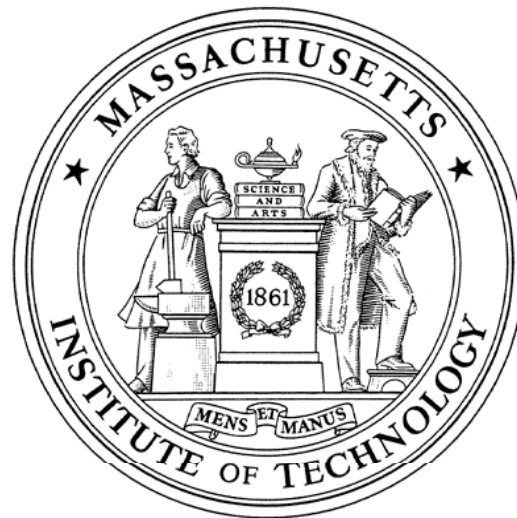


# Sowing the Seeds of a Solid Research Program

*Christine Ortiz*

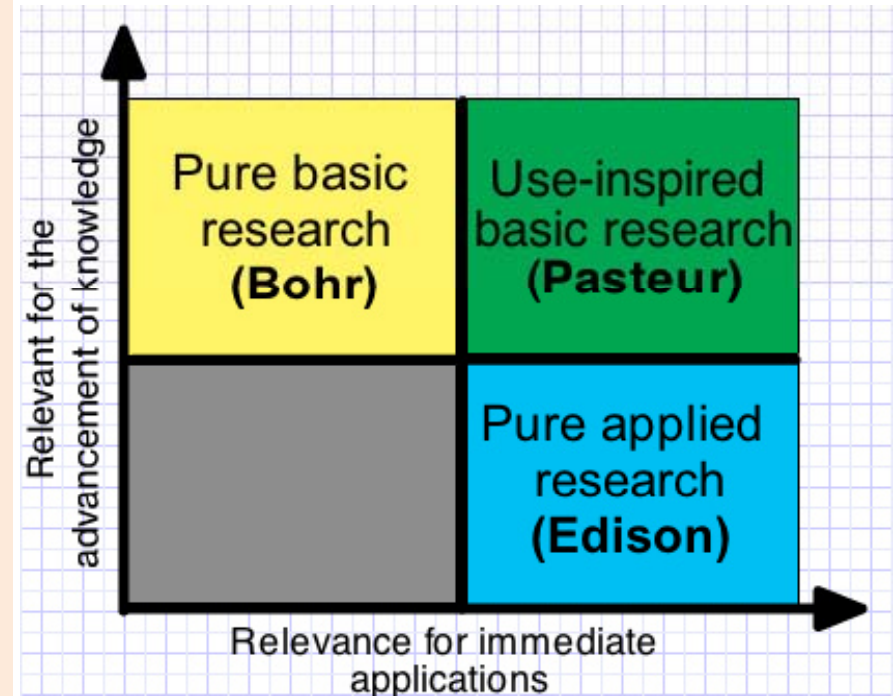
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# Context - Current Trends in Research

- from national to international; globalization (overseas opportunities, collaborations)
- from individual research to team research;
- from narrow, disciplinary-oriented research to multi-interdisciplinary research;
- from small laboratories to larger research institutes, programs and centers
- from fragments to "big science" (e.g. sustainability, energy, health, security, infrastructure, etc. → complex systems);
- from public or university funded to multiple funding sources;
- from unbounded research to research within programs and projects;
- from national security to competitiveness and job creation;
- from utilization of resources to sustainable development.
- from well-defined basic/applied research towards "use-inspired" basic research



Adapted from Pasteur's Quadrant: Basic Science and Technological Innovation, Donald Stokes, 1997

# Research Evaluation Criteria

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- **Quality** – In top/best compared to peer group (worldwide)
- **Impact** – Transformative vs. Incremental
  - Ask and answer important questions
  - Create new knowledge
  - Leads to new ways of thinking; new paradigms
  - Lays the foundation for further research in the field
- **Creativity / Originality / Novelty**
- Clear New **Contribution** (distinguished from graduate/ postdoctoral research, collaborators)
- Technical **Rigor / Depth**
- **Trajectory**

# How to Select a Research Project (1)

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- Think about and **anticipate some results** before doing the first study (pilot study)
- Consider the **interest of the outcome**
- Look for an **unoccupied niche** that has potential
- Go to talks and read papers **outside your specific area** of interest
- Build on a **theme\***
- Be prepared to **pursue a project to any depth** necessary
- **Differentiate yourself** from your mentors
- **Focus and consolidate**
- **Balance low and high risk\***

## How to Select a Research Project (2): Balance the Continuum

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“Low Hanging Fruit”



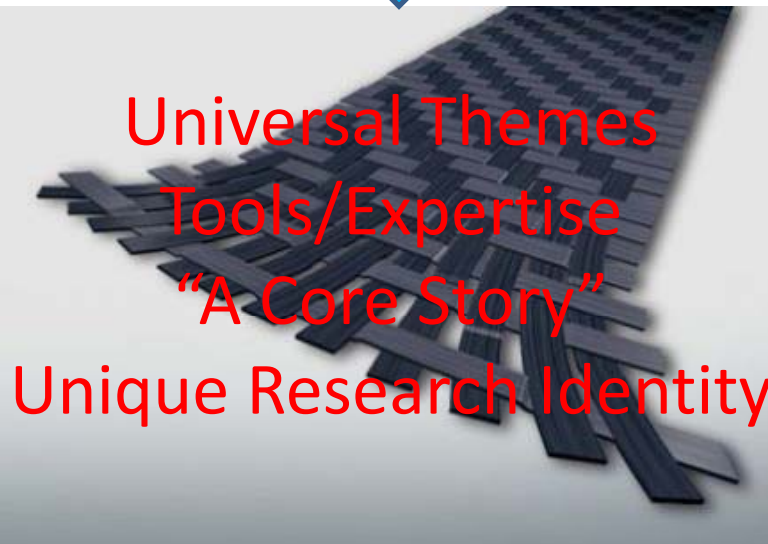
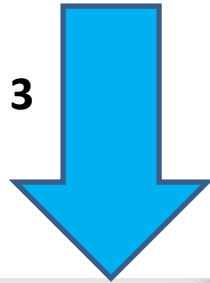
“High risk”

- **Find a balance between low risk and high risk projects**, but always include a high risk project in your portfolio.
- “Low Hanging Fruit” does not mean low impact!
- Try to have each graduate student get a mix of low and high risk.
- Terminate projects that are not working. Be flexible and adaptable.

# Construction of a *Coherent* Research Program

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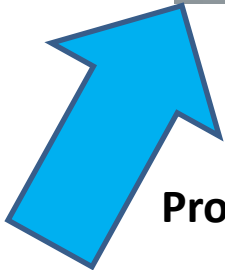
Project 3



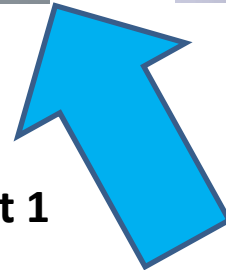
Understand and be able to clearly articulate where your research program fits into the disciplinary landscape



Project 2



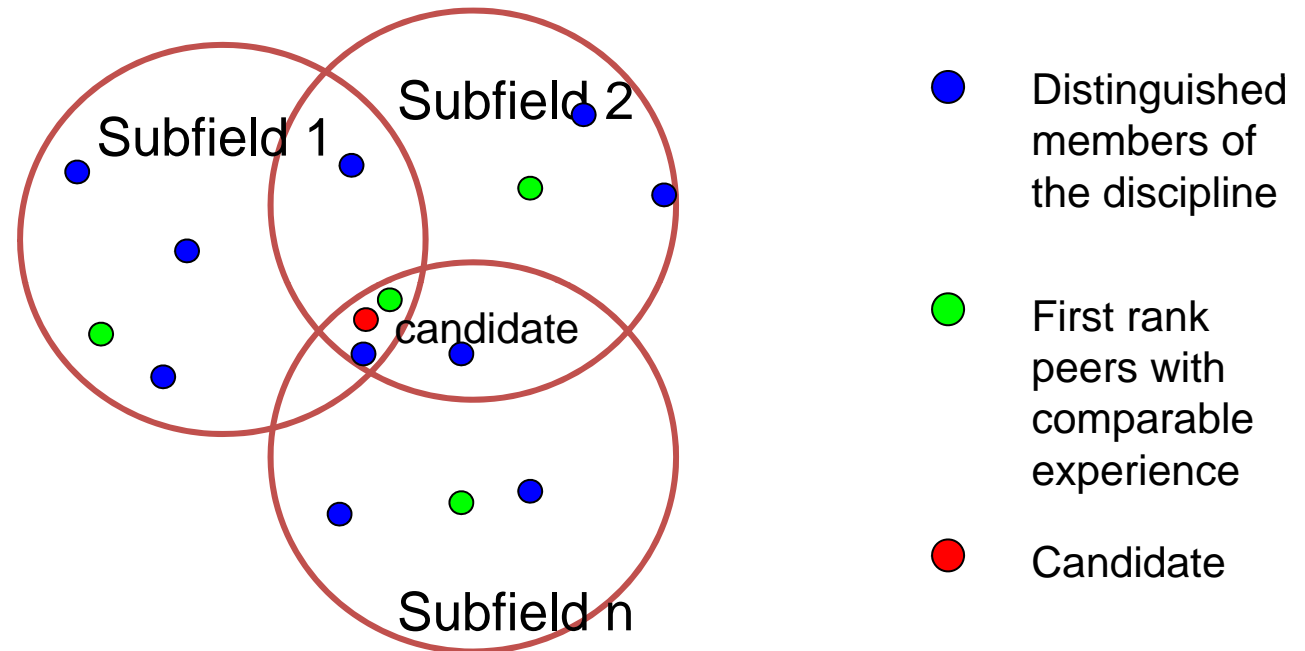
Project 1



# Venn Diagram of Top People in the Field

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Who are the superstars of all ranks, what are they doing, what is the intellectual relationship to the work of the candidate?



- **Define who you are professionally** -- what areas are you working in and looking to make an impact in; how do they overlap and who are the distinguished members of these fields; (if they find they have too many areas they are working in and there is no intersection, then you are likely lining themselves up for a problem and for not making any real impact anywhere )
- **Can also map publications onto the diagram**; the top **journals** of their field onto the diagram; the top **conferences**, as a means of helping them make decisions and choices.

# Heilmeier Questions- Should be Answered Clearly in Research Grant Proposals

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- What are you trying to do? Articulate your objectives using absolutely no jargon.
- How is it done today, and what are the limits of current practice / state of the art?
- What's new in your approach and why do you think it will be successful?
- Who cares?
- If you're successful, what difference will it make?
- What are the risks/challenges and the payoffs?
- How much will it cost?
- How long will it take?
- What are the midterm and final "exams" to check for success?





# Team vs. Individual PI Grants

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## Team Grants:

- Utilize them to learn the inner workings of funding agencies
- Build collaborations
- Topic should be sufficiently related to your “Universal Theme” and ongoing projects
- Consider time requirements (off-campus? reporting requirements?)
- Organizing a team grant is a **HUGE** time sink

## Single PI Grants:

- Apply for “Young Investigator” grants
- Apply for Center “Seed Grants”
- Apply for internal university grants
- Consider requirements of funding agency



# Networking - Build a Team of Mentors (1)

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- Intra- and Extra-departmental
- Seek multiple points of view, experiences
- Collaborators

## What Information can Mentors Provide?

- **Time management** and setting career priorities, goals and choices to judiciously balance research, teaching, and service to the department, University, professional organizations and the community.
- Assisting in developing strategies to **manage multiple demands** on academic time, including knowing when to say “no”.
- Determining what the mentee must accomplish in a specific period of time to advance academically; **supplying honest criticism** about the current year as well as planning ahead; advising the mentee regarding what the department views as acceptable scholarship.
- **Reviewing and critiquing** manuscripts, abstracts, grant applications and presentations.



# Networking - Build a Team of Mentors (2)

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## What can mentors assist with?

- Providing advice on institutional and departmental **allocation of physical resources**, including space, core facilities, equipment, and appropriate staff support.
- Providing guidance on departmental, institutional and national resources and **opportunities available for professional development**.
- **Suggesting ways to improve scholarly output**, including advising on grant writing, facilitating the development of professional collaborations, and encouraging participation at professional meetings; making the mentee aware of competitive grants and other opportunities for research funding; assisting in linking the mentee with other people, locally and nationally, who share common scholarly interests.
- **Providing encouragement and promoting individual recognition** (e.g., nomination for awards), and advice on how to “showcase” one’s work.
- Advising on the development and maintenance of an **academic dossier**, to include a list of referees to write letters of support for promotion, documentation of teaching responsibilities and evaluations, and a summary of committee participation.

# Collaborating

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- Definitely would encourage it, but don't overdo it
- Select collaborators carefully
- Get rid of "dead weight" - don't be afraid to say no
- Both parties have compatible and distinct core intellectual interests
- Ensure that collaborations contribute to Core Universal Theme of your research program
- Collaborators may be called upon to write tenure letters
- Discuss authorship /division of responsibilities in advance to avoid conflicts
- Ensure compatibility of personalities



# Graduate Students

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- Consider carefully students who want to switch research groups
- Consider grant requirements when assigning students to projects
- Create a climate of inclusivity
- Understand your students strengths / interests and tailor your management style accordingly
- Help students master increasingly difficult tasks to build self-confidence
- Set reasonable and attainable goals, and establish a timeline for completion of the project, provide timely feedback
- Meet with students on a regular basis
- Professional development / career advice

*How to mentor graduate students - U. Michigan*

<http://www.rackham.umich.edu/downloads/publications/Fmentoring.pdf>