

Interdisciplinary Collaboration & Team Science



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Research Team Support & Development

- A conduit to translate empirical findings from team science research into evidence-based direction about effective practices for interdisciplinary scientific teams and funders of team science—a bridge between the *science* of team science and the *praxis* of team science

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Overview



- A primer on **Interdisciplinary Research (IR)**, **Team Science (TS)**, and the **Science of Team Science (SciTS)**
- Interdisciplinary Team Science Initiatives
- Funding Models for Interdisciplinary Team Science

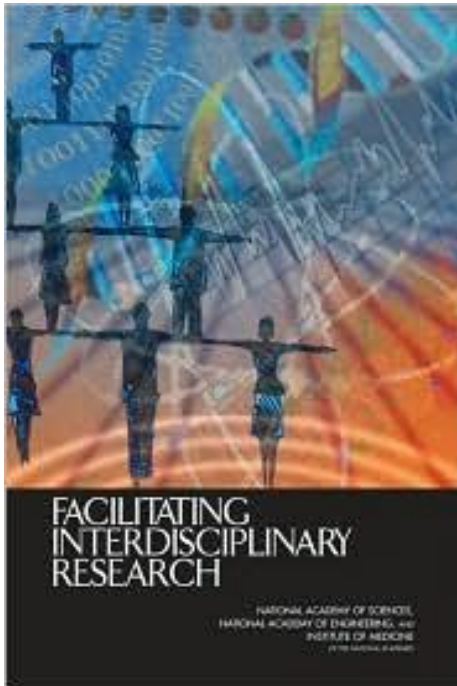
Cross-disciplinary Collaboration

- Combine or integrate from more than one field
 - Concepts
 - Methods
 - Theories
- Three cross-disciplinary orientations
 - Multidisciplinary
 - Independent, Sequential
 - **Interdisciplinary**
 - **Joint, Interactive**
 - Transdisciplinary
 - Integrative , Extends



NAS/NSF Define Interdisciplinary Research

- Interdisciplinary research (IDR) is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.



NIH Defines Interdisciplinary Research

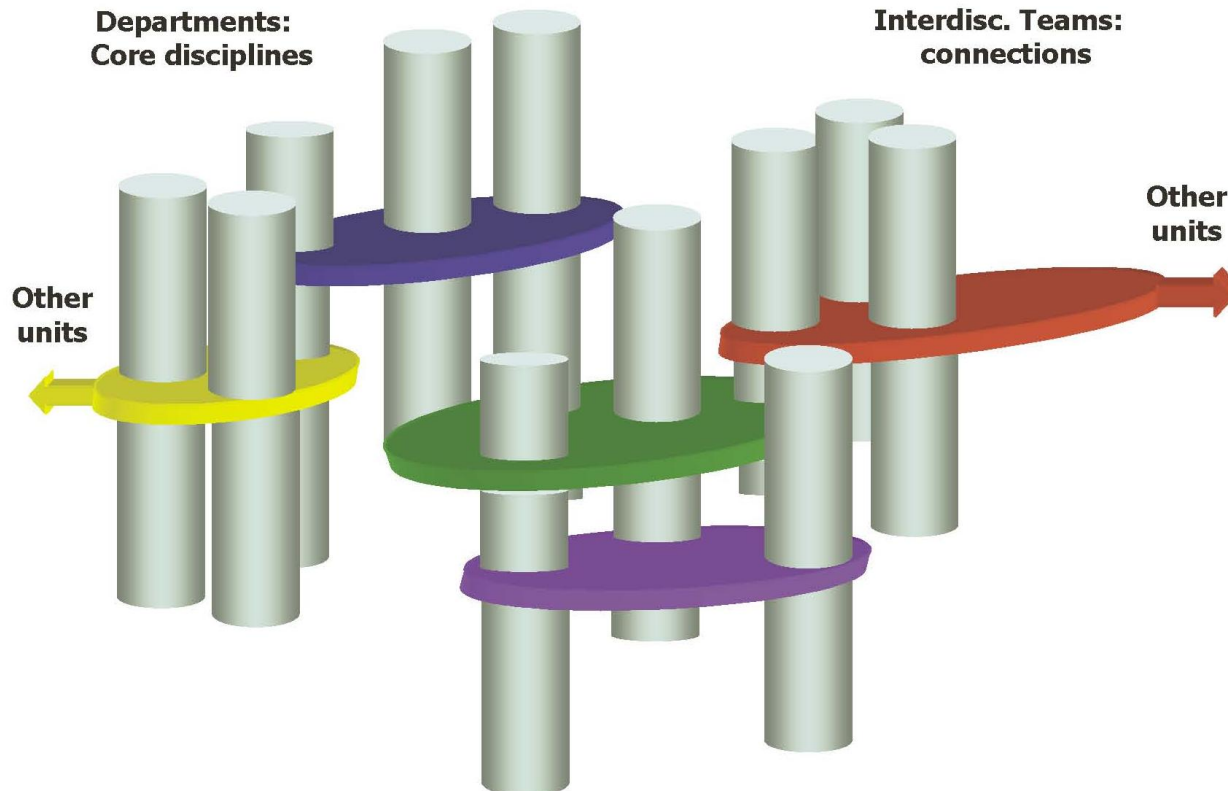
- Interdisciplinary research (IR) integrates the analytical strengths of two or more often disparate scientific disciplines to create a new hybrid discipline. Traditional gaps in terminology, approach, and methodology might be eliminated.
 - Genomics
 - Bioinformatics
 - Proteomics
 - Psychoneuroimmunology



Interdisciplinary Research in Academia

Academic Structure

Departmental towers connected by interdisciplinary initiatives



Mary E. Lidstrom, PhD
Vice Provost of Research
University of Washington

<http://depts.washington.edu/cigr/documents/PhyllisWise2008IGRKeynote.pdf>

Interdisciplinary Research = Team Science



- Complex societal (energy, environment, health, social) problems require interdisciplinary solutions
- Increased demand for collaboration
- Problems being addressed by teams of scientists


Team Science

Team Science Impact



- "Team research, especially interdisciplinary research, is characterized by synergies among experts that can transform both scholars and scholarship"
 - *John Cacioppo, PhD, the Tiffany and Margaret Blake Distinguished Service Professor in Psychology, The University of Chicago*
- "...society's problems do not fit neatly into the University's departmental grid, nor are they rapidly divisible into subproblems...interdisciplinary research teams can readily respond to multi-discipline, problem-oriented research and public service opportunities."
 - *Remick, F. (2000). Barriers to Organized Interdisciplinary Research in a University Environment, in The Interdisciplinary Imperative: Interactive Research And Education, Still An Elusive Goal In Academia (Writers Club Press).*

Team Science Trend

- 
- Increasingly difficult to make scientific discoveries
 - More people required to find out new things
 - Research increasingly done in teams, for virtually all fields
 - Teams learn more and faster
 - Teams typically produce more highly cited research than individuals
 - Teams that are more diverse are even more highly impactful
 - More team science is done inter-institutionally
 - Virtual communities produce higher impact work
 - But, geo-dispersed teams have a high rate of failure

Team Science Initiatives



- Large research, training, and translational Programs
- Funded by universities/research institutions, federal agencies and foundations
- Collaborative and interdisciplinary scientific approaches
- Principal units of analysis for the *Science of Team Science* (SciTS) Studies

Team Science Effectors



ANTECEDENTS

- Intrapersonal
- Social
- Physical environmental
- Organizational
- Institutional



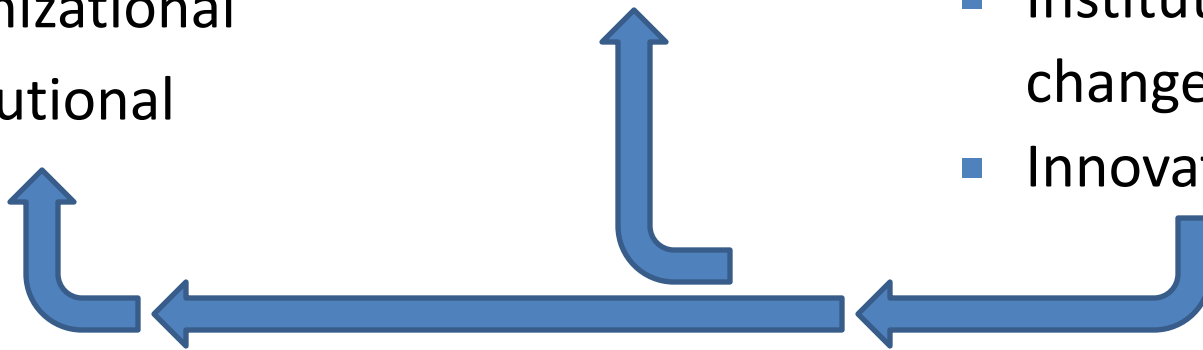
PRCOESSES

- Behavioral
- Affective
- Interpersonal
- Intellectual



OUTCOMES

- Novel ideas
- Integrative models
- New training programs
- Institutional changes
- Innovative policies



Team Science Facilitators



Individual & Interpersonal Factors

- Openness to interdisciplinary collaboration
- Mutual respect among scientists
- Regular interactions focused on the science
- Mentoring in interdisciplinary team science
- Common language/constructs to facilitate collaboration

Institutional & External Factors

- Collaborative data
- Technologies, methods, and suitable physical environment
- Funding for interdisciplinary team science
- Institutional leadership that supports interdisciplinary team science
- Cultural norms to support interdisciplinary team science
- Sufficient time to develop “true” interdisciplinary collaborations
- Training programs in team science

Team Science Challenges

Individual & Interpersonal Factors

- Collaboration readiness
- Early-career investigators career development
- Metrics for success/failure
- Access to appropriate mentors
- Longer lead time to develop team and become productive
- Disciplinary cultural and philosophical differences
- Administrative burden to faculty
- Absence of interpersonal process skills
- Managing conflict and Groupthink
- Lack of common problem focus
- Integration of needs of stakeholders outside of academia (industry, community partners)

Institutional & External Factors

- Institutional disincentives
 - Mismatch between rewards stressing disciplinary competence over interdisciplinarity and innovation
 - Recognizing faculty members' collaborative efforts during promotion and tenure
- IP management
- Metrics for success/failure
- Training environment
- Start-up/sunset
- Intra- and inter-institutional Cultural differences, incld b/t academia & industry
- Financial management of funds for collaborative projects
- Challenge in getting interdisciplinary research and team science grant funding
- Integration of needs of stakeholders outside of academia

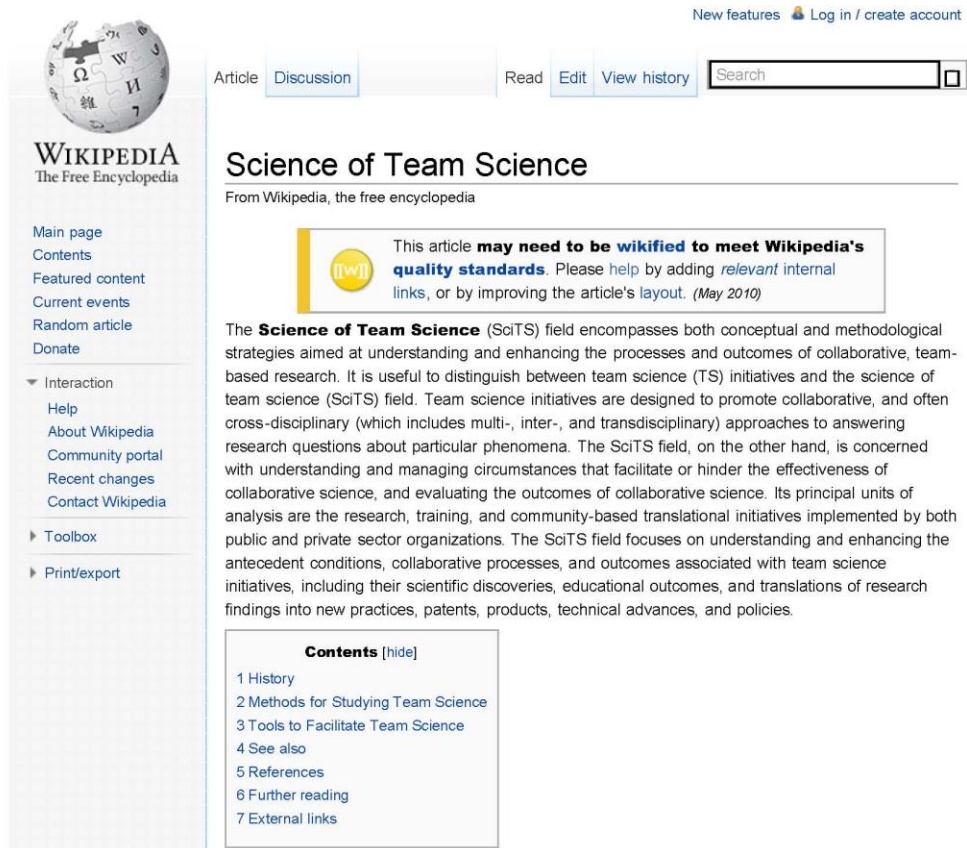
SciTS: A New Interdiscipline

- A rapidly emerging field
- Concerned with understanding and managing circumstances that facilitate or hinder the effectiveness of large-scale CD, collaborative research, training, and translational initiatives
- Field has grown
 - Societal concerns
 - Cost-effectiveness
 - Accountability



SciTS Research

Science of Team Science - Wikipedia, the free encyclopedia



The screenshot shows the Wikipedia article for "Science of Team Science". At the top, there is a navigation bar with "Article", "Discussion", "Read", "Edit", and "View history" tabs, and a search box. Below the navigation bar, the article title "Science of Team Science" is displayed, followed by the text "From Wikipedia, the free encyclopedia". A yellow banner indicates that the article needs to be wikified to meet Wikipedia's quality standards. The main text of the article begins with "The **Science of Team Science** (SciTS) field encompasses both conceptual and methodological strategies aimed at understanding and enhancing the processes and outcomes of collaborative, team-based research. It is useful to distinguish between team science (TS) initiatives and the science of team science (SciTS) field. Team science initiatives are designed to promote collaborative, and often cross-disciplinary (which includes multi-, inter-, and transdisciplinary) approaches to answering research questions about particular phenomena. The SciTS field, on the other hand, is concerned with understanding and managing circumstances that facilitate or hinder the effectiveness of collaborative science, and evaluating the outcomes of collaborative science. Its principal units of analysis are the research, training, and community-based translational initiatives implemented by both public and private sector organizations. The SciTS field focuses on understanding and enhancing the antecedent conditions, collaborative processes, and outcomes associated with team science initiatives, including their scientific discoveries, educational outcomes, and translations of research findings into new practices, patents, products, technical advances, and policies." Below the main text, there is a "Contents" section with a list of links: 1 History, 2 Methods for Studying Team Science, 3 Tools to Facilitate Team Science, 4 See also, 5 References, 6 Further reading, and 7 External links.

- Diverse conceptual methodologies & models
- Assess antecedents, processes, and outcomes of interdisciplinary, team-based research programs
- Need to characterize SciTS field more clearly in terms of theoretical, methodological, and translational concerns

SciTS in Action



Research Team Support & Development at the
NUCATS Institute proudly presents the Second Annual International
SCIENCE OF TEAM SCIENCE CONFERENCE

MONDAY-THURSDAY, APRIL 11-14, 2011
Wyndham Chicago
Chicago, IL

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<http://scienceofteams-science.northwestern.edu/scits-2011-conference>

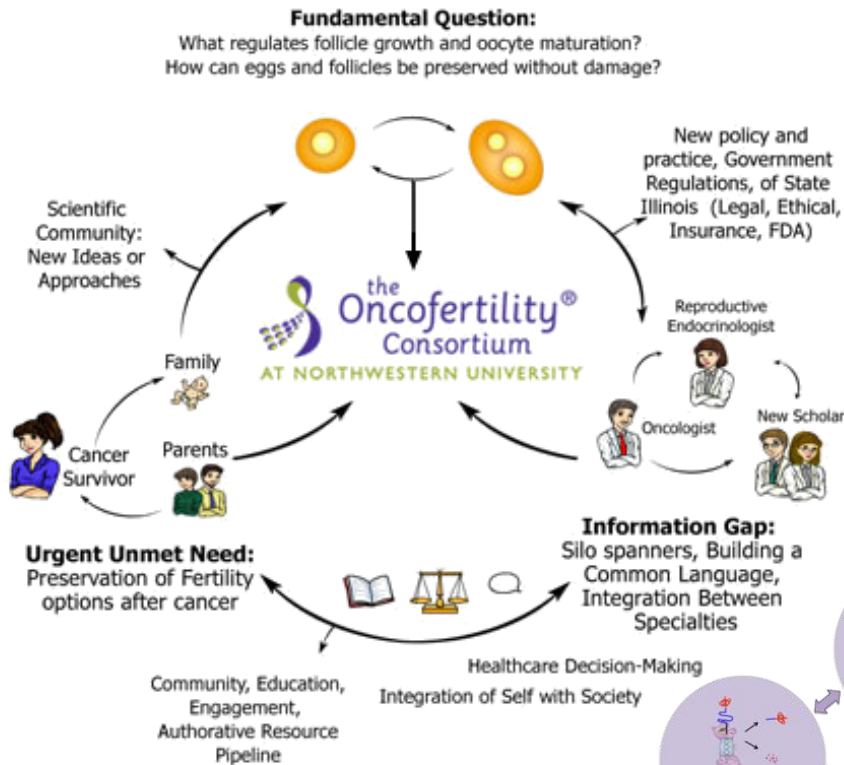
Interdisciplinary Team Science

- Complex Initiatives
 - Several collaborating investigators
 - Multiple projects
 - Dispersed
- Multiple Components
 - Research
 - Pilot Projects
 - Cores
 - Education/Training
 - Clinical /Industrial Translation
 - Community Health
 - Outreach



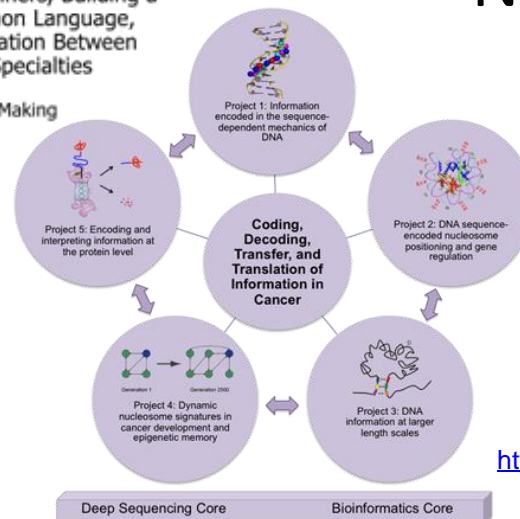
NIH Common Fund Interdisciplinary Research
Consortia
<http://commonfund.nih.gov/interdisciplinary/>

Team Science Structures



- Small Teams
- Research Centers
- Institutes
- Consortia
- Networks

Oncofertility Consortium, Northwestern University
<http://oncofertility.northwestern.edu/about-us>



Physical Sciences-Oncology Center, Chemistry of Life Sciences Processes Institute, Northwestern University
<http://www.clp.northwestern.edu/research/physical-sciences-oncology-center-ps-oc>

Interdisciplinary Research & Team Science Funding

- NIH & NSF
 - Mechanisms
 - Specific Programs
 - Research Centers
 - Collaborative Admin
Supplements
 - Joint Programs
 - Capacity Building
 - Intern'l Collaboration
- DOE
- NASA
- DoD
- ED
- NEH
- DOT
- Foundations



National Organization of Research Development Professionals

http://www.nordp.org/resources/collaborative_funding_mech.php



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