
Second Annual

# Triple Helix Summit

February 2 – 5, 2007

Sheraton Waikiki Hotel
Honolulu, Hawaii

# Collaborating across Disciplines

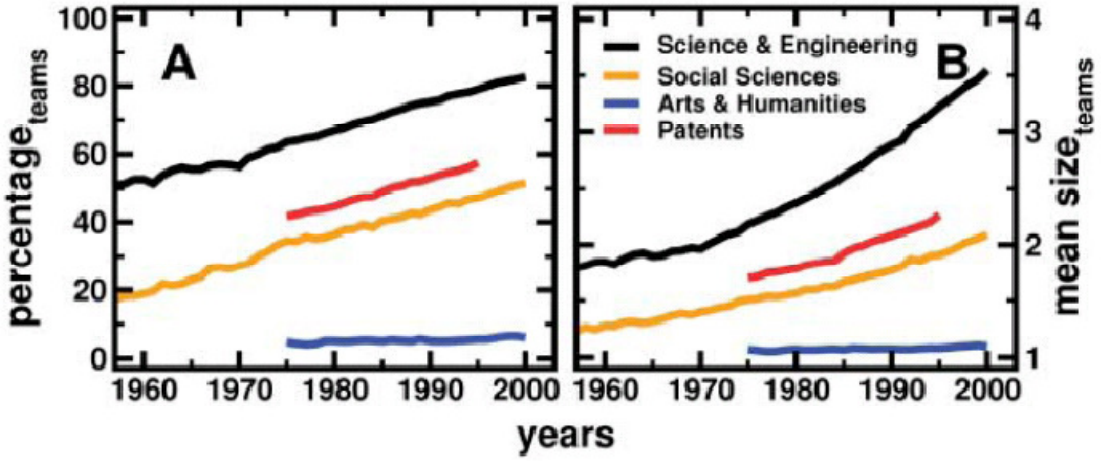
Hille Bruns, Boston University

# Cancer – a Pressing Concern

- 7.6 million people died from cancer in 2007 worldwide
- In North America, over $100 billion a year go toward dealing with cancer
- The NIH spends $4.5 billion a year on cancer related grants

# Importance of Teams in Knowledge Production

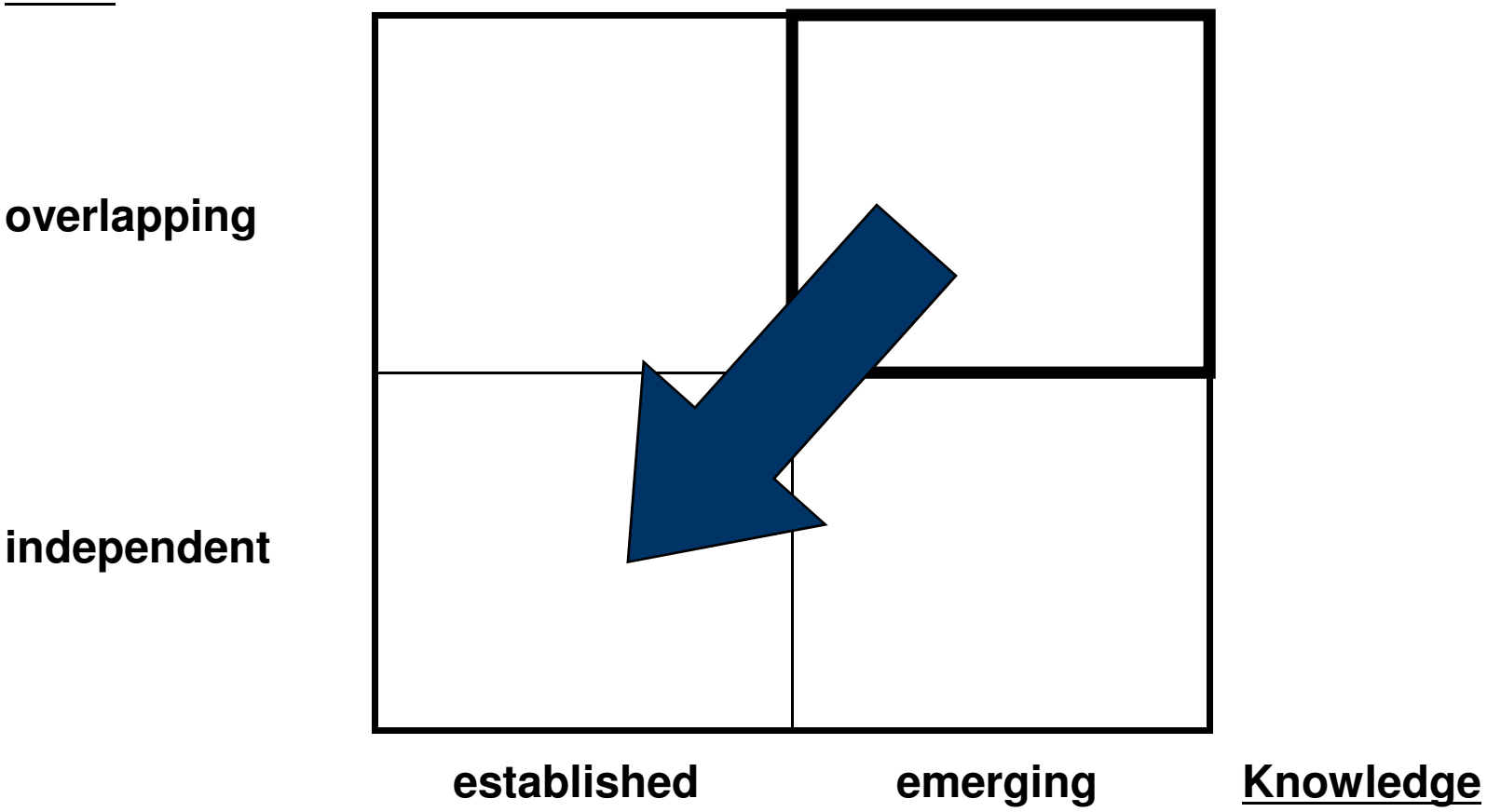
- Production of knowledge in the natural sciences increasingly occurs in interdisciplinary teams (Wuchty et al., 2007)



# Cross-domain Collaboration: A Problem in the Literature

- Innovation and frequently occurs in cross-domain collaboration (Carlile, 2002; Dougherty, 1992)
- Collaboration requires…
  - Common ground and shared vision/language (Bechky, 2003)
  - Joint sensemaking of novel conditions (Faraj & Xiao, 2006)
- Researchers typically study single occupational communities (Bechky, 2003; Carlile, 2002)

# Innovation through Collaboration



# Innovation and Knowledge Production in Cancer Research

How do experts involved in cancer research collaborate across disciplines when the implications of their knowledge across disciplines are unclear?

# Systems Biology

- A new approach to understand the functioning of biological systems
- Draws from several disciplines to understand cellular processes on a systemic level:
  - molecular biology, mathematics, engineering, physics, computational modeling

# Research Site & Time Frame

Research Site:

- Two interdisciplinary, NIH funded cancer research programs
- Time Frame:
- 6 months pilot study of work practices in molecular biology in 2006
- 1 year field study ongoing since 9/2007

# Data Collection

- Qualitative research approach:
  - 40 interviews with scientists, Principal Investigators, and program founders
  - Attendance of weekly program meetings and yearly conferences
  - Observation of work practices
- Archival documents (grant applications, peer reviews, online platforms, and publications)

# 3 Common Problems in Cross-Domain Collaboration

1) Research Question

   *"If you don't struggle over the question, the project is not truly interdisciplinary."*

2) Expectations of the Science

   *"People with a background in physics, chemistry, or engineering expect that all variables are controllable or knowable. Biologists don't know a lot of variables, and this is a challenge for people from other fields."*

3) Recognition & Publication

   *"In Systems Biology, the projects have a larger scale and a larger focus. You never have an answer you are satisfied with. Related to this is that in an interdisciplinary project, the tasks are not easily recognizable and hard to articulate. This poses problems for recognizing people's contributions on papers, as well as on the job market." [Principal Investigator]*

# NIH Funding for Collaborations

*"It's 20 grants, 20 NIH individual grants, for one of these collaborative grants, so basically one of these collaborative grants can feed 20 single investigators. So there's a lot of debate now. The nice thing about forced collaborations is that the framework is there, and there's a lot of resources. At the same time, there are also investigators that insist you need to collaborate with them because that's why the money is there." [Bioengineer]*

# Preliminary Interpretation of Evidence

- Domain-specific contributions are added in a step-wise fashion in the face of novelty

*“My work with [Biomedical Engineer] -- it's a completely new way of looking at things. Nobody has done it before. At one of these collaborative retreats, I said to him, "I know you were trying this previously, and it didn't work with this method. Why don't I suggest to you this method?" And we tried it. It was not there yet. I would say it was maybe 40 or 50 percent there, but it was promising. And I said, "OK, it's promising. Let's go and try the next step.” [Biochemist]*

# Probability of Success

- Each experimental step requires time and money, and so continuous risk assessment is imperative

  *"If it works, we move on the next step. If it doesn't work, it doesn't work. We can try and play around with the conditions again, and keep trying, but at some point, we're going to say that it takes too much effort to prove a point." [Biochemist]*

→ Decision making authority rests with the person who is expert in interpreting specific evidence

# Decisive Differences

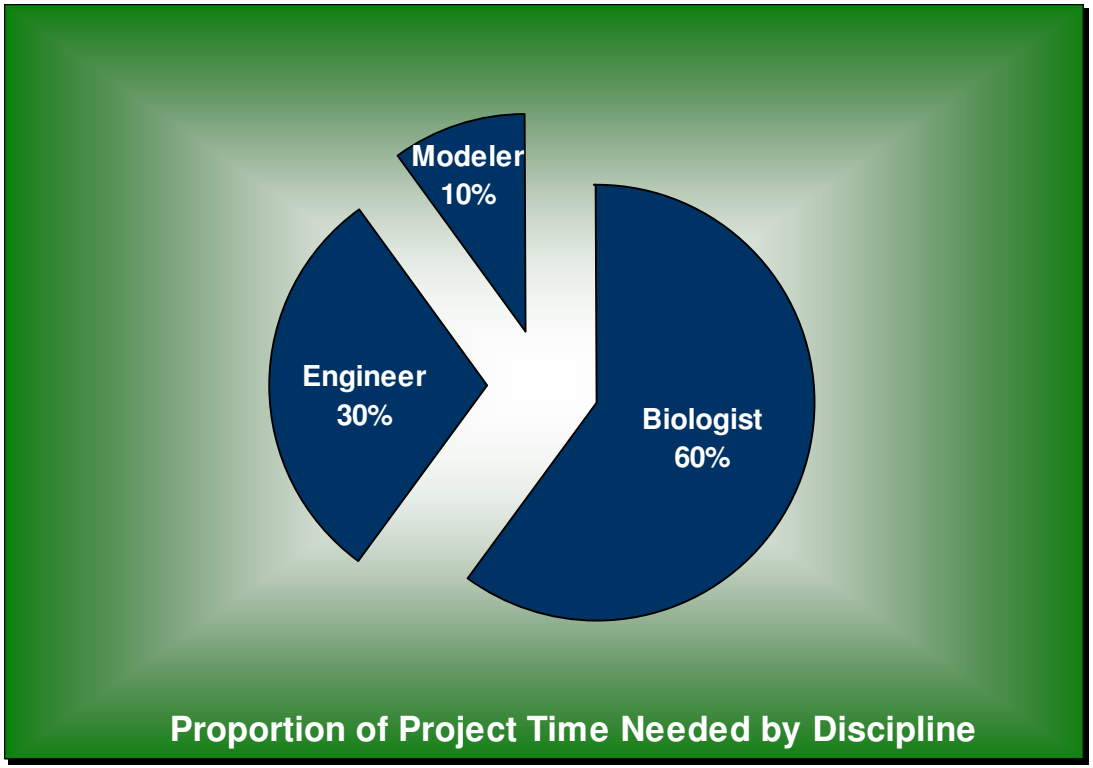
- Tensions surface in ways of thinking and research approaches that impede open-mindedness

  *"You are trained to think a certain way. In fact, it's beaten into you all your life." [Mathematician]*

  *"You talk to the computational people, there's always not enough data. You talk to the biologists, there's always too much data, because they are used to handling discrete sets of data. For the computational people, they're dealing with thousands of data sets, so you give them hundreds, it's like it's not enough. So there is this disconnect." [Biological Engineer]*

  *"It's like he's completely ignorant of what's going on. He's reinventing the wheel. It's so difficult to get people to* really listen*" [PI commenting on a Biologist's presentation]*

# Differences in Time



# Future Research

- Expand the scope of the study to include:
- Collaboration between academia and a pharmaceutical company
  - What are the differences in dynamics in collaboration in industry vs. academia?
  - How do these different dynamics inform industry-academia collaboration?
- Effectiveness of NIH funding policies

# Acknowledgements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