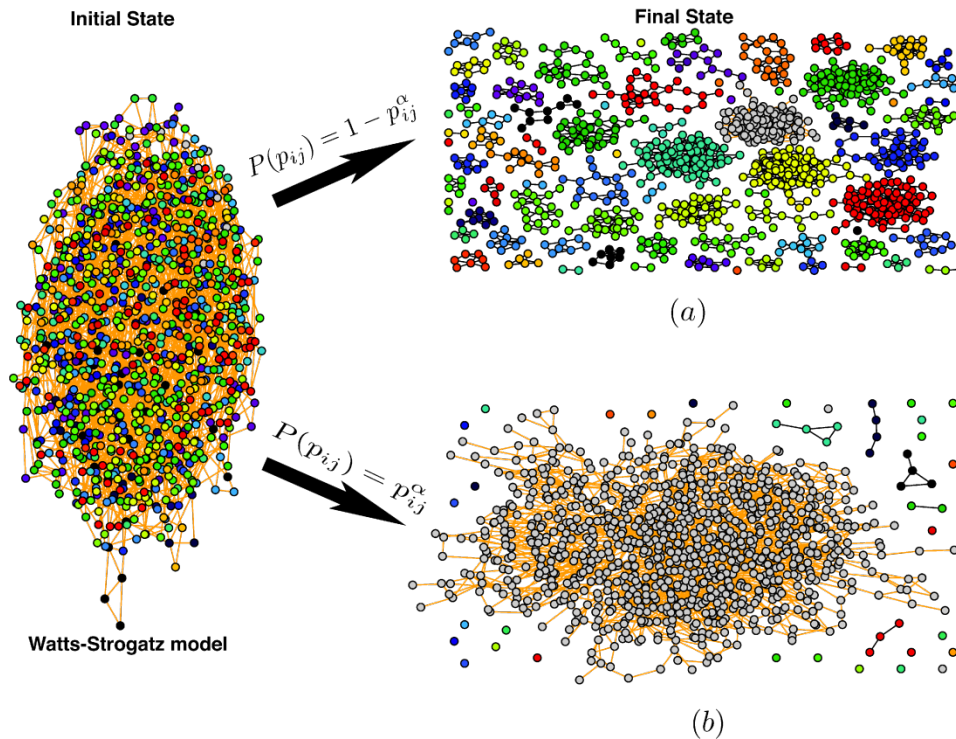
Research opportunities

- Earth systems



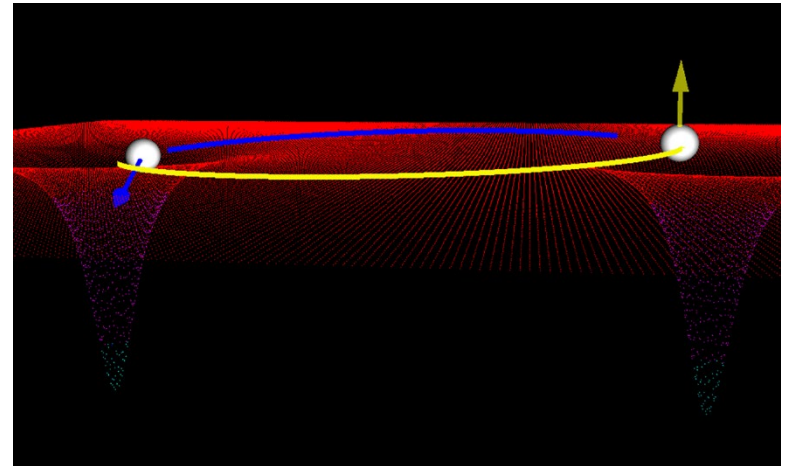
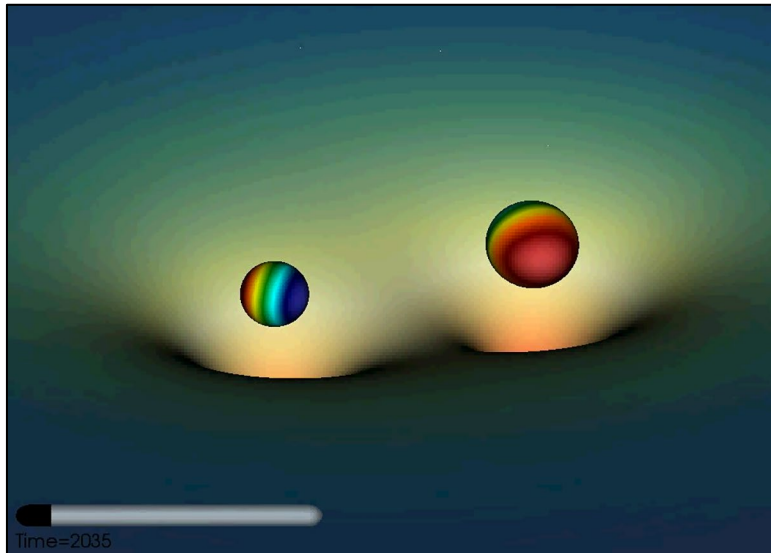
Research opportunities

- Network analysis



Research opportunities

- **Complex systems**



How are students supported?

- **First-year students receive stipends, full tuition, and health insurance**
- **After the first year, students typically are supported as research assistants or as teaching assistants; both types of assistantships come with stipends, full tuition, and health insurance**

Admission requirements

- **Baccalaureate degree**
- **Minimum GPA of 3.0 in major field**
- **Official transcripts for all undergraduate and graduate schools**
- **Graduate Record Examination (GRE)**
- **Undergraduate mathematics coursework**
- **At least two letters of academic and/or professional recommendation**
- **Personal statement**
- **TOEFL score where appropriate (minimum score 100 internet based)**
- **Personal interview in some cases (by teleconference when necessary)**

More information

Math modeling program page:
mathmodeling.rit.edu

Official admissions page:
rit.edu/admissions/graduate

Email me: nathan.cahill@rit.edu

Questions?