



# 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*



Research and Traineeship Program

## Outline for today

- Program overview  
(Lorenzo Ciannelli)
- Big Data (Sinisa Todorovic)
- Current and proposed  
research clusters (Harry  
Yeh, Flaxen Conway, Ana  
Spalding)
- Student testimonials



Research and Traineeship Program

## *First cohort*

### **Tsunami predictions**

- Michael Dumelle, Ph.D., Stats.
- Harrison Ko, Ph.D., Civil Eng
- Will Mayfield, Ph.D., Math

### **Marine Renewable Energy**

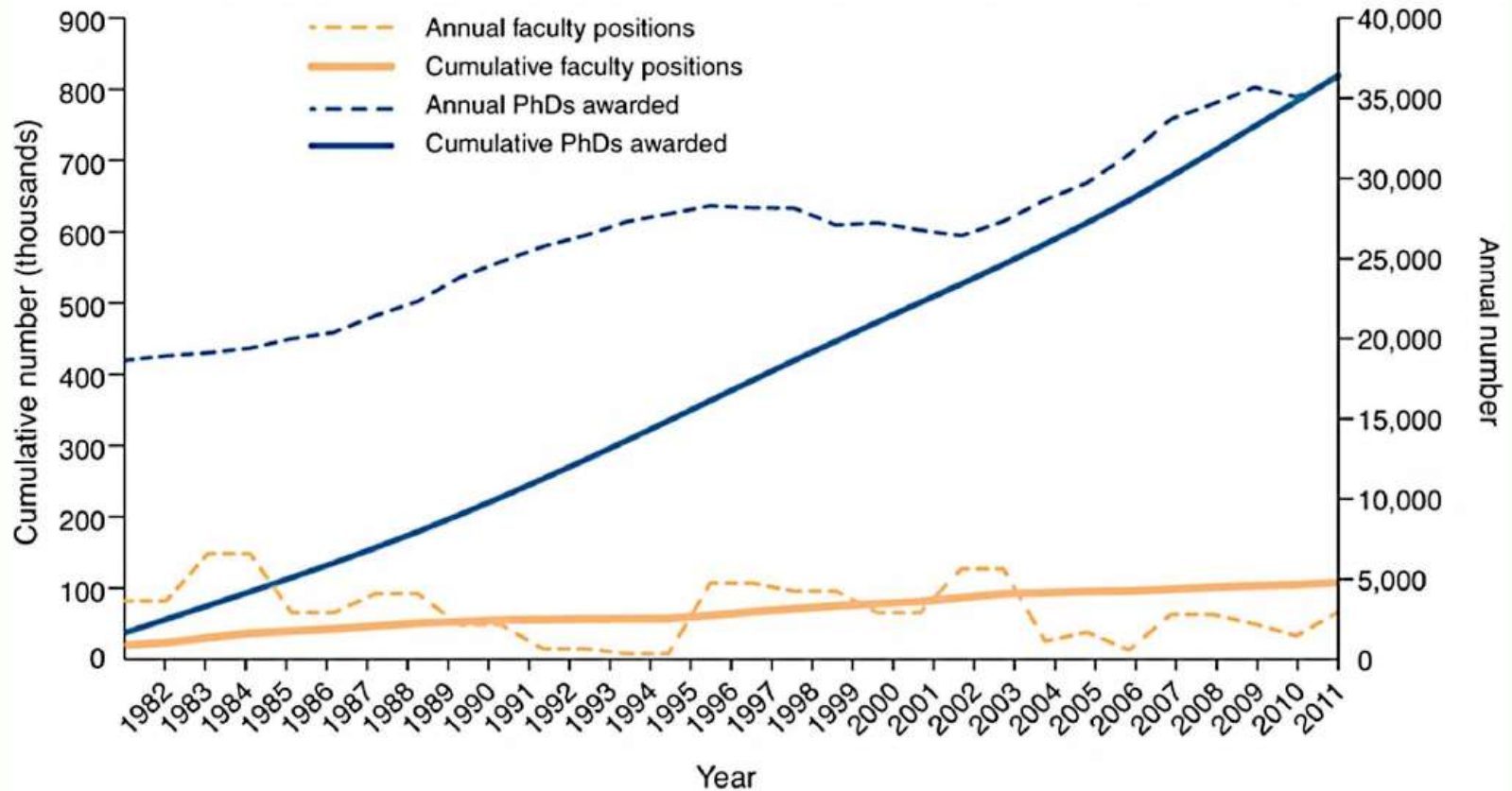
- Brandon Johnson, Ph.D., EECS
- Caitlyn Clark, M.S., M.E
- Chris Sharp,, Ph.D., M.E.
- Jeff Burrignt, M.S., MRM

### **Ocean Condition Forecast**

- Ashley Ellenson, M.S., Civil Eng./ Coastal and Ocean Eng.
- Jane Darbyshire, Ph.D., Geography
- Jess Kuonen, M.S., MRM
- Matt Mauch, M.S., CEOAS



# Prospects for new PhDs in STEM



Schillebeeckx et al. 2013. Data source: NSF 2011, 2012



## 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

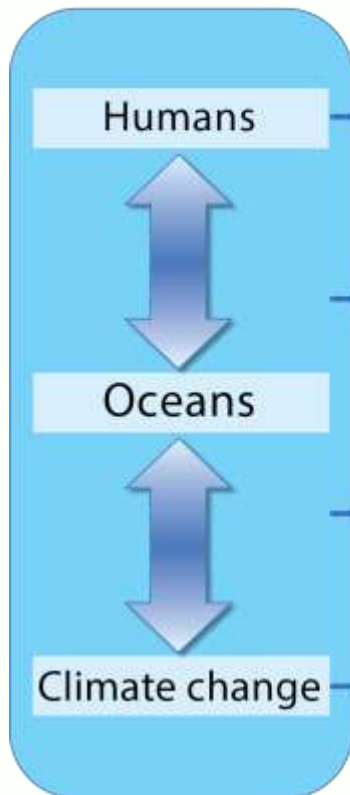


## NRT key features

- 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

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

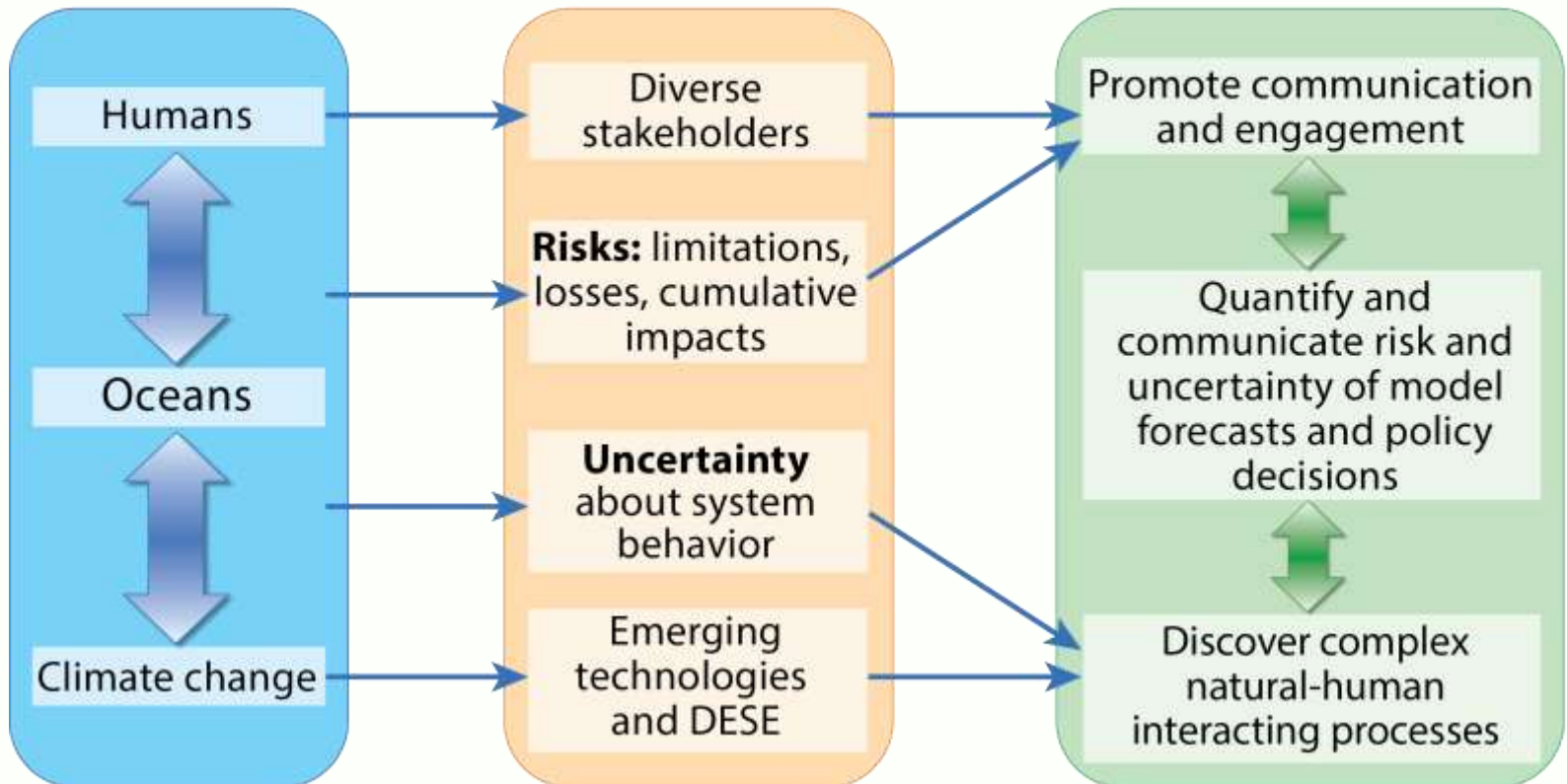
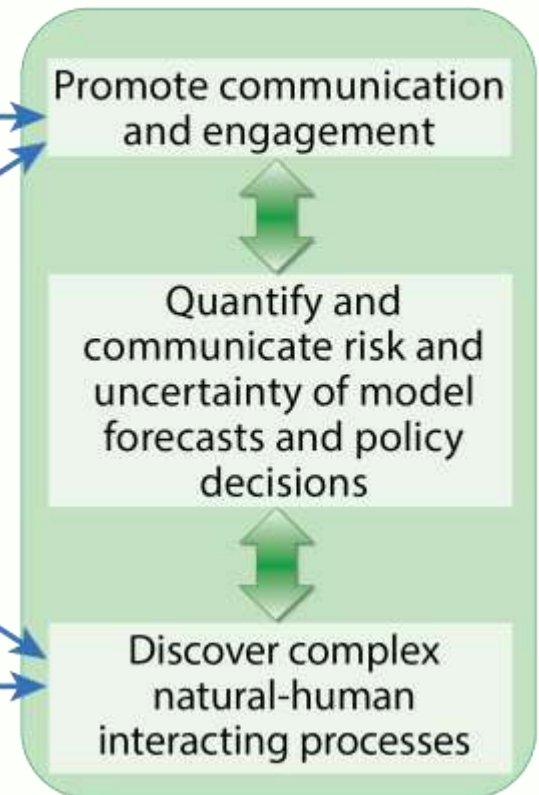
## Marine systems



## Challenges



## OSU NRT Transdisciplinary training and research goals



## *OSU NRT core training and research concepts*

- **Coupled Natural Human (CNH) systems:** include human and biophysical systems, and their connections
- **Big Data (BD):** Large volume of data with high throughput. Big data can be temporal, spatial, or dynamic; structured or unstructured
- **Risk and Uncertainty analyses and communication (R&U):** A risk is quantified by some measure of the expected cost, involving probabilities and magnitudes, of an undesirable event. Uncertainty is driven by unknown processes and data quality



# Training elements

- GEO 508: Intensive Field Course (3 cr)
- IDP
- Minor in R&U quantification (\*)
- Internship (3 credits)
- Interdisciplinary thesis chapter
- Trans-disciplinary team report

## (\*) **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)
  - Conceptual foundation in R&U (2)
  - Collaborative working structure (2)
  - Communication (2)
- <http://catalog.oregonstate.edu/MinorDetail.aspx?minor=5050&college=24>

# Reserach

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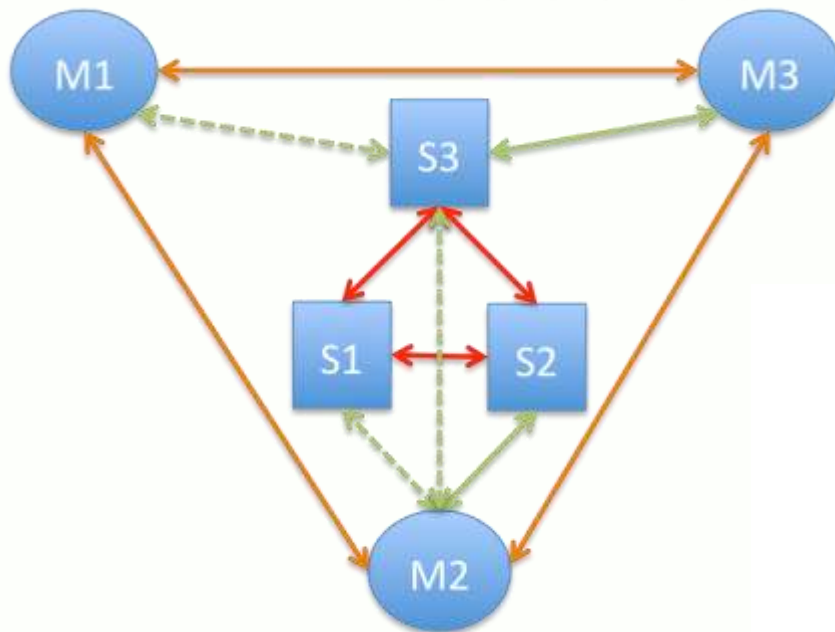
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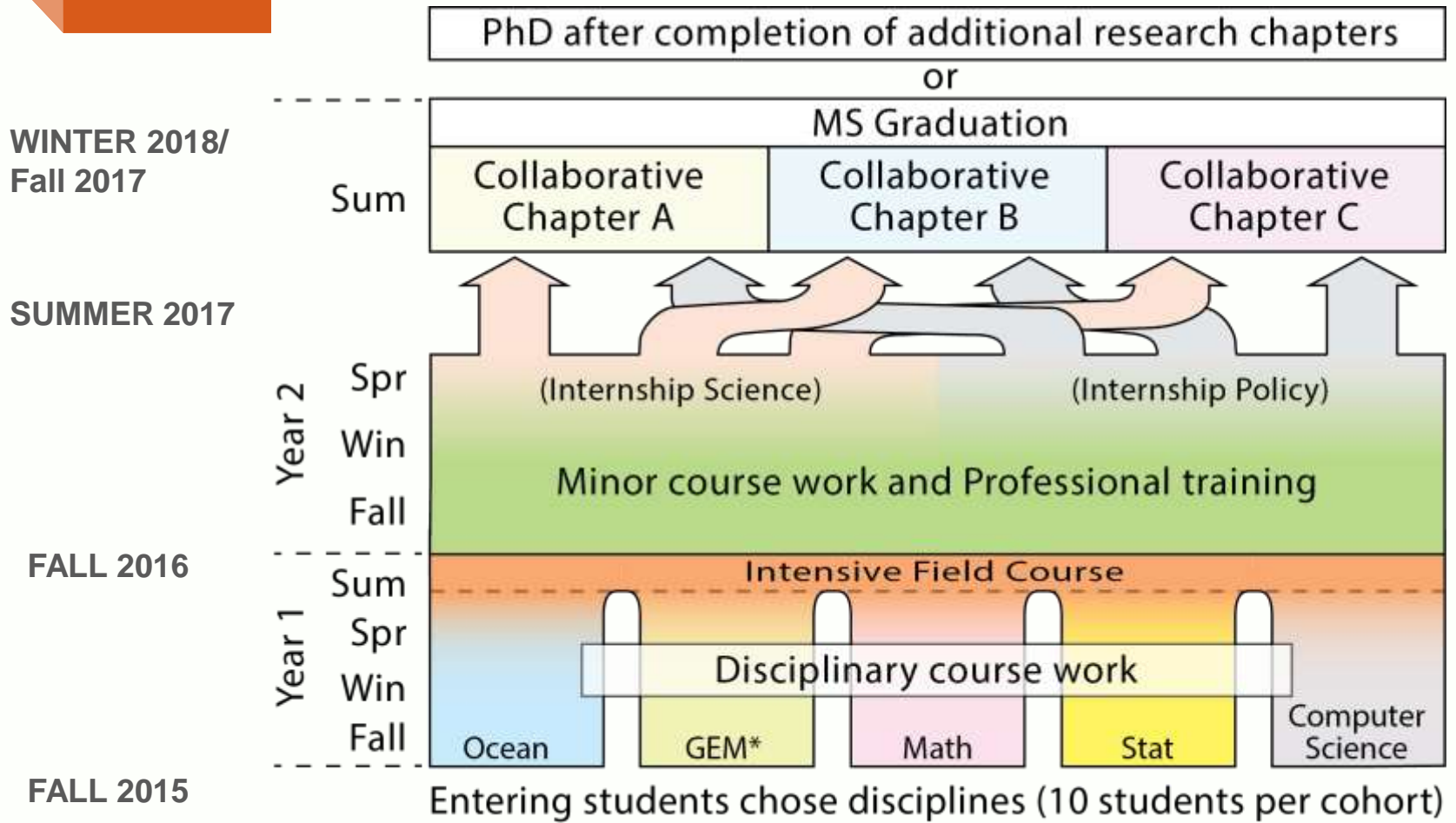


# Mentoring

- ↔ Student to student
- ↔ Mentor and student
- ↔ Mentor and mentor



# Program timeline



\*Geography, Environmental Science, and Marine Resource Management

# Faculty involvement

- Work with colleagues across campus to develop a **cross-disciplinary research idea**
- Providing research and professional **guidance** to primary student and associated team cluster of students as they work in their interdisciplinary chapters and transdisciplinary report (see attached Mentoring plan).
- Develop and follow an **IDP** (Individual Development Plan) with the primary student (see attached IDP description)
- Participate for at least one day to the **GEO 508** Intensive Field Course (IFC): *Introduction to NRT core concepts* (Sept. 5<sup>th</sup>-9<sup>th</sup>, 2016) at HMSC
- Participate in **professional training** activities (MRM 525 series)



## Admission

- Student and faculty application: April 14<sup>th</sup>, 2017
- Faculty propose a research topic: Feb 28<sup>th</sup>, 2017
- List expertise needed in your team
- Check: <http://marinerisk.ceoas.oregonstate.edu/>

## *OSU Team & Colleges*

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