Science of Collaborative Science

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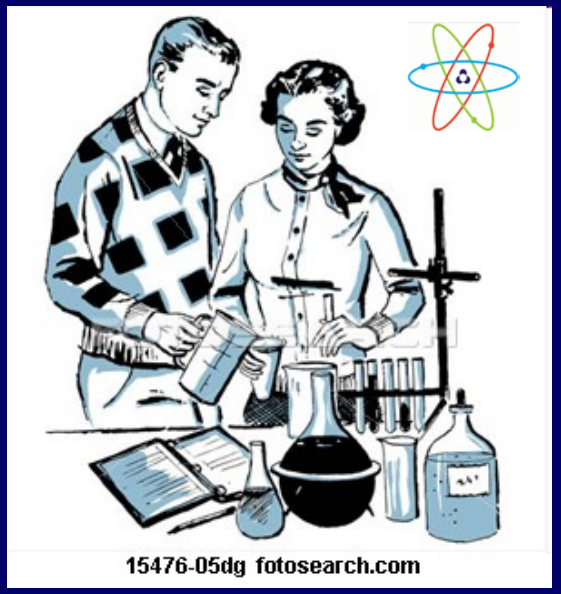
Organization of Scientific Work

- Old Science
  - Lab, Researcher + Assistants
  - Division of Labor
  - Narrow Focus of Work



- New Science
  - Complex Problems
  - Shared Resources
  - Interdisciplinary Teams
  - Global Operations, Distributed, Asynchronous

Science

- Infrastructure Development
  - Enabling Technologies
- Organization of Work
  - Exploitation of Capability

Extending the Scientific Frontiers

- How We Collaborate
  - Teams
  - Centers
  - Organizations
  - Institutes
  - Consortia

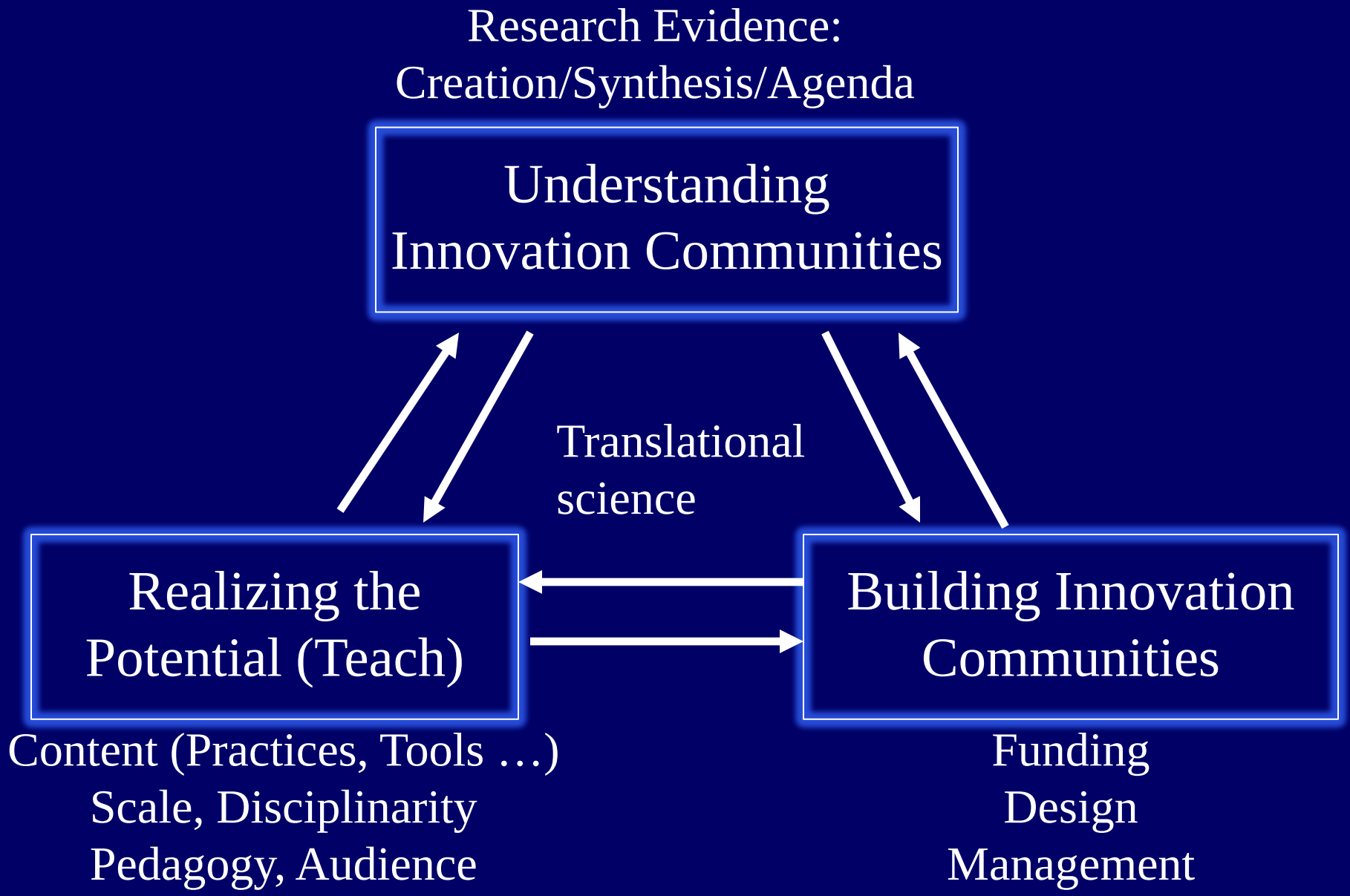
Designing Science Teams, Organizations & Institutions

- Informed and Reflective Choices
  - General Principles
  - Understand Specific Contexts
  - Constrained Resources

- What do we know?
- What is missing?
- How do we teach it?

US Innovation System

- Inherently Fragmented
  - Universities - State, Private
  - Industry Competitors
  - Federal Labs
- Severe Resource Constraints
- Difficult to Influence, Much Less Control

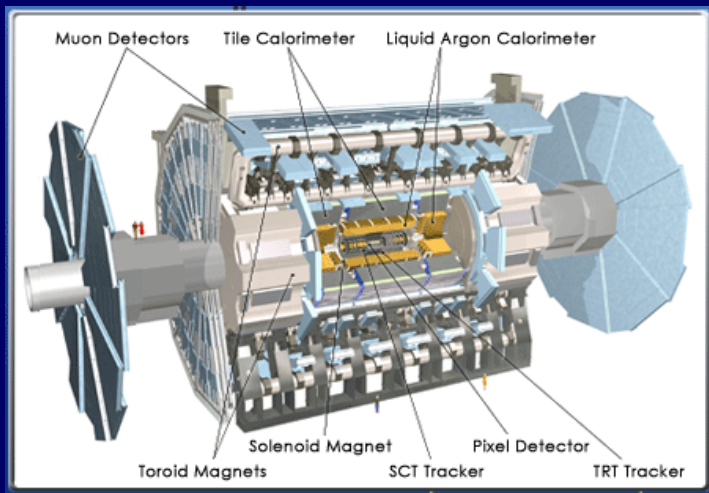

Research Evidence:
Creation/Synthesis/Agenda
Understanding
Innovation Communities
Translational
science
Realizing the
Potential (Teach)
Building Innovation
Communities
Content (Practices, Tools …)
Scale, Disciplinarity
Pedagogy, Audience
Funding
Design
Management

We Do Know A Lot

- Aspects of Scientific Collaborations
  - Assets
    - What do you have to work with?
  - Knowledge Flows
    - Who tells who about what and when?
  - Governance
    - Who can make what decisions?
    - What are the incentives?

Varied Types of Collaborations

- Size (2 vs. 2,000 Scientists)
- Degree of Shared Context
  - Discipline, Organization, Language, Culture
- Task and Actor Interdependence
- Temporary, Recurring, Permanent
- Problem-focused vs. Group-enabling



Limiting Factors & Enablers

- Institutional Arrangements
  - Tenure, Publishing Norms
- Legal & Regulatory Environments
  - Degrees of Freedom?
- Technical and Human Infrastructure
  - Tools (Commercial-Off-the-Shelf? Heterogeneous Environments, Poor Fit to Tasks?)
  - Human - Large Gaps in Expertise on Distributed, International Teams
- Resource Constraints
  - Research Funding Decline
    - Federal, State, Foundations

Challenges: Knowledge is Fragmented

- Group and Team Science
  - Organizational Psychology
- Organizational Science
  - Management, Organizational Sociology, Organizational Communications
- Sociotechnical Systems
  - Information Studies, Computer Science, Communications, Sociology, Anthropology

More Challenges

- Hitting a Moving Target
  - Will Eventually Sort it Out
  - Goal = Accelerate Process so Get Sorted Faster
- Hard and Persistent Problems even with the Help of the Human Sciences
- Resources are Constrained, Sparsely Distributed and Poorly Connected (Who do you call for help?)
  - Hard to Disseminate Lessons Learned

Understanding and Designing Effective Collaborative Science

- Synthesis of Evidence
  - Academic and Industry Lessons Learned
  - Across Multiple Disciplines
- What's Missing and How Do We Fill In the Gaps?
- How to Make the Needed Changes?
  - Constrained Resources – Feasibility!
  - What Trade-Offs Should Be Made?

Questions?