Tips for Conducting Interdisciplinary Research

Faculty Mentoring Workshop

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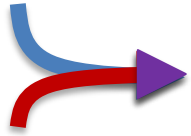
What is a Discipline?

Merged permanently into new dis.

Transdisciplinary



Whole is more than the sum of its parts, synthesis

Interdisciplinary

Aligned but separate, each unaffected by other, parallel, additive

Multidisciplinary

External Drivers of IDR

Inherent complexity of nature and society

Need to solve societal problems

Development of new "generative" technologies

Internal Drivers of IDR

Intellectual curiosity

Ability to tackle larger problems

Personal intellectual growth → learning new tools, ideas

Practical issues→ More opportunities to disseminate research, more funding sources, desire to work w/others

Institutional Barriers

Structure, reward system

- Depts.
- Societies
- Journals
- Reviewers
- Tenure
- Promotion

Underestimate difficulty

- Budget
- Time

Value of interdisciplinary vs. disciplinary

- Rigor
- Publications, awards

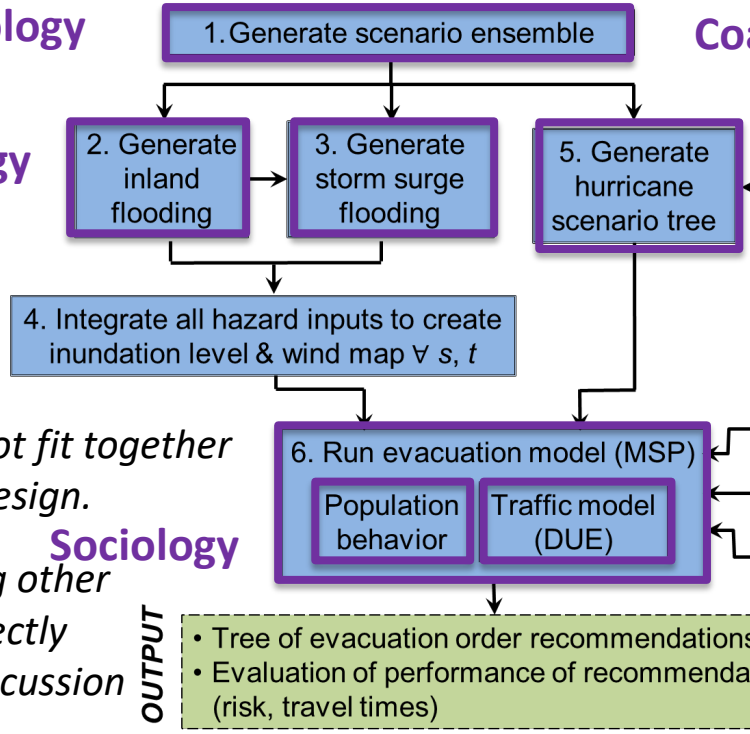
→ Double duty

Barriers due to Disciplinary Differences

- Terminologies
- Approaches
  - Questions considered important
  - Methods
  - Quantitative vs qualitative
  - What's considered a contribution
- Norms
  - Authorship
  - Mechanics of research

What's a model?

Hurricane Evacuation



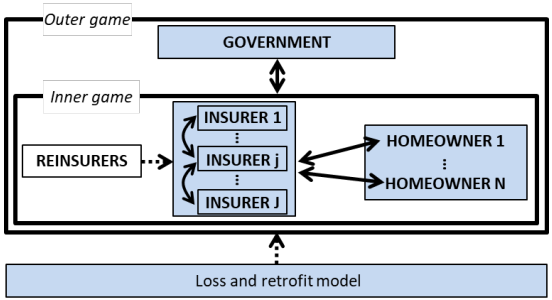
Pieces do not fit together except by design.

Sociology

Interpreting other pieces correctly requires discussion

Hurricane Risk Management

Concept	• Motivation • Problem formulation • Approach • Treatment of ideas
Computational framework	• Inputs • Outputs
Individual tasks	• Surveys • Statistical analyses
Mechanics	• Regular discussions • Disciplinary primers • Co-authorship • Formal evaluation



Approaches

- Organize around clear vision, framework
- Start at end goal and see what disciplines/inputs are needed to get there
- Expand scope and build team gradually

Tips and Tricks

- Patience and persistence
- Realistic time/energy expectations
- Interest in learning about other disciplines
- Assume other disciplines have value
- Willingness to challenge and potentially compromise own discipline

Observations from interdisciplinary teams

Faculty Mentoring Workshop

Prof. April M. Kloxin and Prof. Darrin Pochan

Chemical and Biomolecular Engineering and
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1. Engage partners early for tackling challenging problems

- **Problem selection** 1) about which one is passionate, 2) where one has appropriate expertise for having an impact, 3) clear continued opportunities for funding / impact
- **Partners** 1) have appropriate expertise/resource(s), 2) are local and/or world experts, *and* 3) with whom you like interacting (e.g., shared values and mutual respect)
- **Team for tackling large projects**: complementary expertise with a mix of 1) fundamental and 2) translational researchers and 3) practitioners to facilitate design of relevant research plans with potential for impact

2. Facilitate engagement

- **Plan interactions**: Set up regular, periodic meetings that work for all partners (e.g., biweekly, monthly, or semesterly)
- **Foster interactions**: Complement these with less formal pair-wise interactions (e.g., lunches)
- **Layout mutually beneficial approaches**: research/publication plans and funding paths to facilitate collection of data collaboratively (e.g., 1 paper, 1 proposal annually with target authors)
- **Engage trainees**: Engage students once a rough plan is established for their input and buy in, as they will be the ones executing the collaborative research more directly (~ 1 student per group if possible, opportunities for co-advising)

3. Stick with it

- **Pilot funding**: pilot project type funding (e.g., ~ 1 year funding with opportunity for extension) can be good for launching and continuing efforts (e.g., first publication(s), preliminary data for larger grants)
- **Dissect reviews for any adjustments to paths / plans** (e.g., jointly examine proposal, paper reviews for feedback/adjusting course)
- **Research takes time**: new projects could come to fruition within ~ 6 months; however, many will take 1-2+ years to begin paying dividends (e.g., first joint publications, larger grants)
- **Stay engaged**: continue regular meetings while being cognizant of individual and discipline-specific work-life schedules or changes

https://www.istockphoto.com/photos/mountain-climbing

4. Celebrate success and continue forward

- **Facilitate and celebrate student progress** (e.g., serving on Ph.D. committees, defenses)
- **Produce joint products** (e.g., conference abstract, paper, presentation)
- **Projects will run their course while successful team relationships can continue** in new forms and for tackling new or evolving challenges
- Keep an open heart and mind, **staying flexible while maintaining identity**

Example

Startup and Fellowship funding

- NSF IGERT Systems Biology of Cells in Engineered Environments
- UD Graduate Fellowship

UD Center funding

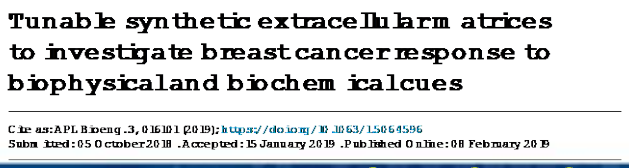
- COBRE grant
- INBRE Core

External funding

- Multiple Komen, DOD, and NIH applications tried over time
- Successful Komen funding (3rd try)

Products along the way

- Graduate students, postdocs/faculty trained
- Conference abstracts
- Lectures
- Publications and Patent application


Tunable synthetic extracellular matrices to investigate breast cancer response to biophysical and biochemical cues

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