Fostering Convergence: Challenges and Lessons Learned

Robert M. Nerem

Parker H. Petit Institute for Bioengineering and Bioscience (IBB)

Georgia Institute of Technology

The Cultural Divide

- Differences between disciplines
- Differences between and within institutions
- Differences between people, but it also is people who make a difference

Research is a people business!

National Academies Report Entitled "Facilitating Interdisciplinary Research"

- Leadership
- An encouraging culture
- Seed, "glue" money
- Reward structure/tenure and promotion
- Physical co-location of researchers
- Shared instrumentation, core facilities
- Enhanced "chance meetings"

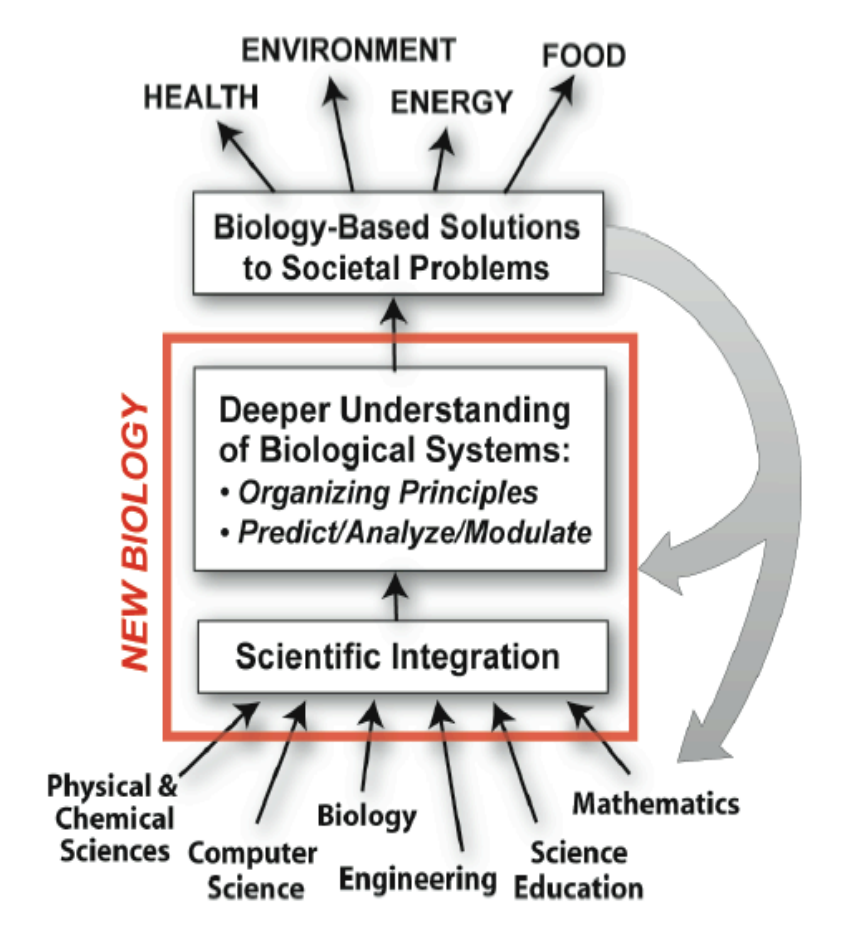
Does Co-Location Inform the Impact of Collaboration?

- A Harvard-based study
- The goal was to understand the fundamental relationship between collaborator proximity and scientific impact so as to improve the planning of research facilities
- Conclude that their results provide “striking” evidence for the role of physical proximity as a predictor of the impact of collaborations

Ref: PLOS ONE, December 2010

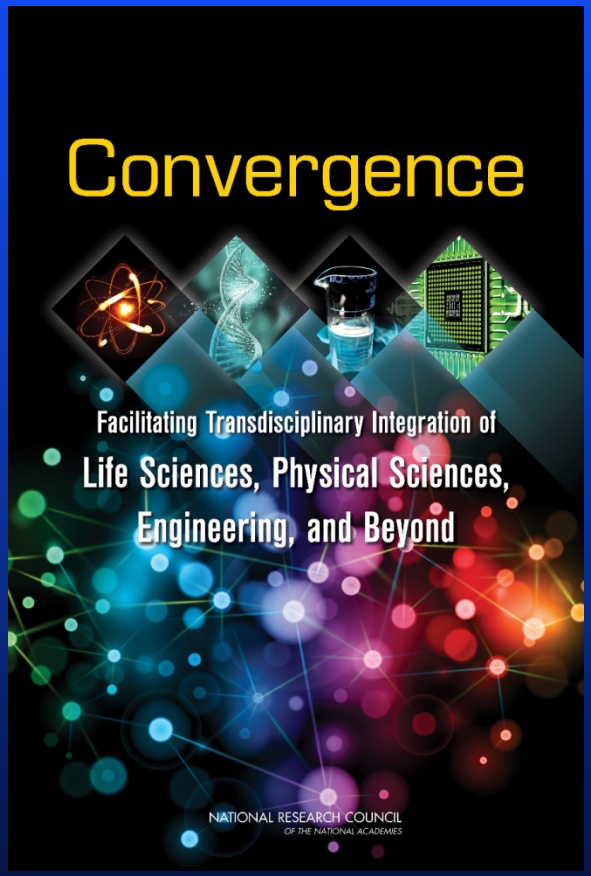
National Academies Report on a New Biology for the 21st Century

The essence of the New Biology is an integration of the many sub-disciplines of biology and the integration into biology of physicists, chemists, computer scientists, engineers, and mathematicians to create a research community… to tackle a broad range of scientific and social problems



National Academies Study

Conducted by the Board on Life Sciences Committee on Key Challenge Areas for Convergence and Health



The full report, “report in brief,” and short video are available at
http://www.nap.edu/catalog.php?record_id=18722
(or search convergence at www.nap.edu)

Goals and Process

- **Explore barriers encountered in facilitating convergence**

- **Provide practical guidance on strategies to structure and sustain a convergence program**

Workshop on Key Challenges in the Implementation of Convergence:

- **A key method of data-gathering**

- **Held September 2013 at the National Academy of Sciences**

- **100 participants included trainees**

Report Recommendations

1. Identify key problems whose solution requires convergence in order to catalyze new research directions and guide priorities

2. Address barriers to effective convergence, including:

   - expand mechanisms for funding convergence efforts
   - support collaborative proposal review across funding partners
   - implement or expand institutional seed funding to catalyze collaborations

3. Review administrative structures, faculty recruitment and promotion practices, cost recovery models, and research support policies to identify and reduce roadblocks

4. Include explicit guidelines in hiring and promotion policies to recognize the importance of both convergent and disciplinary scholarship and include criteria to fairly evaluate them

Report Recommendations (continued)

5. Identify evidence-based practices that have facilitated convergence by drawing on the expertise of economic, social, and behavioral sciences, as well as program management and strategic planning

6. Develop partnerships with colleagues in other organizations and laboratories, especially in small universities and institutions that serve traditionally underrepresented groups

7. Collect, establish, and disseminate best practices on the effective transfer of technologies from research organizations into the private sector to enable economic development

8. National coordination on convergence is needed to support the infrastructure to solve emerging problems that transcend traditional boundaries

Selected Report Conclusions

- The interconnected network of partners, from academic leaders and practitioners to industry researchers, clinicians, and funders, form an ecosystem for convergence
- The process of convergence can lead to advances in fundamental knowledge, the creation of new, problem-driven solutions, and strategies for educating the next generation
- A “one-size-fits-all” approach is not possible although essential characteristics of environments supporting convergence can be identified
- Building sustainable infrastructure for transdisciplinary cooperation through convergence is a promising strategy to accelerate innovation
- Social sciences and the humanities can inform best practices and organizational structures employed in convergence

Convergence to Date

- The key message of convergence is that merging ideas, approaches, and technologies from widely diverse fields at a high level of integration is a crucial strategy for solving complex problems
- The goal of “merging” expertise is not new as there are innumerable examples in which researchers from different disciplines have collaborated.
- This type of approach has been a common feature of industrial research laboratories for nearly a century
- Several academic institutions already have set up programs to support convergence
- Without a systematic focus, however, convergence will continue to be a patchwork of isolated efforts

Parker H. Petit Institute for Bioengineering and Bioscience

- IBB designed to be a vehicle for accelerating Georgia Tech's move into biotechnology
- An experiment to promote interdisciplinary, convergent research
- Launched in 1995, moved into new building in 1999
- Today there are 12 centers headquartered in IBB, 11 of which have a combination of engineering and science faculty

The IBB Environment

- A building designed to foster interaction
- Co-location of science and engineering faculty
- Shared core facilities and an open laboratory concept
- A café that promotes interaction
- Monthly social events to promote community and further interaction
- A seed grant program to even further promote interaction

The IBB Building

- Only has three floors with an atrium that provides “vertical integration”
- Integrates science and engineering faculty into the research space
- An open laboratory concept
- Offices of lab members from different groups integrated together
- Faculty offices are together, not with their laboratories

Neighborhood Concept

- Minimize any walls in the laboratory area as they create “silos”
- This encourages interactions between research groups
- Promote the sharing of space for the more space is shared, the more space each person effectively has

Promotion and Tenure at Georgia Tech

- Critical to the success of this process at Georgia Tech starts with the use of first-level committees
- A first-level committee is made up of the 3-4 individuals on campus that can best evaluate the scholarship of the faculty member up for P&T
- The report of the first-level committee becomes part of the file that works its way up the system

Lessons Learned

- To make something happen at a university takes a combination of faculty leadership and administrative leadership
- Senior faculty can be very territorial, in particular department chairs; young faculty and students are not
- The reward system for faculty, including promotion and tenure, must encourage convergent interdisciplinary research
- A successful interdisciplinary institute must balance the needs of the institute with those of the departments of the participating faculty

Issues/Challenges

- **Campus culture: How can the leadership of an academic institution alter the culture so as to make it more encouraging for “convergence?”**
- **Physical co-location: If not possible, how can “chance” meetings be enhanced as part of a “convergence” strategy?**
- **Reward structure/promotion and tenure: How can university policies be altered so as to fairly evaluate faculty involved in “convergent” research?**
- **Organizational structure: Is there a need to restructure academic institutions in order to foster “convergence?”**

Issues/Challenges (continued)

- **Education: How do we educate trainees to be successful in a "convergent" world?**
- **Funding: Is there a need for government support of "convergent research?" Are there alternative funding mechanisms?**
- **Industry: What is its role in fostering "convergent" activities?**
- **Looking to the future: Over the next century will "convergence" have any influence on the disciplinary structure of academic institutions?**