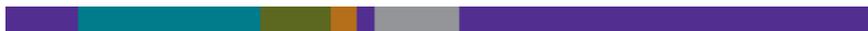


Research Integrity & Team Science



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Objectives

- Define research integrity
- Define cross-disciplinary collaboration and team science
- Identify benefits of team science
- Explain the relation between team science and responsible conduct of research
- Describe methods to enhance team-based approaches to research



Definition of Research Integrity

- Integrity refers to the ability of a researcher to maintain **honesty or truthfulness** in performing responsibilities as a researcher
- Research integrity refers to the ability of a scientist to perform his/her professional duties with honesty and truthfulness
- Research integrity is the **anti-thesis** or **direct opposite** of scientific misconduct or fraud
- Examples of scientific misconduct are **fabrication, falsification, and plagiarism**

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Examples of Behaviors of Lack of Integrity in Research

- **Fabrication.** This is the presentation of data that do not exist or presentation of data that was “cooked up”
- **Falsification.** This is a deliberate change or misreporting of data
- **Plagiarism.** Using the ideas or words of another person without giving appropriate credit

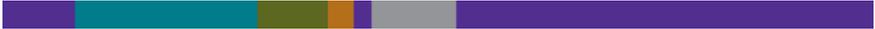
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Classic examples of behaviors of lack of integrity in research (2)

- Multiple publication of same data
- Complementary/honorary authorship
- Excluding as authors persons who deserve to be authors (i.e. those make substantial contribution to project)
- Submission of same paper to multiple journals

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Integrity is Required in all Phases of Research

1. Conception of the research idea
2. Peer review of the proposal
3. Data collection
4. Analysis of the data
5. Dissemination of the data

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How is Integrity Developed?

- Initial & continue education
- Development of policies on integrity by institutions where researcher are employed
- Mentoring & role modelling
- Guidelines by regulating agencies
- Good conscience
- Fear of sanctions & loss of reputation

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Definition of a Team

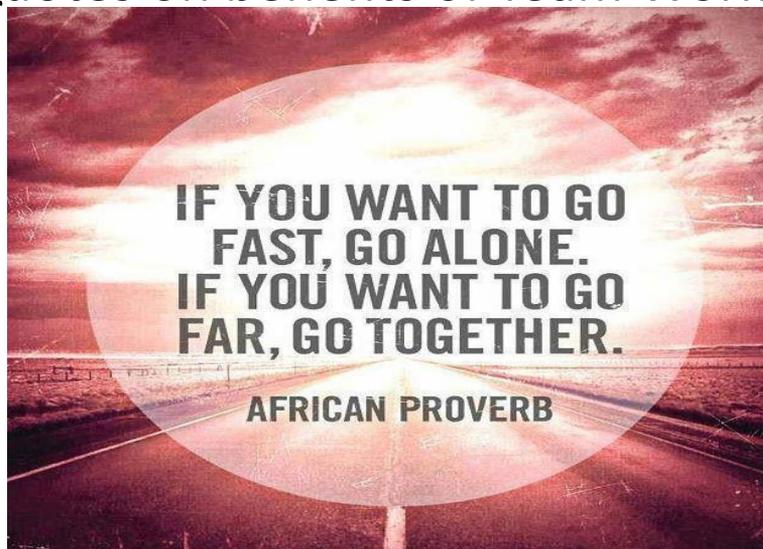


- A group of persons who work together to produce products or deliver services for which they are mutually accountable (Adobamen & Egbage, 2012)
- Two or more people working interdependently towards a common goal.
- A team develops products that are the result of the team's collective effort and involves synergy.
- Synergy is the property where the whole is greater than the sum of its parts (WHO, 2007).

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Quotes on benefits of Team Work



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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 scientific teams and funders of team science—
- A bridge between the *science* of team science and the *praxis* of team science

Research Team Support & Development



- **Science of Team Science (SciTS)**

- Conduct & Support Team Science Research: Research at Northwestern, Sponsor the Annual International Science of Team Science (SciTS) Conference
- Disseminate SciTS Research Findings: Comprehensive SciTS literature library, SciTS resources

- **Praxis of Team Science**

- Collaboration Enhancement: Collaborator identification, New collaboration facilitation, Collaboration tools & resources
- Research Development: Funding opportunities, Catalytic events, Program development, Proposal development
- Team Science Training: Graduate course, Online training modules, Collaboration funding webinar, Collaborative research grantsmanship

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



Team Science Trend

- 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 Origins

- "Most of the work still to be done in science and the useful arts is precisely that which needs knowledge and cooperation of many scientists and disciplines. That is why it is necessary for scientists and technologists in different disciplines to meet and work together, even those in branches of knowledge which seem to have least relation and connection with one another."
 - *French chemist Antoine Lavoisier, 1793 (see Macrina, F.L. 2005. Scientific Integrity : Text and Cases in Responsible Conduct of Research, 3rd ed, Washington, D.C., ASM Press)*

Team Science and the NIH

- "The scale and complexity of today's biomedical research problems increasingly demand that scientists move beyond the confines of their own discipline and explore new organizational models for team science. For example, imaging research often requires radiologists, physicists, cell biologists and computer programmers to work together on integrated teams. Many scientists will still continue to pursue individual research projects, but they too will be encouraged to make changes in the way they approach the scientific enterprise. NIH wants to stimulate new ways of combining skills and disciplines in both the physical and biological sciences."
 - *Excerpt from, 'Research Teams of the Future' in NIH Announces Strategy to Accelerate Medical Research Progress (2003).*
<http://www.nih.gov/news/pr/sep2003/od-30.htm>

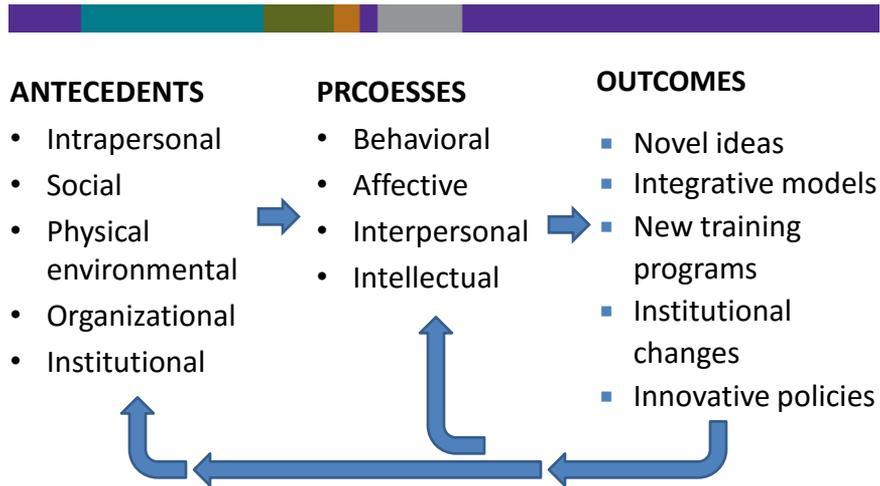
Team Science Advantage

- "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 & Impact

- Increasingly difficult to make new scientific discoveries; More people required to find out new things
- Collaboration balances the need for deeper specialization by individuals; Necessary for making significant advances
- 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 Effectors



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)

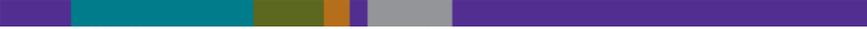
Institutional & External Factors

- 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

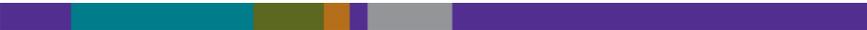
Challenges of Collaborative Team Science

- Structural Issues
 - Research Ctr vs. Dept
 - Space and resource allocation
 - Curricular issues
 - F&A recovery
- Peer Review of Grants and Papers
 - Adequate interdisciplinary diversity of individuals and peer review panels
 - NSF's new Fdn-wide IR review panel
- Authorship Decisions

Challenges of Collaborative Team Science

- 
- Collaboration with Industry
 - Restrictions on public disclosure and publication
 - Openness of training, requirements for graduation/completion
 - Collegiality vs. Competitive Landscape
 - Collaboration and interdependence of investigators
 - Competitive nature of research landscape
 - International Collaboration
 - Cultural Issues
 - Human subject research and informed consent

Career Advancement and Team Science



“Because independent work in the prevailing of scientific identity, junior scientists establishing their careers need to recognize the importance of balancing collaborative and independent work.”

- *Macrina, F.L. (2005). Collaborative Research in Scientific Integrity : Text and Cases in Responsible Conduct of Research, 3rd edn, Chapt. 8, pg 201. Washington, D.C., ASM Press*

Communication and Team Science

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- Establishing collaboration
 - Formalizing collaboration
 - Determining terms of collaboration
 - Maintaining Collaboration
 - Developing trust
 - Managing conflict
 - Use of distributed collaboration technologies
 - Termination Collaboration

Misbehavior Predictors

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- Factors can both impact and predict misbehavior
 - Secrecy
 - Conflicting roles
 - Reward system
 - Ambiguous professional norms
 - Failures of oversight
 - Being in a position of authority

Read Case & Open Space for Discussion



Victimizing the System or a Victim of It?