



# WELCOME: SciTS 101: Fundamentals of the Science of Team Science

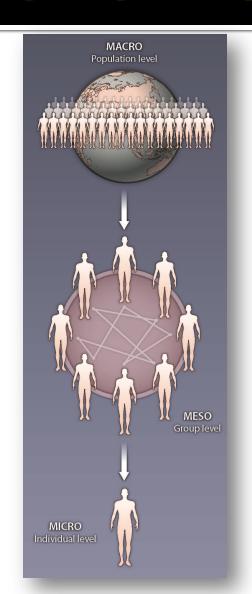
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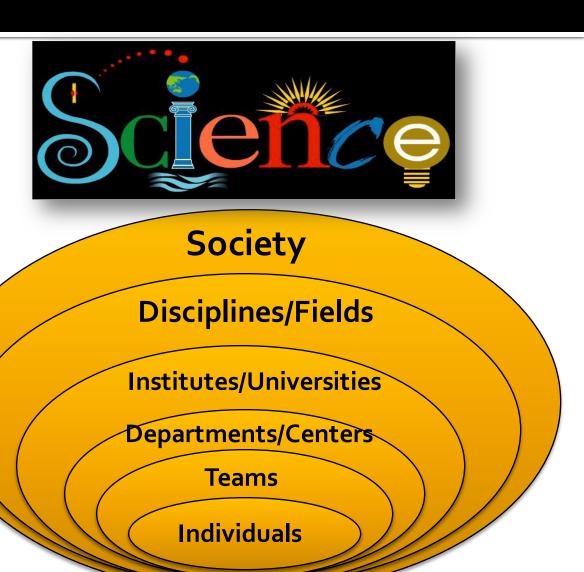
Fiore, S.M. (2016). SciTS 101: Fundamentals of the Science of Team Science. Conference Workshop (May 16<sup>th</sup>), Phoenix, AZ.





## Overview





# The Scholarly Study of Science Foundational Approaches



### **History and Philosophy of Science**

 Decades long tradition of scholarly work <u>examining science and</u> <u>medicine through historical lens</u>

- Examines how humanity's understanding of the natural world has changed over the centuries
- Studies the cultural, economic, and political impacts of scientific innovation



# The Scholarly Study of Science Foundational Approaches



### **Social Studies of Science**

Studies of <u>scientific knowledge</u>, and R&D

Examines dynamics of science including <u>relationship to</u>

politics, society, and culture

### **Science & Technology Studies**

- Examines <u>social dimensions</u> of <u>science and technology</u>
- Explores the <u>role and ethical</u> <u>implications of S&T in society</u>



# The Scholarly Study of Science Foundational Approaches

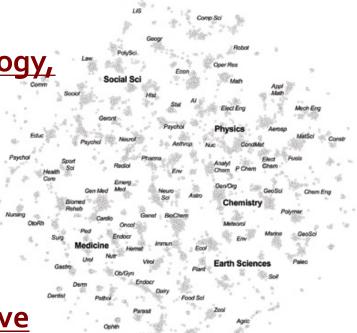


#### **Scientometrics**

- Measures and analyzes science, technology, and innovation
- Examines <u>scientific impact</u> (e.g., bibliometrics)
- Maps scientific fields

### **Science of Science Policy**

- Relies on <u>quantitative</u> data and <u>qualitative</u> information
- Seeks to provide <u>rigorous</u>, <u>quantitative</u>
   <u>basis for science policy</u>
- Develops <u>theory and models</u> to guide decisions about <u>investments in science</u>







### A New Field - Science of Team Science

- Commitment to <u>develop scholarly examination of teamwork in science</u>
  - Goal to understand and improve how scholars <u>interact</u> and <u>integrate</u> <u>across</u> disciplinary, professional, and institutional boundaries

"the inherent complexity of contemporary public health, environmental, political, and policy challenges... [leads to] realization that an integration of multiple disciplinary perspectives is required to better understand and ameliorate these problems" (Stokols et al., 2008).



- Must understand how to make full use of the scientific capacity of science teams (Salazar et al., 2012)
- Salazar, M. R., Lant, T. K., Fiore, S. M., & Salas, E. (2012). Facilitating innovation in diverse science teams through integrative capacity. *Small Group Research*, 43(5), 527-558.
- Stokols, D., Misra, S., Moser, R. P., Hall, K. L., & Taylor, B. K. (2008b). The ecology of team science Understanding contextual influences on transdisciplinary collaboration. *American Journal of Preventive Medicine*, 35(2), S96-S115.



- What we mean by teams is the same inside and outside of science
  - Multiple information sources and intensive communication
  - <u>Task-relevant knowledge</u> with meaningful task <u>interdependencies</u>
  - <u>Coordination</u> among members with <u>specialized roles</u>
  - Affective and attitudinal factors influence group dynamics
- Reframing science collaboration as a <u>process</u> of teamwork to be mastered (Fiore, 2008)
  - Allows us to <u>leverage social sciences</u>
  - Changes question to <u>understanding team</u> <u>activities</u> necessary for science
  - Makes the <u>achievement</u> and <u>measurement</u> of team science more tractable



Fiore, S. M. (2008). Interdisciplinarity as teamwork: How the science of teams can inform team science. *Small Group Research*, 39(3), 251-277.



- Scientific study of teamwork is important catalyst
  - Matured into its own area of inquiry producing a rich base of knowledge
  - Helped us to better understand the complex coordinative processes engaged by teams



Physician heal thyself...











Fiore, S. M. (2008). Interdisciplinarity as teamwork: How the science of teams can inform team science. *Small Group Research*, 39(3), 251-277.



#### Key Milestones in the SciTS Field NCI Conference: The Science of Team Science: Assessing the Applying the Science of Mapping a Research Agenda Value of Transdisciplinary Teams to inform Policy & for SciTS Research Research on Team Science The Science of Team Science dels of Tea **Annual SciTS Conference** & UCF Building the knowledge base for effective team science FINAL REPORT NSF Workshop Applying the Science of Teams to Inform Policy and Research on Team Science University of Central Flo 2016 2008 2011 2012 2013 2014 2015 2006 2010 **Team Approaches to** SciTS Journal Science, Practice, & Collaboration Science & Supplement **Policy in Health National Academies Translational Medicine Consensus Study** PREVENTIVE TRANSLATIONAL MEDICINE BEHAVIORAL MEDICINE The Science of Team Science Assessing the Value of Transdisciplinary Research TeamScience Translational Medicine & Epidemiology ACPM APTR SciMedCentral **TEAM SCIENCE**

Hall, K, Courtney, P., & Srivastava, A. (2016). The Mycroft Cognitive Assistant: Enhancing and Supporting T-Shaped Skills and Research Collaborations. *T-Summit 2016: Transformational Approaches to Creating T-Shaped Professionals* (March 22). Washington, DC.



### NRC Report on Enhancing the Effectiveness of Team Science

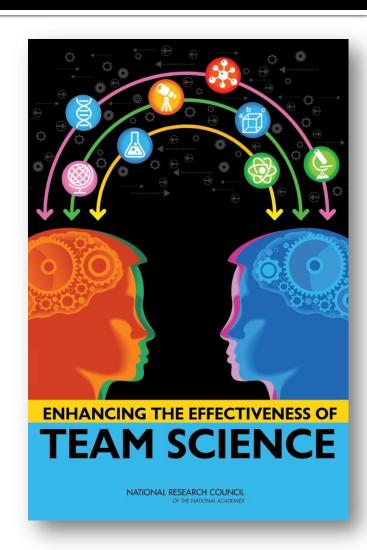
Key Features	Ranges Possible in Team Science		
Size	Small (2)	<b>←</b>	<b>Mega (1000</b> s)
Task Interdependence	Low	<b>←</b>	High
Boundaries	Stable	<b>←</b>	Fluid
Goal Alignment	Aligned	<b>←</b>	Divergent or Misaligned
Integration	Unidisciplinary	<b> </b>	Transdisciplinary
Diversity	Homogeneous	<b>←</b>	Heterogeneous
Proximity	Co-located	<b>←</b>	Globally Distributed



#### The GOOD NEWS

There is a rich and robust scholarly literature on team performance that can be extended to improve team science effectiveness

- The science points to interventions for:
  - Assembling teams
  - Providing professional development and education opportunities
  - Supporting leadership development opportunities
  - Virtual collaboration
  - P&T credit for team-based work
  - Study and measurement of science teams



#### **Report Free for Download**



- Duality of the Science of Team Science (SciTS)
  - Exists a <u>complementarity</u> in our goals
  - Draws from iterative give-and-take between understanding and use

- (1) Studying science teams to:
  - Gain <u>fundamental understanding</u> about the production of knowledge
  - Develop <u>methods and models to improve</u> the scientific enterprise
- (2) Applying what is known to improve effectiveness of science teams
  - <u>Utilize concepts</u> from study of other team types (e.g., team training)
  - Draw from <u>measures and metrics</u> of teamwork (e.g., information sharing)

# Instructions to Workshop Participants – Practice IPS...



#### **Practice Active Listening**

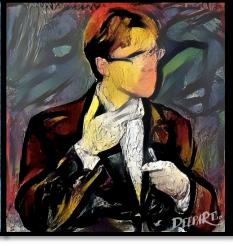
- Carefully attend to what is said
- Ask other party to <u>explain what is meant</u>
- Request that <u>ambiguous ideas</u> or statements are <u>repeated</u>
- Targets "listening to learn and understand" and "listening to contribute and integrate to problem solving"



#### **Practice Assertive Communication**

- <u>Directly express</u> ideas and opinions
- Address conflict purposely and openly
- Address differences without intimidation
- Targets the ability to "propose ideas", to "question disciplinary values/methods" and to "be directive and appropriately assert your needs and views"







### Workshop Agenda

Time	Event	
SciTS 101: Lay	ving the Foundation (Stephen M. Fiore)	-
8:30-8:45	Welcome and Overview	1000
Integrative Ca	pacity (Maritza Salazar)	THE REAL PROPERTY.
8:45-9:00	Understanding Integrative Capacity for Science Teams	E S
9:00-9:30	Developing Integrative Capacity	
Facilitating In	terdisciplinary Team Science (Julie Thompson Klein and Michael O'Rourke)	WILL BE
9:30-9:45	Facilitating Interdisciplinary Team Science: Organizational and Institutional	80
	Factors	
9:45-10:00	Break	
10:00-11:00	Facilitating Team Communication Using the Toolbox Dialogue Method	
Collaboration	Planning (Kara Hall and Amanda Vogel)	100
11:00-11:15	Understanding Collaboration Planning	
11:15-11:45	Considerations for Collaboration	
SciTS 101: Ke	eping Perspective (Stephen M. Fiore)	No.
11:45-12:00	Summary	1







### Conclusion: Looking Back to Look Ahead

#### Dealing with Scholarly Structure

Disciplines are distinguished partly for historical reasons and reasons of administrative convenience (such as the organization of teaching and of appointments)... But all this classification and distinction is a comparatively unimportant and superficial affair. We are not students of some subject matter but students of problems. And problems may cut across the borders of any subject matter or discipline (Popper, 1963).



#### Dealing with University Structure

 What is critical to realize is that "the way in which our universities have divided up the sciences does not reflect the way in which nature has divided up its problems" (Salzinger, 2003, p. 3)

NEXT STEPS – Collaborations influencing the <u>practice of science</u> and <u>production of knowledge</u>. *To achieve success we must surmount these challenges*.

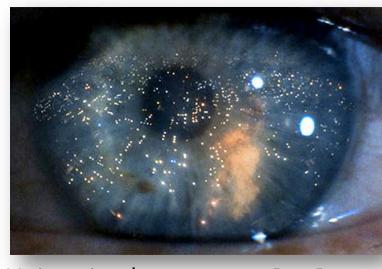
Popper, K. (1963). Conjectures and Refutations: The Growth of Scientific Knowledge. London: Routledge. Salzinger, K. (2003). Moving Graveyards. *Psychological Science Agenda, Summer, 3.* Washington, DC: American Psychological Association.



### Conclusion: Looking Back to Look Ahead

### These fictions we call disciplines

"Academic disciplines are made, not found. They are socially constructed, just like ideas, organizations, identities or relationships... Like other social constructs, disciplines have become reified, such that social actors forget their responsibility as creators, perceiving what they themselves have made as solid and unchanging... In particular, universities are responsible for the



reification of disciplines, and surprisingly recently... University departments [are] now well established "as the basic unit of academic organization". As is the case with other social constructs, once disciplines were built into the design of a university in the form of departments, they became solid in a new way, and consequently more difficult to question or modify" (Leeds-Hurwitz, 2012)

 NEXT STEPS – Academic and scholarly cultures need to move beyond the artificial organization of knowledge.

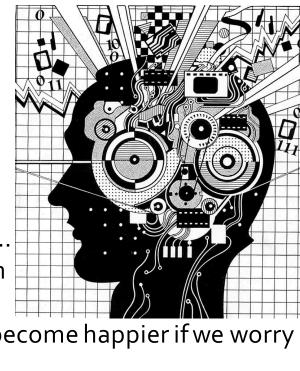
Leeds-Hurwitz, W. (2012). These fictions we call disciplines. *The Electronic Journal of Communication / La Revue Electronic de Communication, 22* (3/4).



### Conclusion: Looking Back to Look Ahead

### Collaborate to Solve the Big Problems

"Forget about finding your passion. Instead, focus on finding big problems. Putting problems at the center of decision-making changes everything. It's not about the self anymore. It's about what you can do and how you can be a valuable contributor. People working on the biggest problems are compensated in the biggest ways... in a deeply human sense. For one, it shifts your attention from you to others and the wider world. You stop



dwelling. You become less self-absorbed. Ironically, we become happier if we worry less about what makes us happy" (Segovia, 2012).

 NEXT STEPS — (Understanding) scientific and professional collaboration is the most likely path to solving complex societal problems.

Segovia, O. (2012). To Find Happiness, Forget About Passion. Harvard Business Review.



# Thank You! *Questions or Comments?*

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