NRT DESE: Risk and Uncertainty Quantification and Communication in Marine Science and Policy

Engaging graduate students in transformative research, education, and professional experiences to address the effects of human actions and climate change on marine systems
Prospects for new PhDs in STEM

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STEM education concerns

- PhD time to graduation too long, completion rate is low
- MS degree is undervalued
- Narrow training, few transferable skills
- Mentoring focused on academia
- Diversity
- Not aligned with disciplinary, societal, workforce, and student needs
NRT key features

• Advancement of interdisciplinary research in high priority areas.
• Development and testing of innovative models.
• Extension of benefits to broad student population.
• Evidence-based strategies to broaden participation.
• Broad training for academic and non-academic careers.
• Robust assessment that informs and improves practice; facilitates dissemination of models.
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Research and Traineeship Program
Motivations

• New ocean observatory platforms and analytic approaches
• Novel drivers of change: global warming, acidification, and expansion of hypoxic regions
• Policy and management component of ocean resources
Research and Training Goals

Marine systems:
- Humans
- Oceans
- Climate change

Challenges:
- Diverse stakeholders
- **Risk** of revenue losses or local extinction
- **Uncertainty** about system behavior
- Emerging technologies

OSU NRT Training and research goals:
- Promote engagement and communication
- Quantify and communicate risk and uncertainty of policy decisions and model forecasts
- Discover complex natural-human interacting processes
Learning Outcomes

Working in transdisciplinary teams, OSU-NRT trainees will:

**Analyze** ever expanding data sources in natural and social science to quantify risk and uncertainty of policy actions and environmental change

**Discover** mechanisms that control the response of marine systems to climate change and human pressures

**Engage** with stakeholders to assess their needs and communicate risk and uncertainty of climate change and policy decisions
Training elements

• Orientation to transdisciplinarity (3 cr)
• Internship
• Minor in R&U quantification (*)
• Collaborative thesis chapter

(*) Minor in R&U Quantification
• Big data and uncertainty quantification (3-4 cr)
• Risk analyses (3-4 cr)
• Earth Systems (3-4 cr)
• Human Systems (3-4 cr)
• Professional training (6 cr)
  • IDP (2)
  • Collaborative working structure (2)
  • Communication (2)
Timeline and Training

R&U Minor

PhD after completion of additional research chapters

or

MS Graduation

Collaborative Chapter A
Group Project A

Collaborative Chapter B
Group Project B

Collaborative Chapter C
Group Project C

Year 1
Fall
Win
Spr
Sum

Disciplinary course work

Ocean
GEM
Math
Stat
Computer Science

Year 2
Fall
Win
Spr
Sum

DESE Course work and Professional training

Internship Science

Internship Policy

Entering students chose disciplines (10 students per cohort)
Group projects

- involving some aspect of marine resource management,
- having a policy as well as a science question,
- being based on the analysis of large data sets (e.g., genomics, remote sensing, telemetry, etc),
- involving risk and uncertainty quantification.
Admission: general requirements

- Interest in NRT learning outcome and training elements
  - Interest in working with big data and analytical techniques
  - Interest in working collaboratively
  - Interest in science and policy connections
  - Willingness to work in marine related topics
- MS and PhD OSU students (> 1 year)
- Form a research team focused on a group project
- For NRT fellowship: be US citizenship or permanent resident
Admission: specific requirements

Student letter of interest
- prior research and training experiences
- willingness to work on team
- academic and professional goals
- funding plan

Faculty letter of support
- student success within program
- student ability to work collaboratively
- funding plan
- faculty engagement in NRT program:
  1. follow students progress to finalization of degree through the IDP
  2. participate in NRT activities when requested,
  3. engage with other NRT faculty collaborating with your student.

Send all material to Katherine.Hoffman@oregonstate.edu
May 13th 2016 for 2016-17
## OSU Team & Colleges

<table>
<thead>
<tr>
<th>Name</th>
<th>Academic Unit</th>
<th>Discipline</th>
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<tbody>
<tr>
<td>Lorenzo Ciannelli</td>
<td>College of Earth, Ocean, and Atmospheric Sciences</td>
<td>Fisheries Oceanography</td>
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<tr>
<td>Julia Jones</td>
<td>College of Earth, Ocean, and Atmospheric Sciences</td>
<td>Geography</td>
</tr>
<tr>
<td>Alexander Kurapov</td>
<td>College of Earth, Ocean, and Atmospheric Sciences</td>
<td>Physical Oceanography</td>
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<tr>
<td>Juan Restrepo</td>
<td>Mathematics</td>
<td>Uncertainty</td>
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<tr>
<td>Enrique Thomann</td>
<td>Mathematics</td>
<td>Stochastic modeling</td>
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<tr>
<td>Ed Waymire</td>
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<td>Risk analysis</td>
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<tr>
<td>Alix Gitelman</td>
<td>Statistics</td>
<td>Environmental statistics</td>
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<tr>
<td>Sinisa Todorovic</td>
<td>Computer Science</td>
<td>Machine learning</td>
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<tr>
<td>Flaxen Conway</td>
<td>Liberal Arts</td>
<td>Social Science</td>
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<tr>
<td>Michael Banks</td>
<td>Fisheries and Wildlife</td>
<td>Genomic</td>
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<tr>
<td>Ana Spalding</td>
<td>School of Public Policy</td>
<td>Policy science</td>
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<tr>
<td><strong>Cynthia Char</strong></td>
<td>Char Associates</td>
<td>Human development</td>
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Get involved!

• Be a mentor
• Be a project client
• Be part of the leadership teams
• Be an instructor
• Give us feedback
• Check: http://marinerisk.ceoas.oregonstate.edu/
Organizational chart

NSF, OSU Graduate School, OSU Colleges

- External Evaluator
- Lead PI
- Project Coordinator
- Executive Team
  - External Advisory Team
  - Curriculum & Internship Team
  - Recruitment & Diversity Team
  - Mentoring Team
  - Stakeholders
  - Student Team
  - Faculty advisors

Stakeholders