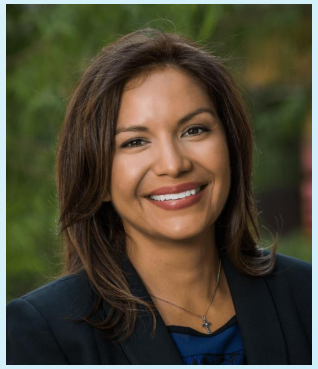
What is the Knowledge Base for Developing Effective Interventions

Panel Discussion

Stephen M. Fiore, Ph.D.
Cognitive Sciences Program
University of Central Florida



Maritza Salazar Campo, Ph.D.
The Paul Merage School of Business
University of California, Irvine

Brian Uzzi, Ph.D.
Kellogg School of Management
Northwestern University

Panel Key Questions

1. What are relevant findings on research leadership and research team performance?
2. What are key insights that we can build on to shape approaches to training and professional development to advance research integrity?
3. What are critical issues that deserve more examination?

Overview

- Panel Overview
  - Understanding the Science of Team Science
  - Multilevel Perspectives on SciTS and RCR
- Part 1. Some Team Dynamics in Collaborative Science
  - Understanding Trust and Conflict in Science Teams
- Part 2. Leading and Managing Science Teams in RCR
  - Some Critical Issues for Science Team Leadership

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Panel Overview
Understanding Science of Team Science

- Consider what was published on interdisciplinary research in the journal *Science*:
  - "The interdisciplinary approach is becoming one of the **prominent** characteristics of [science] and represents a **synthesizing** trend which focuses the specialized research techniques on problems common to a number of separate disciplines. Such cooperative research has to **overcome serious obstacles** when operating within the existing **departmentalized framework** of the universities. It appears that real progress in this direction will be made in institutions which are organized on a permanent and frankly **cooperative basis.** Psychologically, interdisciplinary research requires not only abstract, theoretical intelligence…, but also '**social intelligence**.' Cooperative work is a social art and has to be practiced with patience."

Panel Overview
Understanding Science of Team Science

What is informative here?

- Increasing influence/importance of interdisciplinarity as method of inquiry
- Challenge of interdisciplinarity distinguished in 2 ways

- 1) The problem of **infrastructure** - tangible and tacit
  - Inherent challenge associated with structure of the modern university - **the discipline bound department** - and the tacit norms which prevent or stifle interaction amongst them
- 2) The problem of **interaction**
  - Difficulty inherent in communicating and collaborating across disciplines and how patience and a **particular form of social intelligence** are necessary precursors to effective collaboration in such environments

Panel Overview
Understanding Science of Team Science

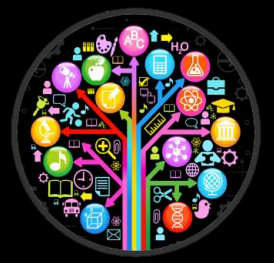
- Anyone familiar with some manner of cross-disciplinary collaborative effort will likely have experienced some or all of these factors
  - ***So one might wonder why this quote is particularly informative***

- What is informative is not **what** was said, it is **when** it was said
  - ***Written well over a half century ago in one of first articles specifically addressing interdisciplinary research (Brozek & Keys, 1944).***

- **Science still struggles so why should we think anything will change?**
  - ***Should we be so bold as to think that we have a better chance at overcoming these challenges than those from generations before us?***

Brozek, J., & Keys, A. (1944). General aspects of interdisciplinary research in experimental human biology. *Science*, *100*(2606), 507-512.

Panel Overview
Understanding Science of Team Science



Changes in Collaboration Drive Changes in Study of Science

1. **Policy, Academia, and Industry** communities engaged in more collaborations and making more of a concerted effort to understand and **improve teamwork**
2. Tremendous **growth** in study and **understanding of teams**

Organizational Sciences an important leverage point

- Matured into its own area of inquiry producing a rich base of knowledge
- Helped us to better understand the complex coordinative processes (teams and institutions)

Developing Interdisciplinary Field - International Network for Science of Team Science (INSciTS)

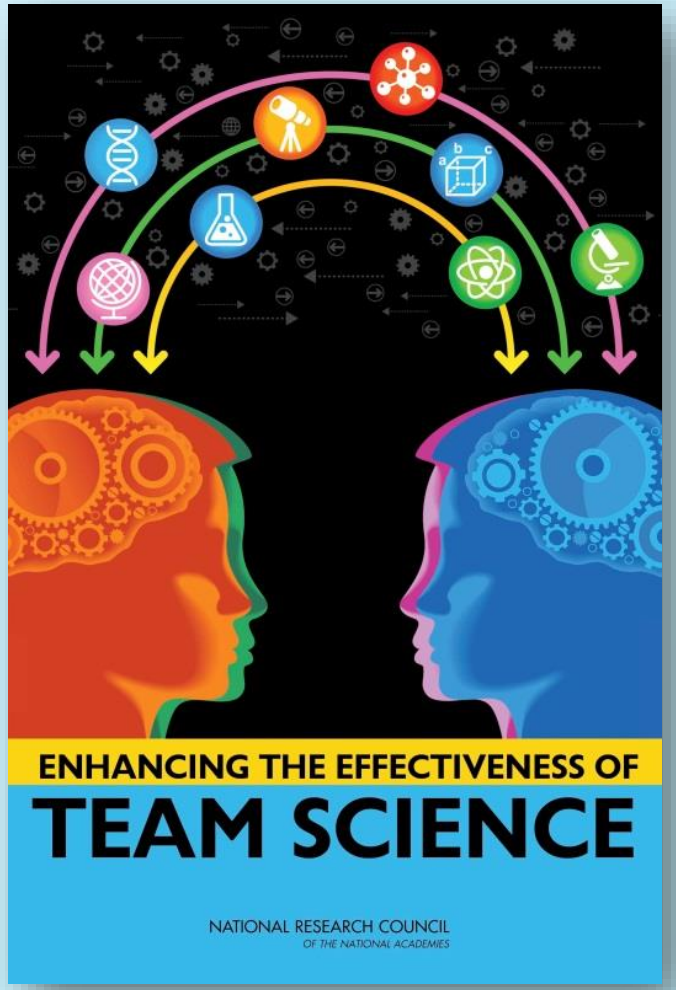
- Scholarly society to support understanding and improving scientific collaboration (https://www.inscits.org)

INSciTS | Building the knowledge base for effective team science
International Network for the Science of Team Science

INGROUP
interdisciplinary network for group research

Panel Overview
Understanding Science of Team Science

- **Evidence base** building for guidance on:
  - **Assembling** teams
  - Group **dynamics** in teams
  - Supporting **leadership** development opportunities
  - **Virtual** collaborations
  - **Study and measurement** of science teams
  - **Promotion & Tenure** in science teams
  - **Credit** for team-based work

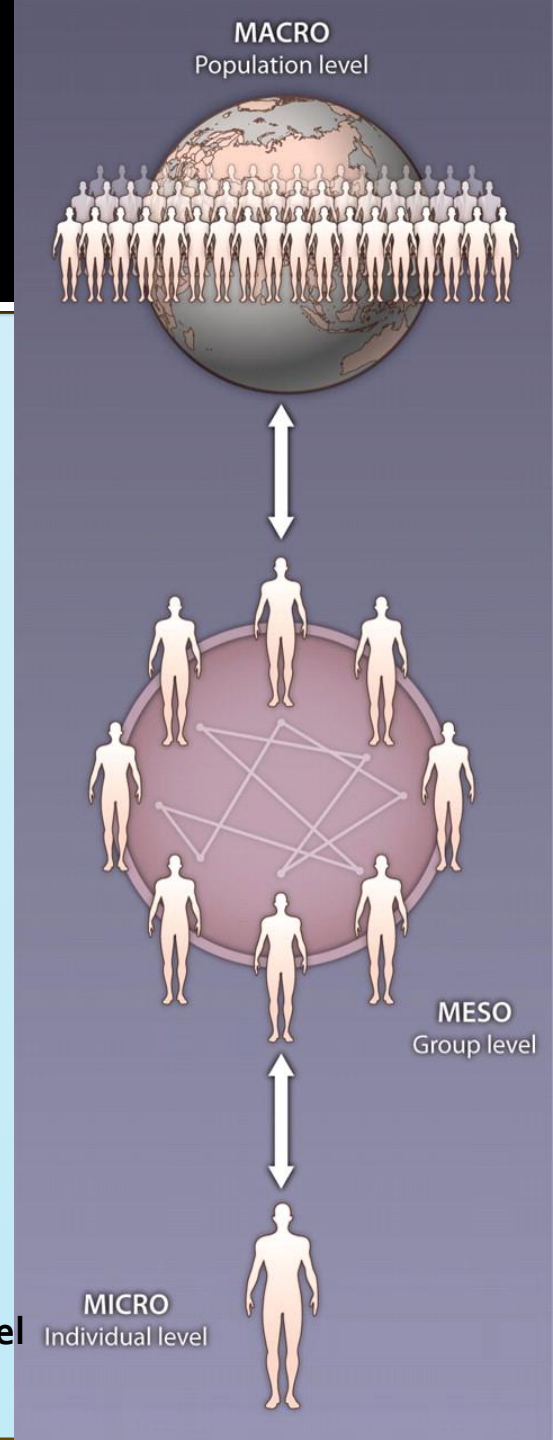


Enhancing the Effectiveness of Team Science (2015) -- http://www.nap.edu/catalog/19007/enhancing-the-effectiveness-of-team-science

Panel Overview
Multilevel Perspectives on SciTS and RCR

Macro-level Issues in Team Science

- **Examines structures of collaboration across networks (centers, universities, fields)**
  - Address broad issues on the ways of pursuing/encouraging scientific progress
- **At macro-level, need to attend to and manage the following issues:**
  - Professional culture and identity
    - *Affiliations within and across, centers, universities, disciplines*
  - Governmental policies
    - *Rules and regulations managing interactions*
  - Societal values and norms
    - *Expected actions related to research and acceptable behaviors*



Börner, K., Contractor, N., Falk-Krzesinski, H. J., Fiore, S. M., Hall, K. L., Keyton, J., ... & Uzzi, B. (2010). A multi-level systems perspective for the science of team science. *Science Translational Medicine*, 2(49), 49cm24-49cm24.

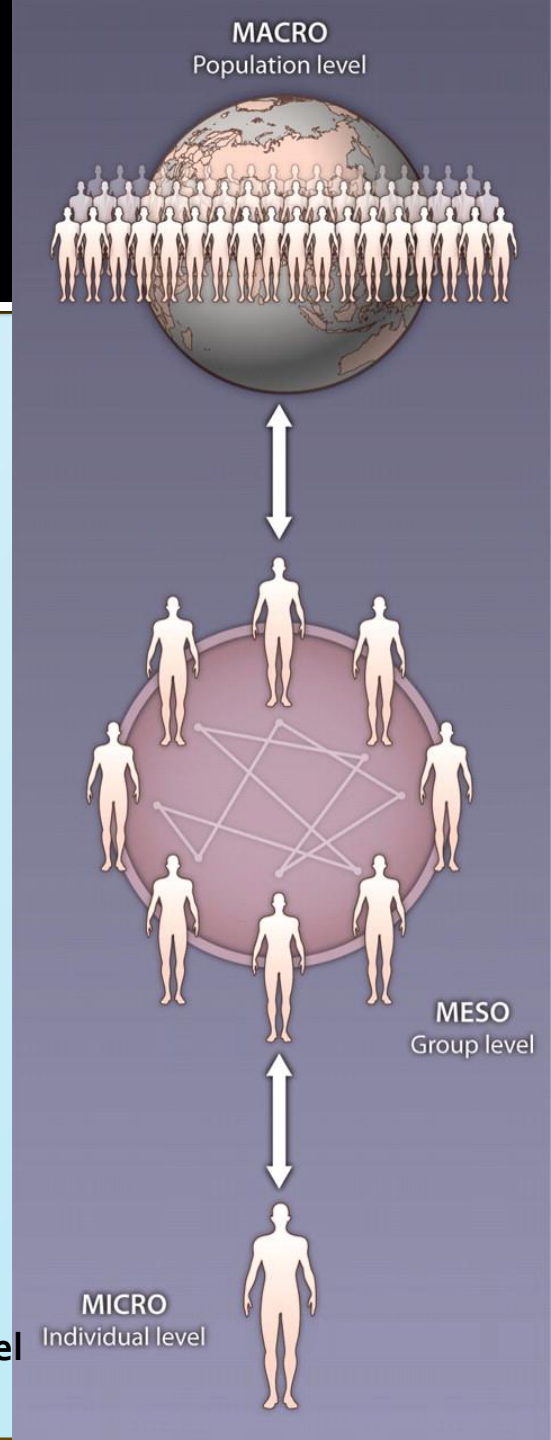
Panel Overview
Multilevel Perspectives on SciTS and RCR

Meso-level Issues in Team Science

- **Considers how understanding group process influences scientific teams**
  - Involves examining the group dynamics emerging in team science
- **At meso-level, need to attend to and manage the following issues:**
  - Identification of nature of interdependencies within team
    - *Determine who relies on whom for task completion*
  - Form of Interpersonal Skills Needed (Marlowe, 1986)
    - *Understand behaviors, cognitions, and attitudes in team*

Micro-level Issues in Team Science

- Understand learning and development of the individual scientist
- **At micro-level, need to attend to and manage the following issues:**
  - *What do individuals need to know (e.g., disciplinary breadth versus depth)*
  - *What does individual need to know how to do (e.g., methods, procedures, technologies)*



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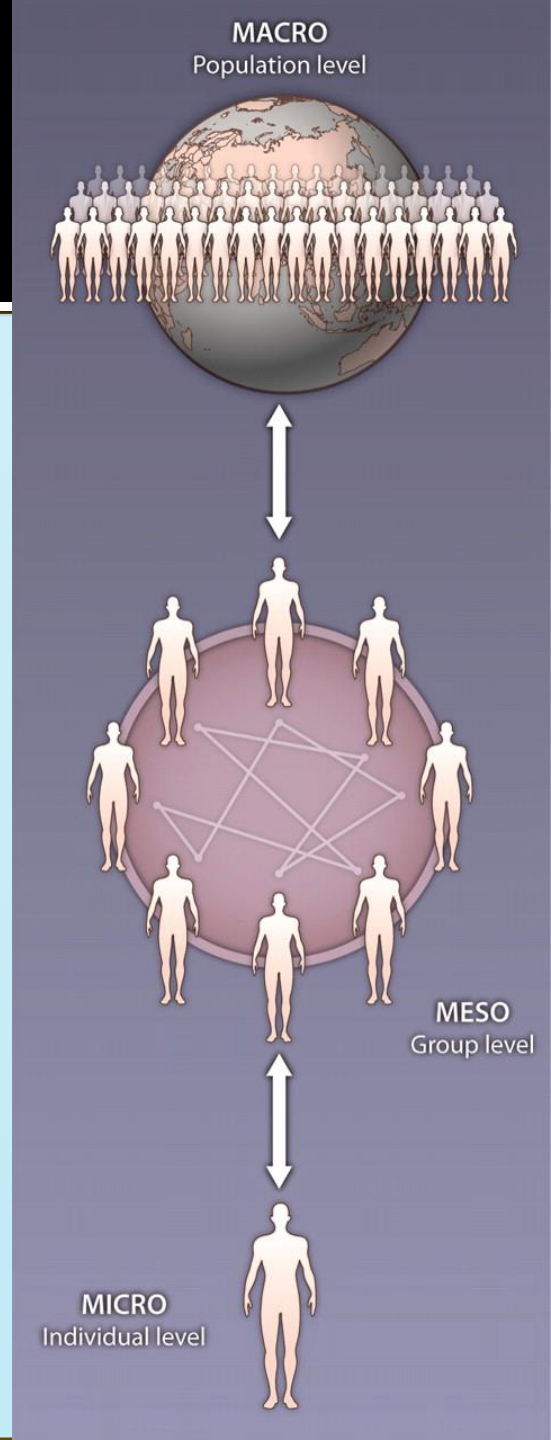

Team Dynamics and RCR: Understanding Conflict and Trust in Science Teams

Stephen M. Fiore, Ph.D.
University of Central Florida
Cognitive Sciences, Department of Philosophy and
Institute for Simulation & Training

Fiore, S. M. (2023). Team Dynamics and RCR: Understanding Conflict and Trust in Science Teams. On Leading a Lab: Strengthening Scientific Leadership in Responsible Research, A Workshop. National Academies of Sciences, 3-4 December. Washington, DC, USA.

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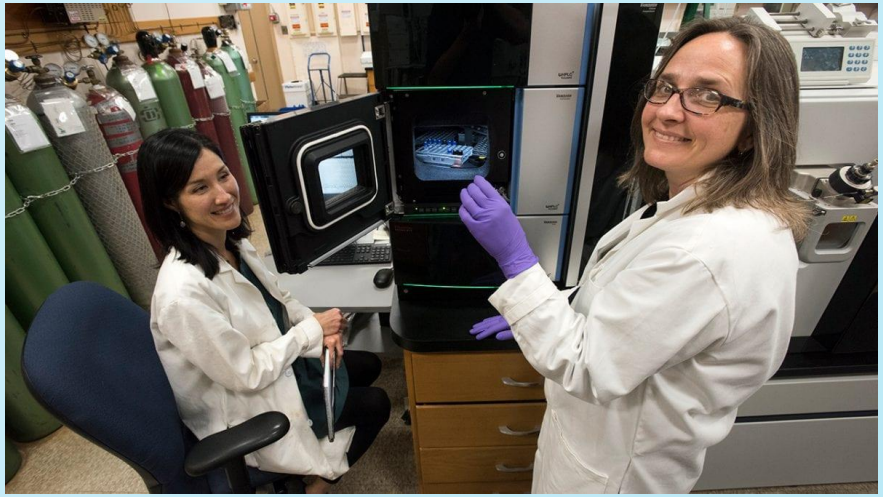
Part 1. Some Team Dynamics in Collaborative Science
Understanding Trust and Conflict in Science Teams

- **What do we mean by teams**
  - Multiple information sources and intensive communication
  - Task-relevant knowledge with meaningful task interdependencies
  - Affective and attitudinal factors influence group dynamics
  - Coordination among members with specialized roles

- **Scientific collaboration is a form of teamwork to be both managed and mastered (Fiore, 2008)**
  - Allows us to leverage science of teams
  - Changes question to understanding teamwork for science
  - Makes measurement of scientific teamwork 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.

Part 1. Some Team Dynamics in Collaborative Science
Understanding Trust and Conflict in Science Teams

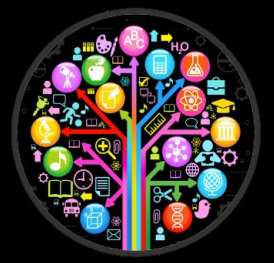
Science teams engage in both taskwork and teamwork as they work and learn together **(Fiore et al., 2015; Fiore, 2008)**

- **TASKwork refers to what needs to be accomplished to meet goals and complete objectives**
- **This is the "work" of science teams**
  - **Knowledge - Understanding the relevant theory and constructs**
  - **Skills - Conducting analyses and interpreting results and writing up findings**
  - **Attitudes - Preferences for differing methodological approaches**

- **TEAMwork refers to the attitudinal, behavioral, and cognitive factors required to function as a team**
- **This is 'how' they accomplish task**
  - **Knowledge - Knowledge associated with teammates (roles, responsibilities)**
  - **Skills – Behaviors supporting interacting with teammates (conflict management)**
  - **Attitudes – Attitudinal and affective issues arising from working with teammates (trust)**

Fiore, S. M. (2008). Interdisciplinarity as Teamwork: How the Science of Teams can inform team science. *Small Group Research, 39(3),* 251-277.
Fiore, S.M., Carter, D.R., & Asencio, R. (2015). Conflict, Trust, and Cohesion: Examining Affective and Attitudinal Factors in Science Teams. In E. Salas, W.B. Vessey, & A.X. Estrada (Eds.), *Team Cohesion: Advances in Psychological Theory, Methods and Practice* (pp. 271-301). Emerald Group Publishing Limited.

Part 1. Some Team Dynamics in Collaborative Science
Understanding Trust and Conflict in Science Teams



RCR Relevant Components of Scientific Teamwork - CONFLICT and TRUST

- **Hall, Stokols, Moser et al. (2008) - Examined perceptions of interpersonal processes and included conflict resolution, trust and communication**
  - "[F]eelings of trust essential prerequisite for effective collaboration in cross-disciplinary teams" and organizational factors contribute to "greater trust and cohesion" (p. 170).

- **Stokols et al. (2008) - Stated that "the importance of establishing interpersonal trust and respect among team members… among the most-commonly-cited factors that exert strong influences" (p. 106).**
  - Conflict "from divergent disciplinary world views, competing theoretical and methodologic perspectives, different departmental affiliations, and dissimilar interpersonal styles hinder the formulation of clear goals and their accomplishment" (p. 105).

Hall, K. L., et al. (2008). The collaboration readiness of transdisciplinary research teams and centers findings from the National Cancer Institute's TREC Year-One evaluation study. *American Journal of Preventive Medicine, 35(2S)*, S161-S172.

Stokols, D.,et al. (2008b). The ecology of collaborative Science - Understanding contextual influences on transdisciplinary collaboration. *American Journal of Preventive Medicine, 35(2),* S96-S115.

Part 1. Some Team Dynamics in Collaborative Science
Understanding Trust and Conflict in Science Teams

Understanding Conflict and Teamwork

- **Awareness on the part of team members of discrepancies, incompatible wishes, or irreconcilable desires, affecting teamwork** (De Dreu & Weingart, 2003)

Two Components of CONFLICT Important for RCR (cf. Fiore, Carter, & Asencio, 2015)

- **TASK (intellectual) conflict - Science team leaders must manage knowledge-based disagreements pertaining to theory, constructs and/or methodologies**
  - **Can increase goal-relevant communications (e.g., idea synthesis)**
  - **Can motivate open practices**
- **TEAM (interpersonal) conflict - Science team leaders must manage animosity toward each other based upon assessments of different values, attitudes, etc.**
  - **May lead to intolerance and disdain across members or labs**
  - **Can increase goal-irrelevant communication (e.g., personal attacks)**

De Dreu, C. K. W., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology, 88*(4), 741-749.
Fiore, S.M., Carter, D.R., & Asencio, R. (2015). Conflict, Trust, and Cohesion: Examining Affective and Attitudinal Factors in Science Teams. In E. Salas, W.B. Vessey, & A.X. Estrada (Eds.), *Team Cohesion: Advances in Psychological Theory, Methods and Practice* (pp. 271-301). Emerald Group Publishing Limited.

Part 1. Some Team Dynamics in Collaborative Science
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Understanding Trust and Teamwork

- **Defined as "a willingness of a party to be vulnerable to the actions of another party based on the expectation that others will perform action important to the trustor"** (Mayer et al., 1995, p. 712).

Two Components of TRUST Important for RCR (cf. Fiore, Carter, & Asencio, 2015)

- **TASK (intellectual) trust - Science team leaders must manage confidence in, or willingness to accept, and/or rely on, team member's competence**
  - **Can help improve acceptance of mistakes/error**
  - **Can support sharing practices beneficial to lab members**
- **TEAM (interpersonal) trust - Science team leaders must manage confidence placed in members based upon feelings of security and level of concern for each other**
  - **Can increase help-seeking (providing) behaviors**
  - **Can support willingness to seek out problems before they occur**

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Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *The Academy of Management Review, 20*(3), 709-734.

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Part 2. Leading and Managing Science Teams in RCR
Some Issues for Science Team Leadership

Critical Issue 1. Need to recognize when leadership matters in science teams

- ***What does the leadership data show? (Burke et al., 2006)***
  - Task-focused and person-focused leadership behaviors important
    - Task-focused leadership: 12% of variance
    - Person-focused leadership: 10% of variance
  - But…degree of **interdependence matters**
    - Leadership behavior explained **19% of variance** in performance in **highly interdependent teams**
    - Leadership behavior explained 6% of variance in performance within teams characterized by low interdependence

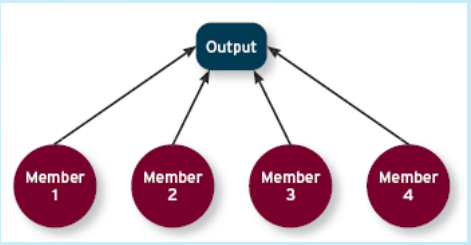
Burke, C. S., Stagl, K. C., Klein, C., Goodwin, G. F., Salas, E., & Halpin, S. M. (2006). What type of leadership behaviors are functional in teams? A meta-analysis. *The Leadership Quarterly*, *17*(3), 288-307.

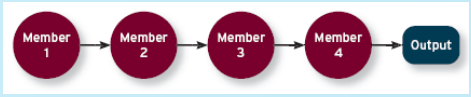
Part 2. Leading and Managing Science Teams in RCR
Some Issues for Science Team Leadership

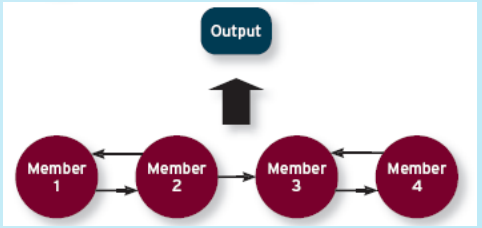
Critical Issue 2. Need to understand nature of science teams interdependencies

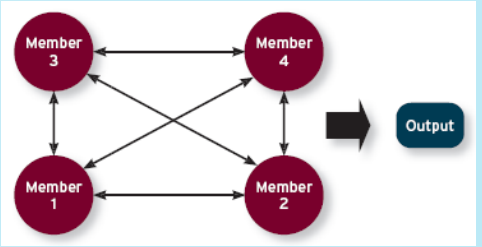
Interdependencies - *who relies on whom for task completion and how does that alter collaboration (Fiore, 2008; Saavedra et al., 1993)*

- ***Pooled interdependence***, each scientist performs his/her own task, and the team result is the sum of each scientist's output
- ***Sequential interdependence*** occurs when one scientist's output is necessary for another scientist's input (i.e., B cannot act without output from A).
- ***Reciprocal interdependence***, one scientist's output becomes another scientist's input and vice versa
- ***Intensive interdependence*** is the highest form of coordinated activity – scientists "jointly diagnose, problem solve, and collaborate to complete a task"









Increasing collaboration size increases coordination challenges

Fiore, S. M. (2008). Interdisciplinarity as Teamwork: How the Science of Teams can inform team science. *Small Group Research, 39(3),* 251-277.
Saavedra, R., Early, P. & Van Dyne, L. (1993). Complex Interdependence in Task-Performing Groups. *Journal of Applied Psychology, 78(1),* 61-72.

Part 2. Leading and Managing Science Teams in RCR
Some Issues for Science Team Leadership

Critical Issue 3. *Need to understand how to deal with science team conflict and trust*

Managing Conflict in Science Teams

- **Leaders support task conflict**
  - Promote usage of knowledge diversity
  - Encourage discussion of evidence
- **Leaders influence team conflict**
  - Create sense of psychological safety
  - Manage emotional issues

Managing Trust in Science Teams

- **Leaders support task trust**
  - Encourage reliance on each other's work related judgments
  - Depend on each other's task-related competencies
- **Leaders influence team trust**
  - Depend on each other for back up in difficult situations
  - Encourage confiding in each other about issues affecting work

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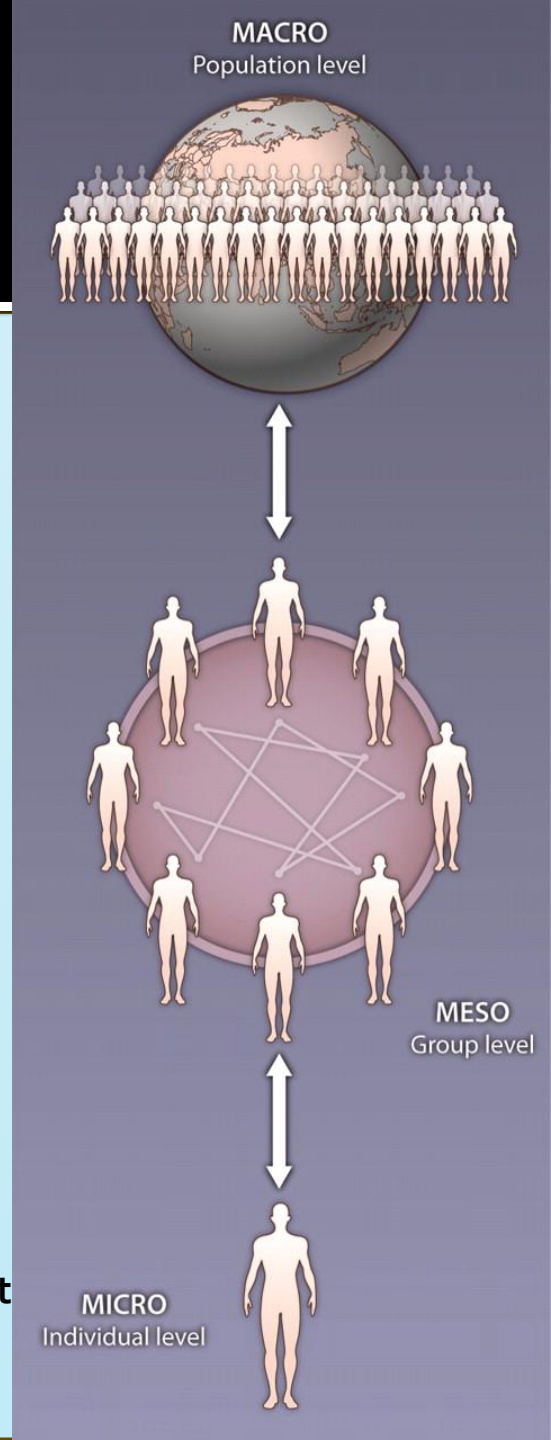
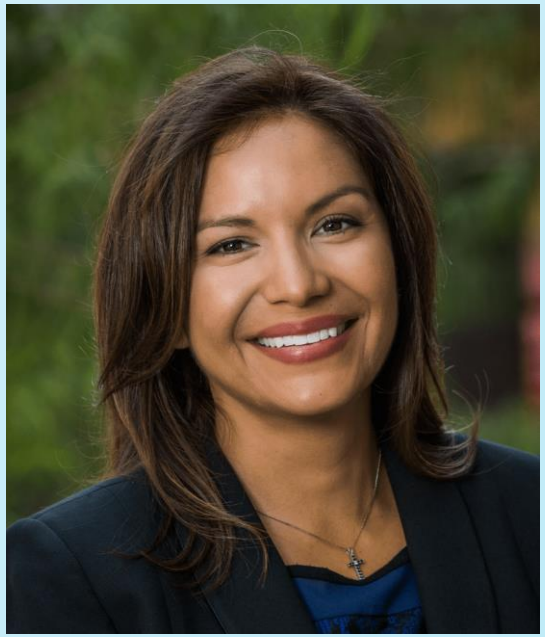


Dr. Maritza Salazar Campo



Background

- Faculty with the Paul Merage School of Business, University of California, Irvine
- Numerous teaching, mentorship, and civic awards
- Named by California's Orange County Business Journal as OC 50 Shaping Future of Healthcare

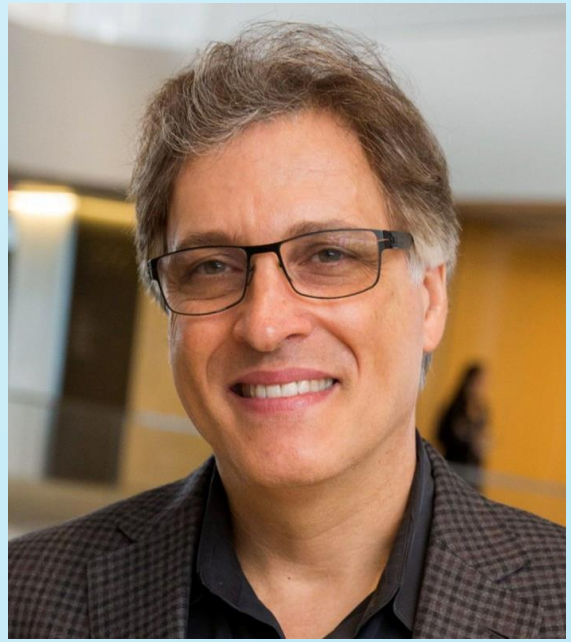
Research Areas

- Factors that drive the effectiveness of high-performance teams
  - Varied levels - team and organizations
  - Across domains - industries ranging from professional services to healthcare.
- Enhance ability of leaders and teams to work together under challenging circumstances
  - job strain, task complexity, and cultural distance.
- Supported by the National Institute of Health and the National Science Foundation,
- Faculty lead of the Latinx Initiative to support the academic and professional advancement of Latinos in for-profit and non-profit organizations

Dr. Brian Uzzi

Background

- Faculty with the Kellogg School of Management, Northwestern University
- Co-Director of Institute on Complex Systems and Data Science (NICO)
- Professorship in Sociology and McCormick School of Engineering
- Numerous teaching and research prizes worldwide



Research Areas

- Studies link between social networks and human achievement
- Examines role of AI in complex human decision making.
- Writes a column on AI and business for Forbes
- Funded by DARPA, NSF, and private foundations
- Before entering science, Brian was a carpenter and a musician

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