PROMOTING INTERDISCIPLINARY COLLABORATION:

Tools for Developing Diverse Research Teams

Barbara L. E. Walker, Ph.D.
Director, Research Development, Social Sciences, Office of Research, UC Santa Barbara

Amanda Quintero, Ph.D.
Executive Director of Student Academic Success and Equity Initiatives, Cal State University Channel Islands

John Crockett, Ph.D.
Senior Director, Research Advancement Division of Graduate and Research Affairs San Diego State University

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- CREDITS: https://oru.research.ucsb.edu/teamscience/about/
  - Co-Investigator Team
    - UC Santa Barbara: Barbara Endemaño Walker, Ph.D.
    - Cal State Channel Islands: Amanda Quintero, Ph.D.
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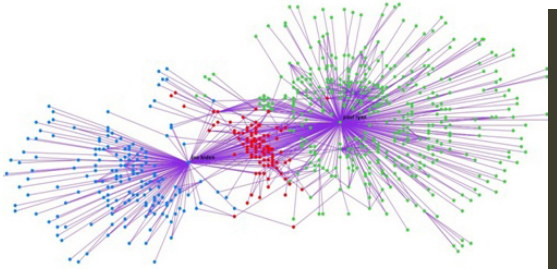
OVERVIEW

- Team Science and Diversity
- What make some teams great!
- Starting Collaborations
- Action

WHY DO YOU WANT TO DEVELOP INTERDISCPLINARY COLLABORATIONS?

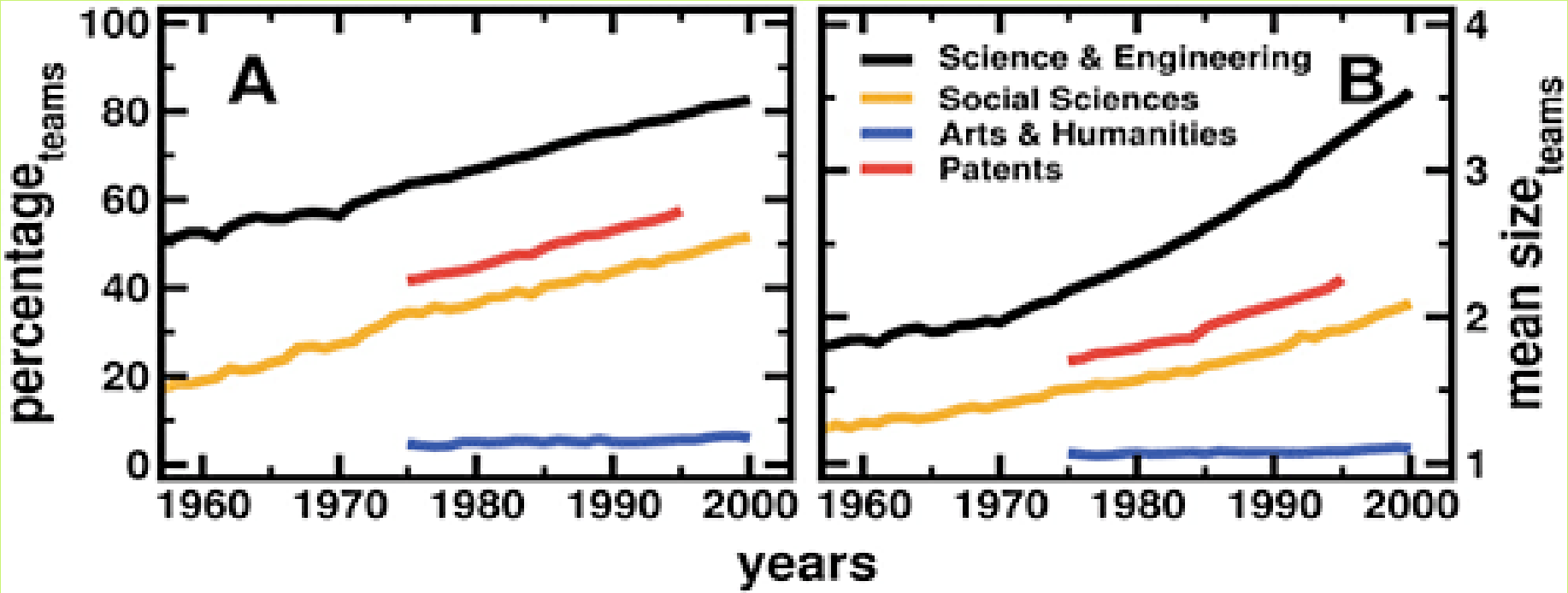
TEAM SCIENCE & DIVERSITY



TEAM SCIENCE

- **Definition: interdisciplinary, collaborative research among two or more researchers in which team members integrate their perspectives and methods in a single research endeavor.**
- Increasingly the **norm** with exception of arts and humanities
  - (Wuchty et al. 2007; Englander 2014)
- Solve most **complex and intractable** scientific and social problems
- Accelerate scientific and technological **innovation**, and provide a mechanism for **translating** scientific research into practices and policy
  - (Uzzi et al. 2013).

WUCHTY S, JONES BF, UZZI B. (2007). THE INCREASING DOMINANCE OF TEAMS IN PRODUCTION OF KNOWLEDGE. *SCIENCE.*



TEAMS SCIENCE IMPACTS ON CAREER AND INSTITUTION

- TS projects garner more funding
- TS projects yield greater publication productivity
- TS projects yield higher impact publications
- Strong network of collaborators and co-authors is critical to a more productive and successful academic career
  - (Hitchcock et al.1995; Bozeman & Corley 2004; Bland et al. 2005; Haslam & Laham 2009; Haller & Welch 2013; Seibert et al. 2014).

(Uzzi et al. 2013 , Stokols et al. 2008; Falk-Krzesinski et al. 2011; Elfner et al. 2011; Hall et al. 2012; Salazar et al. 2012).

COLLECTIVE INTELLIGENCE …

THE VALUE OF COLLECTIVE (TEAM) INTELLIGENCE

Experience and practice with members, technologies, tools, creates knowledge embedded in a team's **structure and routines**

Research shows that team knowledge has distinct value

WHAT PREDICTS COLLECTIVE INTELLIGENCE IN TEAMS?

- *Not* members' intelligence
- *Not* group satisfaction, cohesion, or motivation
- *Not* personality traits of individuals

Proportion of females in group

Woolley, A. W., Chabris, C. F., Pentland, A., Hashmi, N., & Malone, T. W. (2010). Evidence for a collective intelligence factor in the performance of human groups. *science*, *330*(6004), 686-688.

Campbell, L. G., Mehtani, S., Dozier, M. E., & Rinehart, J. (2013). Gender-heterogeneous working groups produce higher quality science. *PloS one*, *8*(10), e79147.

- Among ecology and environmental scientists, **authorship teams with at least one woman received 34% more citations** than publications produced by homogeneous teams, and that peers perceive the publications produced by gender-diverse groups to be of higher quality.

Freeman, R. B., & Huang, W. (2014). *Collaborating with people like me: Ethnic co-authorship within the US* (No. w19905). National Bureau of Economic Research.

- By examining the ethnic identity of authors in over 2.5 million scientific papers written by US-based authors from 1985 to 2008, we find that persons of similar ethnicity coauthor together more frequently than predicted by their proportion among authors. The **greater homophily is associated with publication in lower-impact journals and with fewer citations**. Meanwhile, papers with authors in more locations and with longer reference lists get published in higher-impact journals and receive more citations.

"FEMALE FACTOR" EXPLAINED BY SOCIAL INTELLIGENCE

Playful Comforting Irritated Bored

Source: Simon-Baron Cohen

"FEMALE FACTOR" EXPLAINED BY COMMUNICATION PATTERNS

- Uneven distribution in speaking turns negatively predicts team productivity
- Higher proportion of females leads to more even distribution of speaking

Sociometric Badge

DIVERSITY CAN AMPLIFY BENEFICIAL EFFECTS OF TEAMS

- Diversity on teams has positive effects on creativity, innovation, and productivity.
  - Hong & Page 2004; Woolley et al. 2010; Bear & Woolley 2011.
- Scientific research enhanced when informed by diverse (and thus often broader) viewpoints and research questions.
  - Margolis & Fisher 2003
- Women and URM scientists have made scientific discoveries because of their particular gendered and racialized perspectives experiences.
  - Melo-Martín & Intemann 2010

THREE INTERRELATED CHALLENGES:

1. Women and URM scientists are **less likely** to participate in collaborations, and these networks **develops later** in their careers.
   - (Kyvik & Teigen 1996; Fox & Mohapatra 2007; Misra et al. 2012; Kegen 2013)

2. Diversity can hinder team cohesion and individual performance
   a) Low psychological safety and trust
   b) Implicit bias
   c) Stereotype threat

   Can reduce communication, help- and feedback-seeking, boundary-spanning, new ideas, innovation

3. Universities reward single author, last author, and first author

CREDITS: Center for Research, Diversity, and Excellence in Team Science

- Research on effects of diversity and collaboration in UC and CSU systems
- Annual Team Science Retreats to build team science capacity in CA
- https://oru.research.ucsb.edu/teamscience/about/

WHAT MAKES SOME TEAMS GREAT

RESEARCH: WHAT MAKES (SOME) TEAMS GREAT?

Identity

It's the **MEMBERS!**

Attitudes

Intelligence

Communication

Cohesiveness

Trust

It's what members **DO!**

Structure

Knowledge Flow

Shared Understanding

It's the **CONTEXT!**

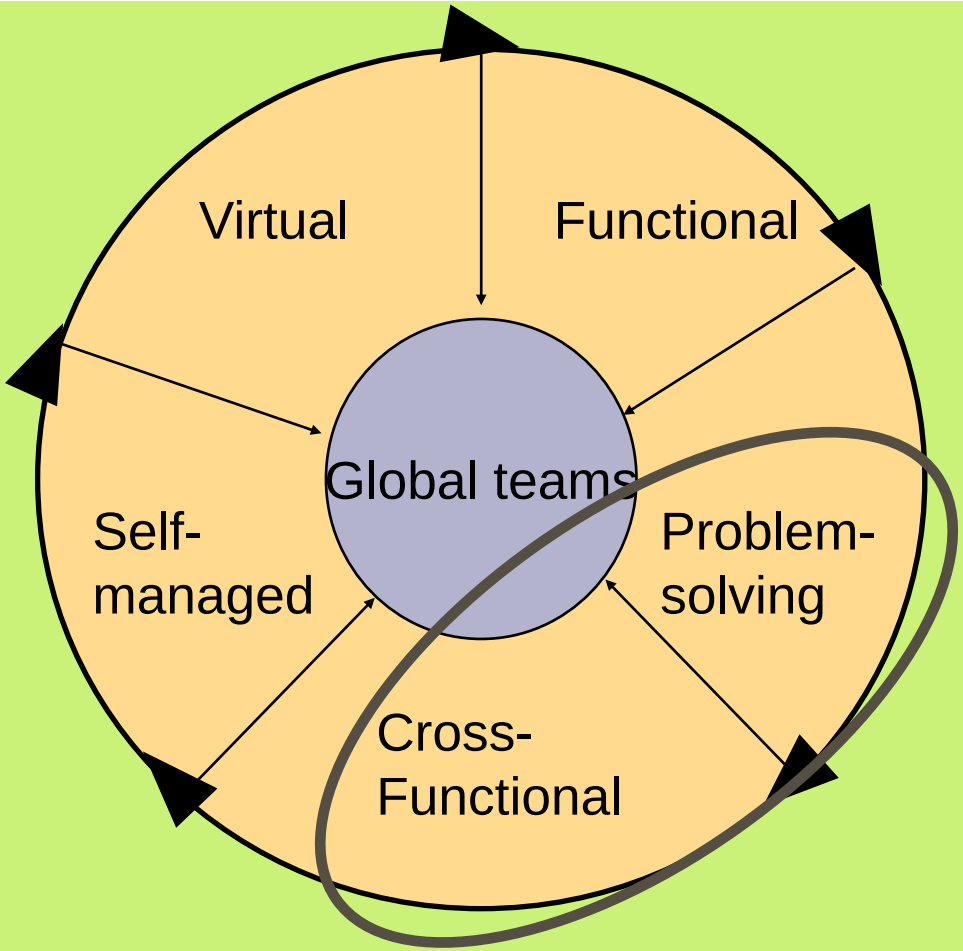
Motivations

Leadership

Task

Personalities

TYPES OF TEAMS



Brought together to tackle a specific issue or problem

Typically short to medium term, with ending point

Example: Project Research Team

COMPOSING A TEAM … CONSIDER

Expertise

Choose people with knowledge, skills, needed

Research: Diverse expertise can increase performance and innovation

Personality

Choose a variety of personalities

Research: Both introverts and extroverts; “big picture” and “detail-oriented”; worriers and non-worriers

Demography

Choose demographic mix to bring in new perspectives

Research: Women and underrepresented minorities can be disadvantaged if they are “solos”

MAKING TEAMS WORK … EXERCISE!

- Assemble in teams of 5-6 people
- Each person will be given a card to study (2 minutes)
- In your team, come up with a solution to the problem!
- **RULES:**
  - **25 minutes**
  - **Do not pass around your card to others in your team**

CORRECT SOLUTION

Room	Period 1	2	3	4
700	Jones	Lee	Martin	Jacobs
701	Jacobs	Martin	Lee	Jones
702	Martin	Jones	Jacobs	Lee
703	Lee	Jacobs	Jones	Martin

LET'S DISCUSS!

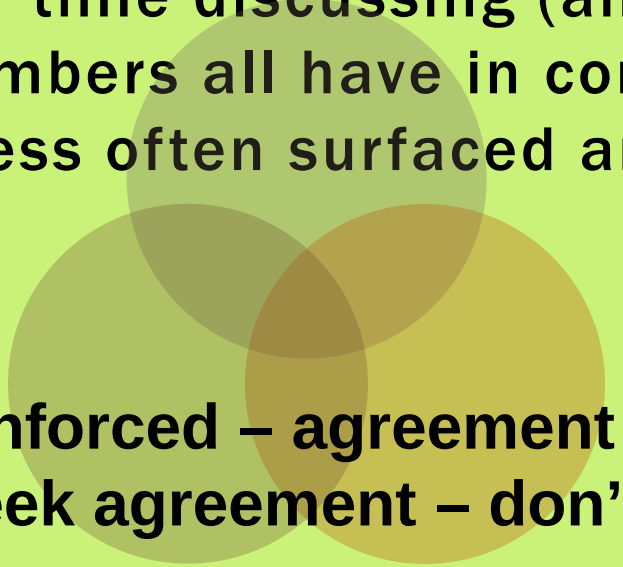
- Did your team arrive at the "correct" solution?
- How many people spoke / provided input?
- If not all members contributed, why not?
- Was all of the information used to develop a solution?

Contributions tend to be uneven:

- In a 4-person group, 2 people do over 70% of talking
- In a 6-person group, 3 people do over 86% of talking
- In an 8-person group, 3 people do 77% of talking

DISCUSSION BIAS

Contrary to our expectations, groups spend the vast majority of their time discussing (and repeating) information members all have in common; *unique information* is less often surfaced and discussed



Why?

- **Socially reinforced – agreement feels good**
- **Assume, seek agreement – don't examine alternatives**
- **Dysfunctional processes or outcomes – what happens if I speak up? Are goals congruent?**
- **Blurry role-expertise linkages – doubt about credibility**

FACTORS THAT MAKE MANAGING TEAMS HARD

Status Differences	Impoverished knowledge exchange Curtailed discussion
Goal Differences	Members working at cross purposes Lack of cooperation
Conflict	Reduces “psychological safety” Can escalate if low trust
Knowledge utilization	Important (and uniquely-held) knowledge not considered

TACKLING STATUS DIFFERENCES

Reduce status differences

- Each member has important (and perhaps unique) input
- Eye contact – gaze at all (not just high status) members
- *Amplification* of members' comments

- Where do status differences come from?
  - Formal hierarchy / title
  - Experience / tenure / age
  - Discipline
  - Demography

TACKLING GOAL DIFFERENCES

Create Team Goals

- Create team goal and values
- Choose learning goals, not only performance goals
- Get buy-in from members
- Remind, remind, remind

- Differences are not often articulated
- Superordinate goal can become the team "glue"
- Learning goals promote collective intelligence
  - AND team performance
  - AND individual performance

TACKLING CONFLICT

Manage Conflict

- Identify "type" of conflict
- Frame decisions as collaborations towards best possible solutions
- Create norms for “safe” speaking up

Foster trust with team identification

- Team "artifacts"
- Team meetings AND social events
- Emphasize collective, not individual

- Conflict can take two forms:
  - Disagreements about the TASK
  - Personal relationship conflicts
- Task conflicts CAN escalate to relationship conflicts
- Need to build TRUST to manage conflict effectively

TACKLING KNOWLEDGE UTILIZATION

Leverage Team Knowledge

- Train and practice as a team
- Assign roles based on actual expertise … and make sure members know
- Encourage face-to-face interactions
- Maintain stable membership

- Members' knowledge is not always applied!
- Discussion tends to favor "shared" versus "uniquely-held" knowledge
- Turnover can exacerbate knowledge utilization

SUMMARY

- Teams are powerful engines for innovation and performance
- Diverse teams are <u>more</u> innovative
- BUT, teaming is hard …
- Leaders can strongly affect team processes

The big win: Team is greater than the sum of its parts

STARTING COLLABORATIONS

TEAM "CHECKLIST" – USE TEAMS WHEN:

- ✔ The task is <u>knowledge intensive</u>
- ✔ Task activities are <u>interdependent</u>
- ✔ <u>Different expertise / perspectives</u> are needed

PRE-NUPTIAL AGREEMENT

- https://ccrod.cancer.gov/confluence/display/NIHOMBUD/Collaborative+Agreement+Template
- **Overall Goals**
- **Who Will Do What?**
- **Authorship, Credit**
- **Communicating & Contingencies**
- **Conflict of Interest**

DOUBLE THE TIMELINE

- Collaboration takes time – start early
- Pre-Nuptial Agreement
- Common language – translation
- Divide and conquer – more rounds of writing and review
- File sharing
- More campuses – more administrators – more signatures!

LEARNING AND/OR EXECUTION

LEARNING TEAM	• Egalitarian • Information Sharing • Psychological Safety	Innovation and Creativity HIGH	Forming Storming
EXECUTION TEAM	• Hierarchy • Roles • Coordination	Innovation and Creativity LOW	Norming Performing

BALANCING CREATIVITY & HIERARCHY

- Egalitarianism in developing ideas (learning team)
- Strong leadership and hierarchy in the writing itself (execution team)
- At some point, consensus ends and lead PI-writer makes decisions
- STRONG LEADERSHIP MATTERS

RECOGNIZING AND REWARDING COLLABORATION

TRADITIONAL RECOGNITION AND REWARDS

- Emphasis on Individual
  - Author position – first and last
  - PI status
  - H-index
  - Election to prizes and academies, etc.
- Collaboration contribution less recognized
  - Being part of a team, although not the team leader
  - One of many authors

Klein, Julie Thompson & Falk-Krzesinski, Holly. (2017). Interdisciplinary and collaborative work: Framing promotion and tenure practices and policies. Research Policy. . 10.1016/j.respol.2017.03.001.

Petersen, A.M., Riccaboni, *M., Stanley, H.E., and Pammolli, F. (2011). Persistence and Uncertainty in the Academic Career.*

ACTION PLANNING

WHAT CAN I DO?

- Diverse teams are high performers (and are more creative) when:
  - Information diversity is leveraged
  - Diversity in preferences, values, beliefs is minimized … emphasize superordinate values and goals
  - Team trust is high (so that task disagreements are welcome)

WHAT CAN I DO?

- Don’t become – or don’t invite – the “token” team member.
  - Engineering and arts
  - Society and STEM
  - Digital humanities

- All members and approaches should be thoroughly integrated into the project, and not just an after-thought or appendage to get the larger project funded.

WHAT CAN I DO?

- Publication goals and assignments discussed up front as part of the proposal development process.
- Each members should accomplish what they need from the collaboration.
- Each team member should have
  - lead or last-author role in a journal/book that will benefit their next promotion case.
  - Evidence of their contribution to the collaboration and other publications.
  - Share of funding and other resources that enables productivity by all members

WHAT CAN I DO?

- Establish norms or rules for even distribution of speaking turns
  - Limit air time hogs
  - Reduce the amount of interruptions … appoint an 'interrupter cop'
  - Sit "boy – girl – boy – girl"
  - Eye contact … gaze at *all* members

WHAT CAN I DO?

- Reduce status differences
  - Convey that everyone has important (and *unique*) input
  - Use group techniques for decision-making (consensus, deliberation, if a sensitive or controversial topic – electronic voting)

WHAT CAN I DO?

- Build and maintain team trust
  - Encourage “safe” scholarly debate and exchange as part of the team identity and everyday process.
  - Find opportunities for your team to interact outside of the work environment.
  - Identify and emphasize team values and goals.
  - Create a “superordinate identifier” (coffee mug or a poster).

50 WAYS TO LEAVE YOUR COLLABORATOR

(can you just slip out the back, Jack?)

- When teams fall apart:
  - Confronting team member – resolving problems
  - Withdrawing from the team
  - Soldier on in bad relationship

- Carefully consider
  - The commitments you made in terms of expertise, data, field sites, or samples.
  - Losing access to jointly-collected data and/or co-authorship on publications and other products.
  - Your reputation.

50 WAYS TO LEAVE YOUR COLLABORATOR

(can you make a new plan, Stan?)

- Resolve Conflict:
  - Campus or agency ombudsperson
  - Resources for resolving conflicts on academic teams (Bennett, Gadlin & Levine-Finley 2010).
    - Relationship
    - Process
    - Task

Bennett, L. M., Gadlin, H., & Levine-Finley, S. (2010). *Collaboration & team science: a field guide*. NIH Office of the Ombudsman, Center for Cooperative Resolution.

- Side-Step Conflict:
  - Divide the work and funding
  - Reconfigure the project
  - Satisfy mutual needs

- Recognize interrelated power structures that may prevent you from adequately solving conflicts.

Cloke, K., & Goldsmith, J. (2011). *Resolving conflicts at work: eight strategies for everyone on the job*. John Wiley & Sons.

Topic Area	Goal	Audience? • Faculty (Junior or Senior) • Leadership	Division or Department?	Best way to Present Resources? • Presentation/ Workshop • Learning Community • Provide reading materials • Other	Who can present or facilitate the presentation of this material? • Internal presenter? • Invited presenter? • Other?
1. Team Science - Beyond Disciplinarity					
2. Finding Funding for Multi-National Research					
3. Starting Collaborations					
4. Collaborative Proposal Writing					
5. Assessing Yourself and Team Members					
6. Best Practices for Productive Teams					
7. Recognizing and Rewarding Collaborations					
Other?					