Perspectives on Convergence and Team Science

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September 14, 2018

A continuum of disciplinary integration

Multidisciplinary

Researchers from different disciplines work sequentially, each from their own discipline-specific perspective, with a goal of eventually combining results to address a common problem

Transdisciplinary

Researchers from different disciplines work jointly to develop and use a shared conceptual framework that synthesizes and extends discipline-specific theories, concepts, and methods, to create new approaches to address a common problem

Unidisciplinary

Researchers from a single discipline work together to address a common problem

Interdisciplinary

Researchers from different disciplines work jointly to address a common problem. Some integration of perspectives occurs, but contributions remain anchored in their own disciplines.

Adapted from Rosenfield, 1992

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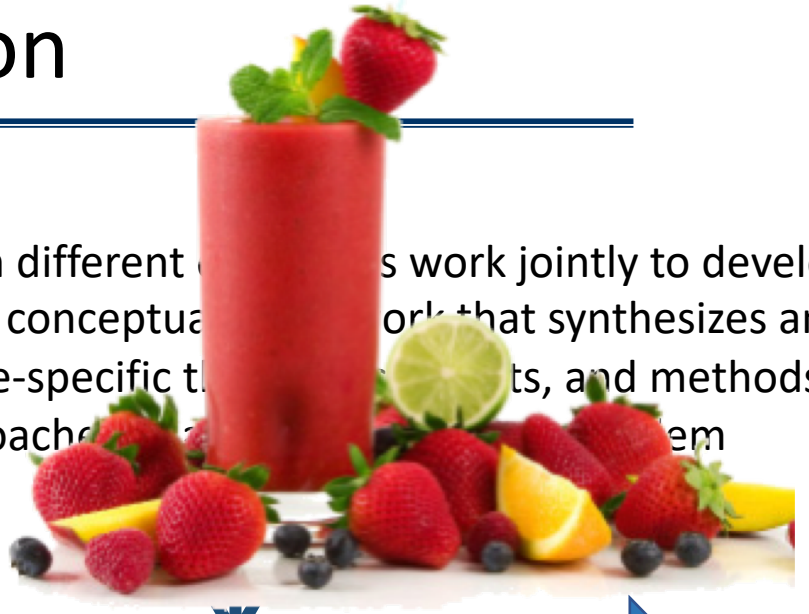

(within) Disciplines (across)

Unidis

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Adapted from Rosenfield, 1992

Interdisciplin

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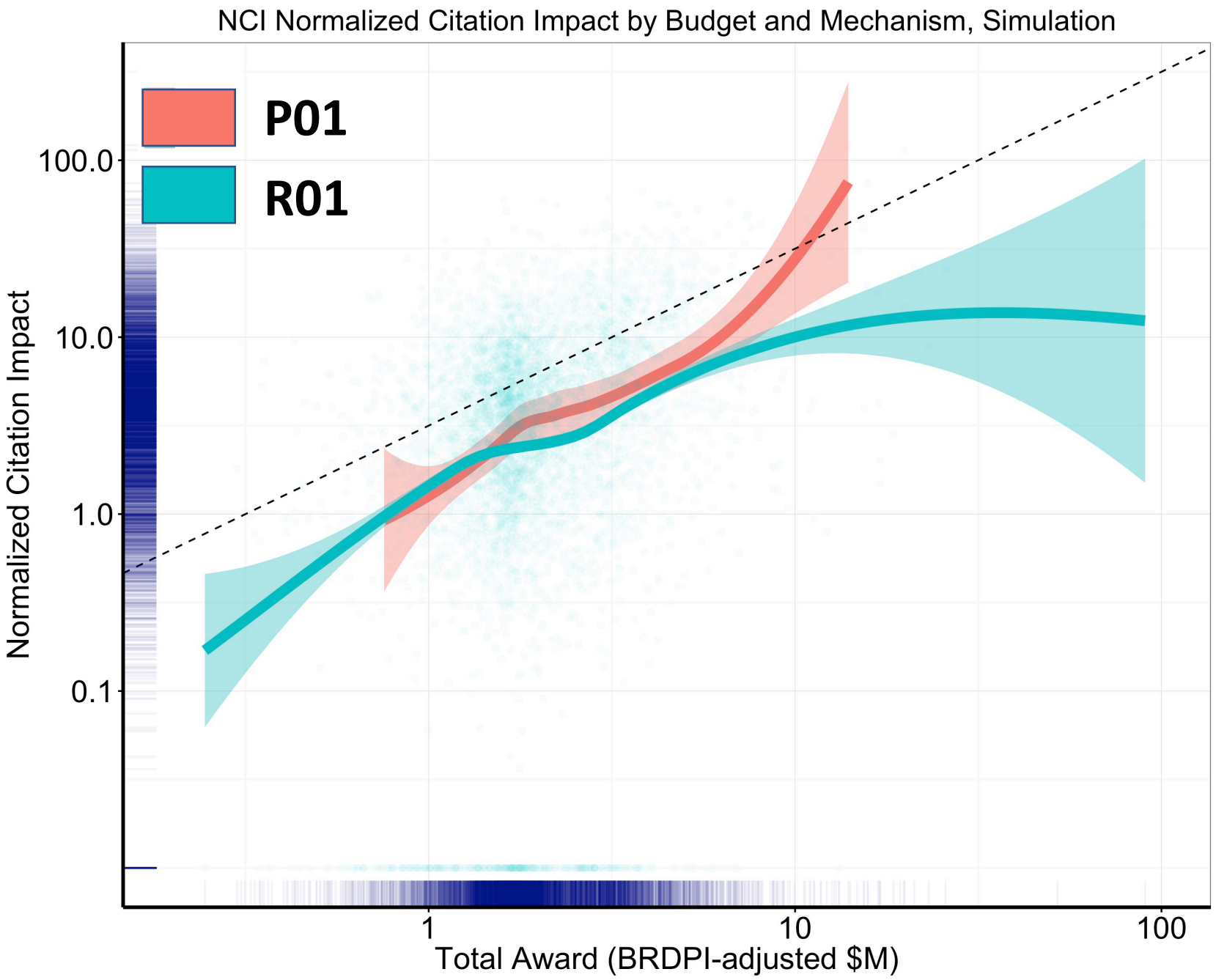
Examples of NIH Funding Opportunities

- Research Specialist Award: Lab or Core (R50: PAR-16-025, PAR-18-342)
- Genomic Innovator Award (R35: RFA-HG-18-006)
  - highly innovative, creative investigators, early career, ***team-science efforts***
- Collaborative Program Grant for Multidisciplinary Teams (RM1: PAR-17-340)
  - Required integrated research and management/leadership plan
- Clinical and Translational Science Awards (CTSA) Program (U54: PAR-15-304)
  - Requires team science and training in collaboration/team science
- Program Project Applications (P01: NCI PAR-18-290; Other ICs too)
  - Several coordinated/integrated sub-projects (approx 4) and cores under one umbrella
- Generally: P01, MPI R01, U54, P20/50, P30

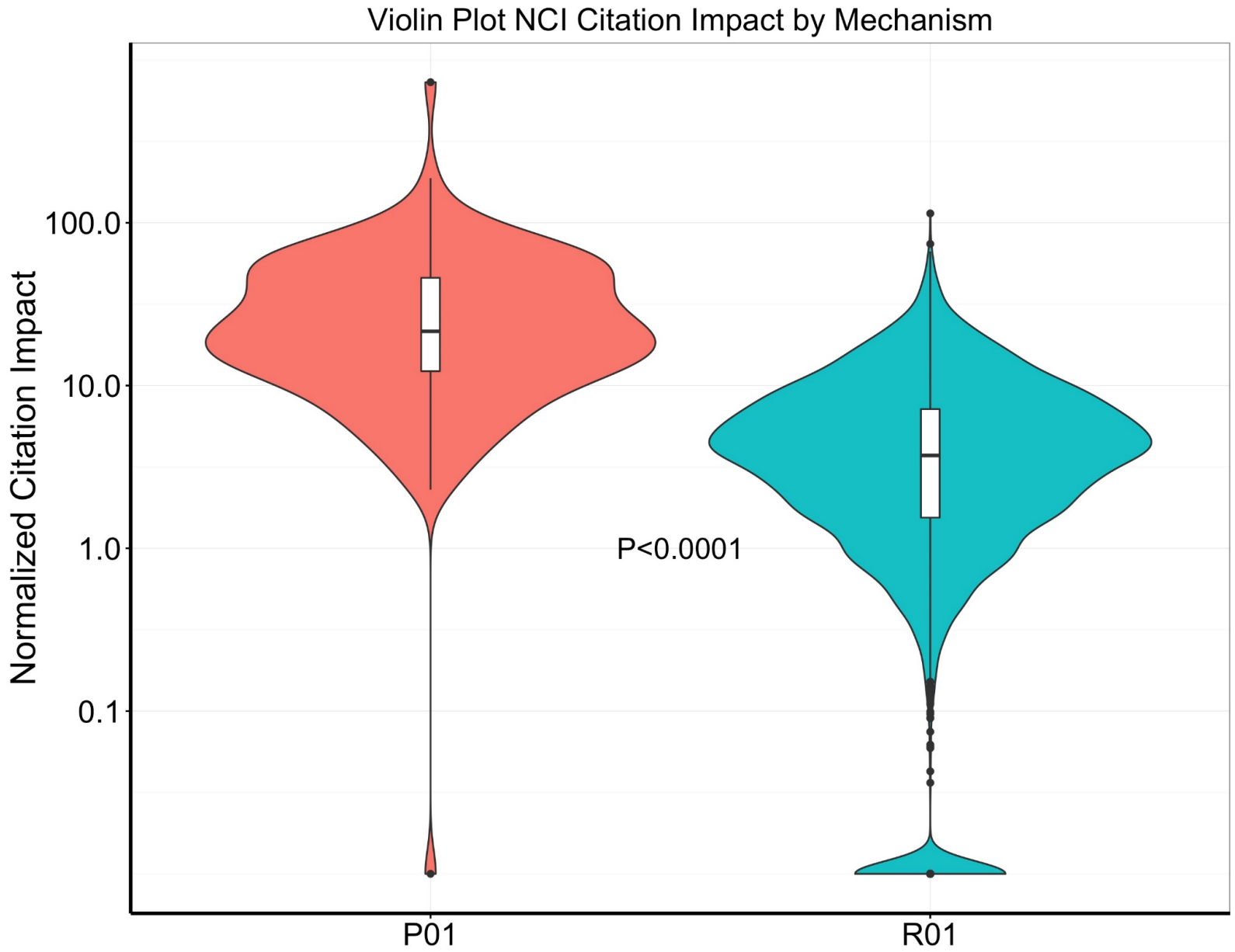
Quantifying the Impact of Collaborative Approaches



NCI P01 funding may have higher citation impact than R01 funding

- **Citation impact increases for higher levels of P01 funding**

Mike Lauer, OER

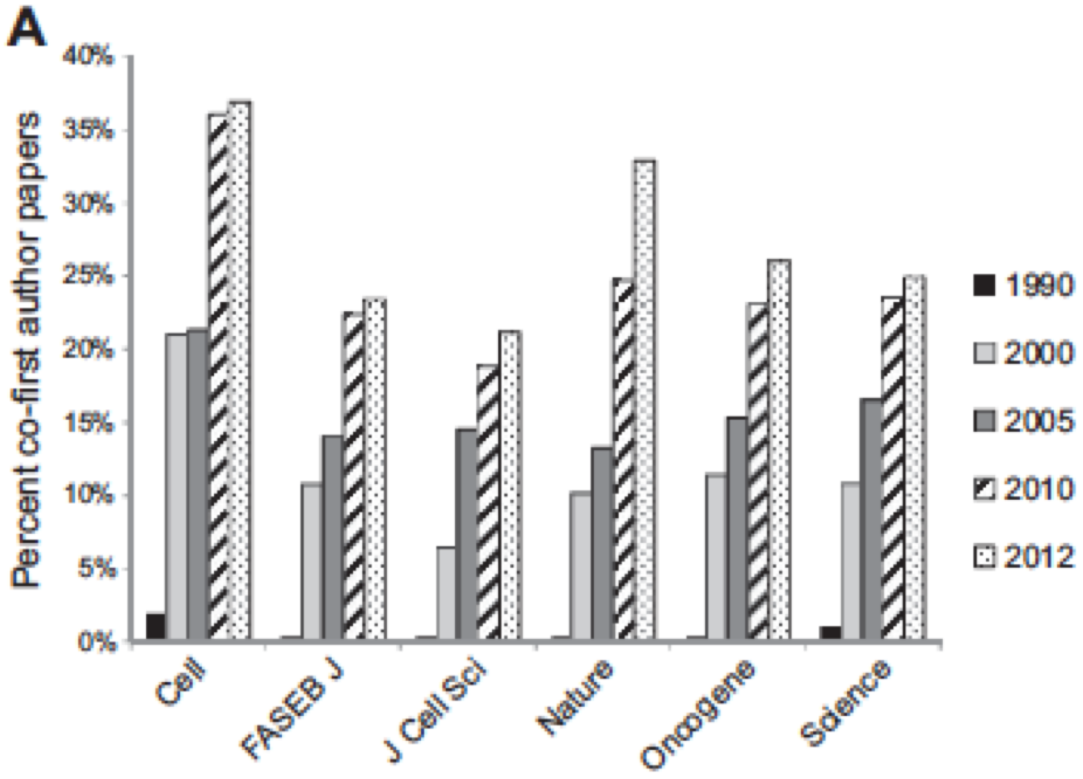


Violin plot of the citation impact per grant
(all papers citing a grant for each mechanism)

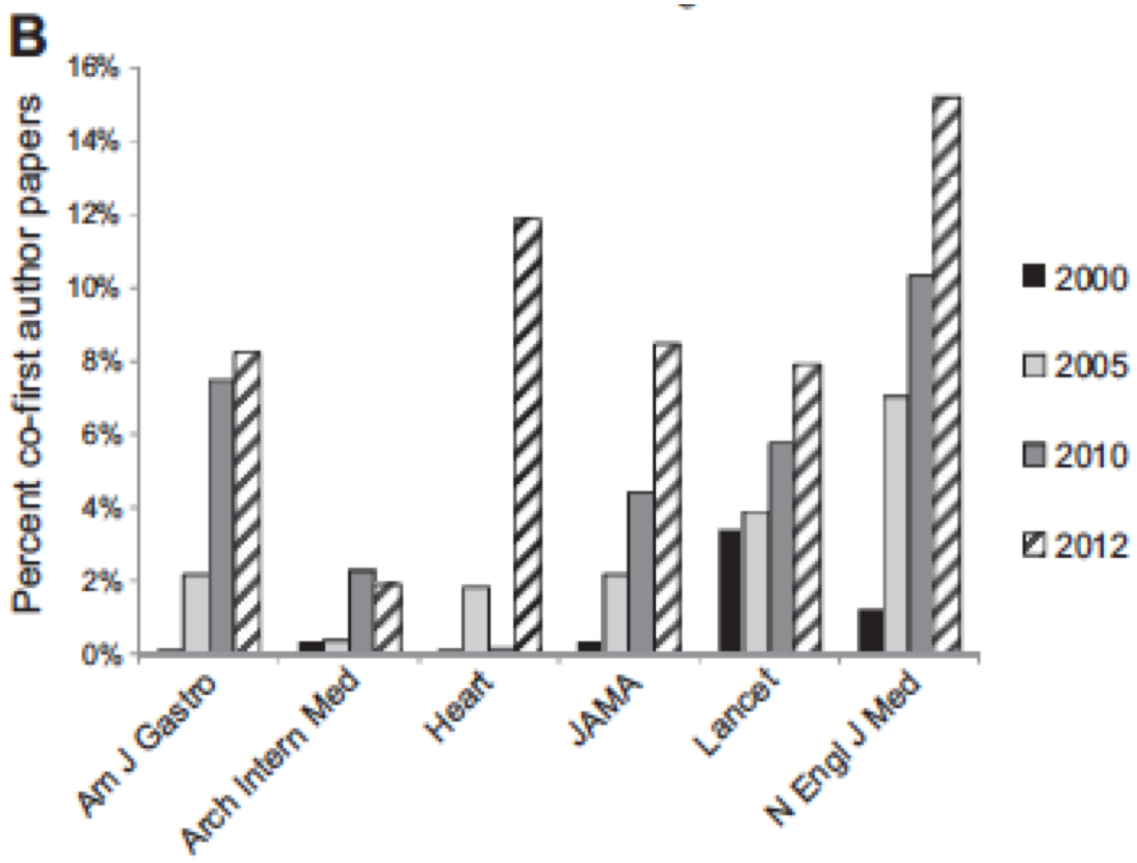
- Mike Lauer, OER, NIH

Trends of co-first author manuscripts

Biomedical Journals



Clinical Journals



Conte et al. *FASEB J.* 2013

“Last year, this journal received an unusual request: could three authors have it indicated in a footnote that they were joint second authors on a paper? We refused…”

- Nature Editorial, Jan 2 2013

LETTER

doi:10.1038/nature12439

De novo mutations in epileptic encephalopathies

Epi4K Consortium* & Epilepsy Phenome/Genome Project*

- Published online 11 August 2013

Convergence Research

- Characteristics include:
  - Focus on a compelling and complex grand challenge
  - Integration across multiple and diverse disciplines
  - A degree of (initial) incommensurability is a plus
  - Benefit from fostering and building off of diversity: disciplinary, geographic, life experience, career level, intellectual or other perspectives, demographics, etc.
  - Reflexivity about differences – in formulating research questions, approaches, a shared language and conceptions of the research problem, etc.
  - Open to new frameworks, paradigms, or disciplines that may emerge from such convergent approaches
  - Proposals address how the team/project is going to push thinking on what convergence is, how to engage with it, processes, etc.”

Adapted from Linda Vigdor

Scientific Review Panel: *Team Science Expert*

- Identifying Team members
- Building, forming, and sustaining the team
- Effectively leading a team
- Interdisciplinary/Transdisciplinary/Convergent Research
- Engaging the community
- Communicating (logistics, scientific, process, etc.._
- Managing the Team

Research Proposal Requirements…

- Acknowledgement of the complex nature of the scientific challenge
  - Intro, background, research plan, etc…
- Providing information that enables the reviewers to understand:
  - the work that has gone into forming the team
  - how the team will work together
  - the advantage the various perspectives will bring
  - how will the team communicate (internally? with external partners/stakeholders?)
  - how disagreements will be resolved successfully
  - how information, reagents, data will shared/managed within and beyond the group
  - the philosophy for training and mentoring in an era of team science

Note: together this information could establish a collaboration plan

Scientific Review: Team Science Expert

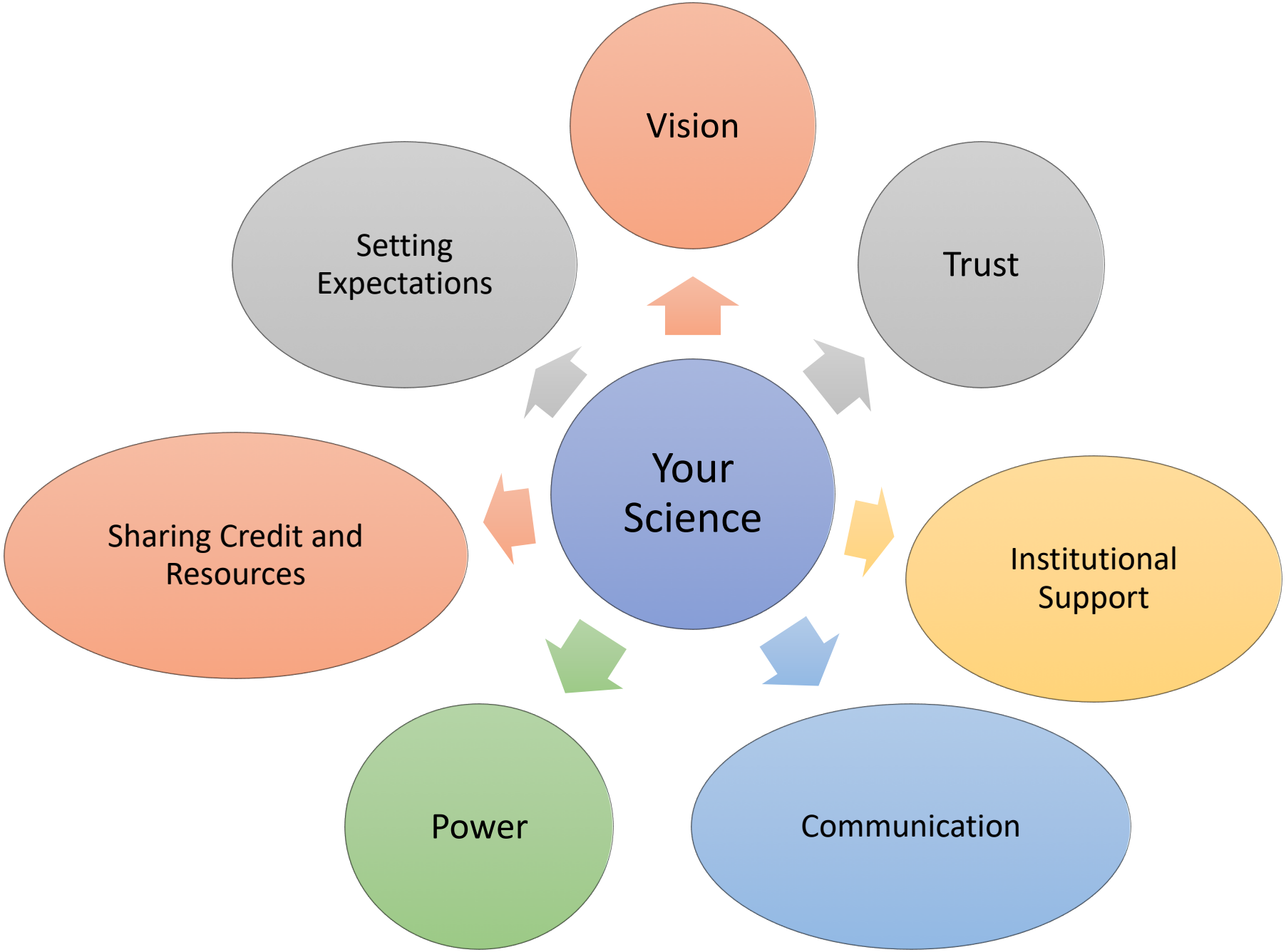
- Team member identification
  - Scientific background/expertise
  - Interests/motivations/”fit”
- Team building and management
  - Establishing Trust
  - Setting Expectations
  - Team development
- Effective leadership
  - Shared Vision
  - Research Plan
  - Collaboration Plan
- Interdisciplinary/Transdisciplinary /Convergent
  - Disciplinary backgrounds relevant to complexity of the problem
- Engagement of community
  - Authentic?
- Communication skills
  - Internal/external
  - Managing conflict and promoting disagreement

Team Formation: Descriptions in Grant Proposal

a) Once I am funded, I will form the team. I will be the leader. I will outline the goals and objectives, and will give the team explicit directions in order to successfully achieve the goals and objectives of this project.

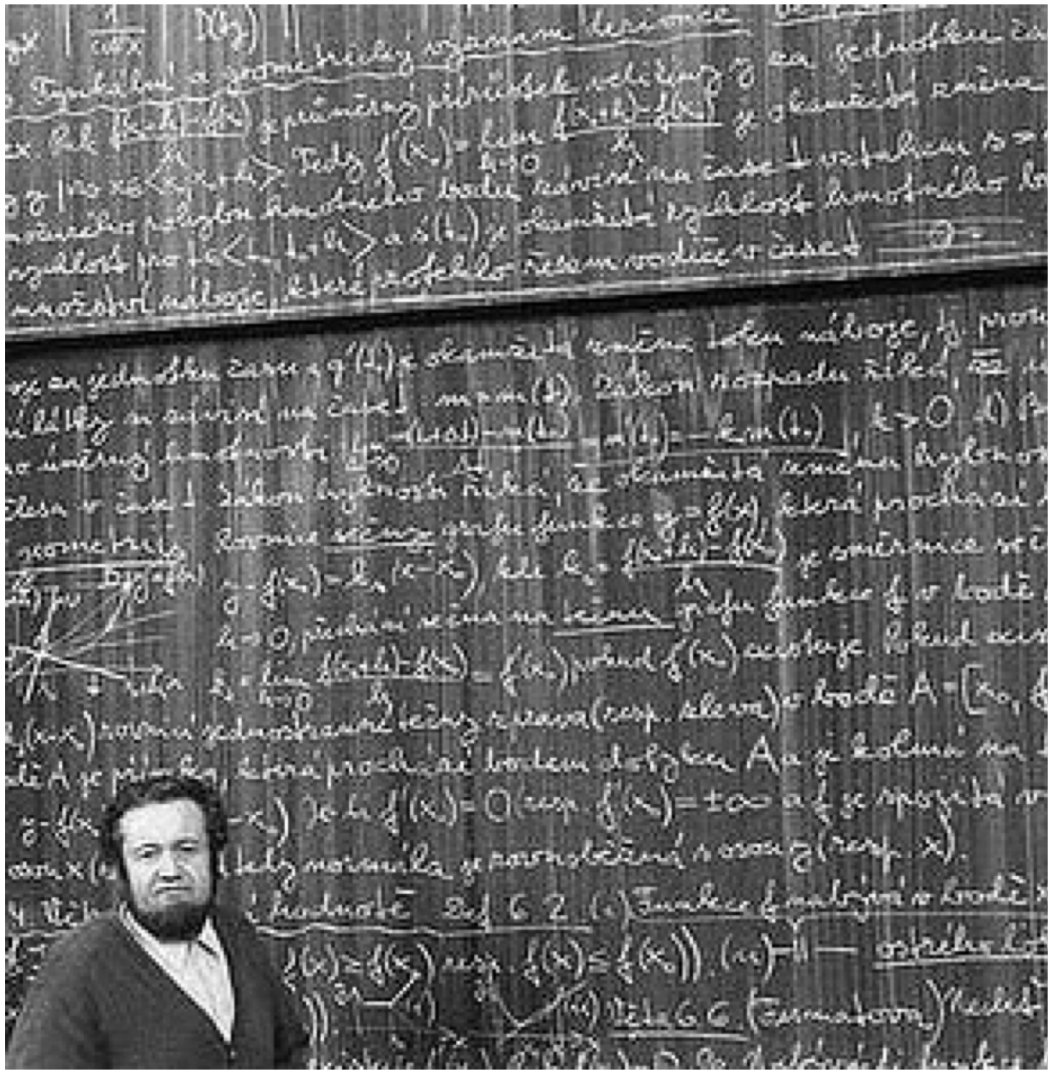
b) The team is well established. We have been working together for years and are very comfortable together.

c) I have reached beyond my comfort zone and identified individuals who are also interested in this complex problem. They represent a variety of disciplines ranging from close to the science, to expertise in the technological methods, to community level responsibilities.


Vision
Setting Expectations
Trust
Your Science
Sharing Credit and Resources
Institutional Support
Power
Communication

Effective Leadership: There is No Formula

- Self-awareness
- Awareness about that around you
- Shared responsibility for success
- Accountability for issues and problems
- Mentoring others
- Managing up and across
- Creating a safe environment
- Difficult conversations
- Speaking up, challenging ideas
- Giving your best everyday
- Serving as a role model



“The most productive, innovative teams were led by people who were both task- and relationship-oriented. What’s more, these leaders changed their style during the project.”

Gratton and Erickson, HBR, November 2007
https://hbr.org/2007/11/eight-ways-to-build-collaborative-teams

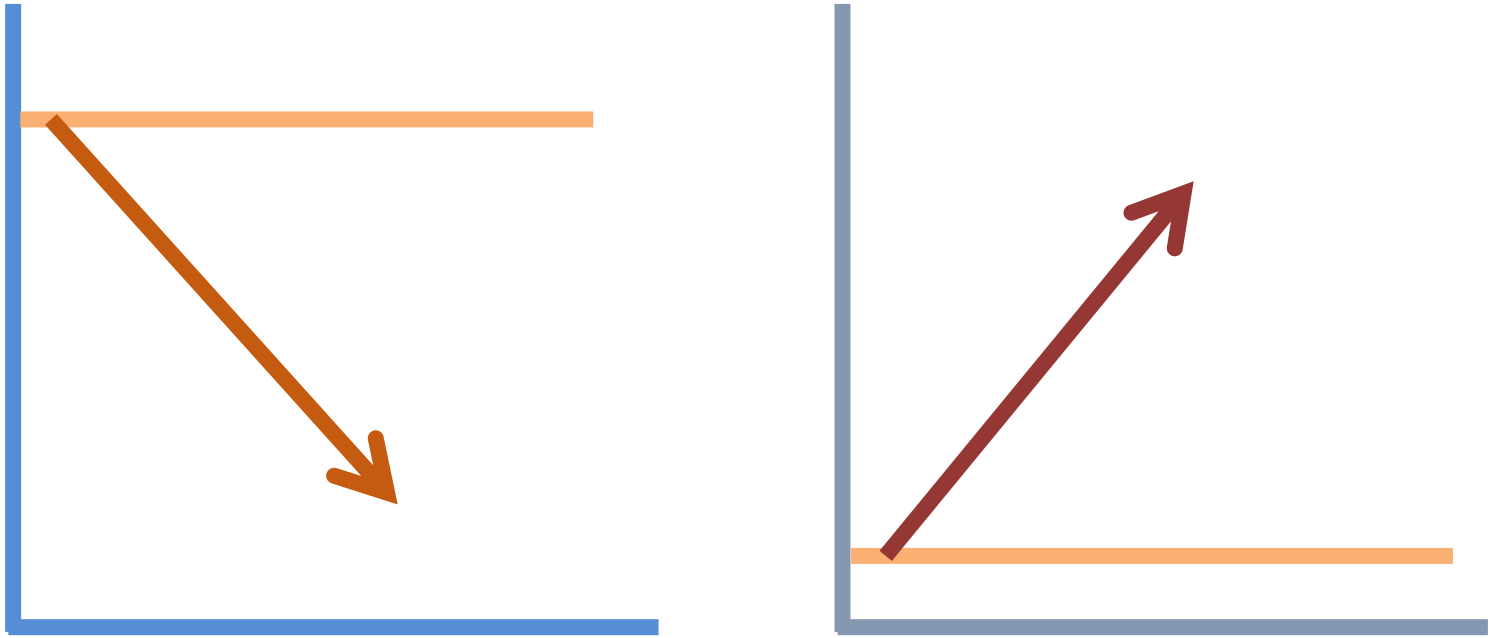
Shared Vision/Goal

- Is a key to successful leadership
- Sets the course for the team members to travel
- Improves group effectiveness
- Should be revisited regularly with the team –
  - Are we on track?
  - What has changed?

O'Connell et al. Group and Organization Management 36: 102 (2011)

Trust

Trust



Types of Trust

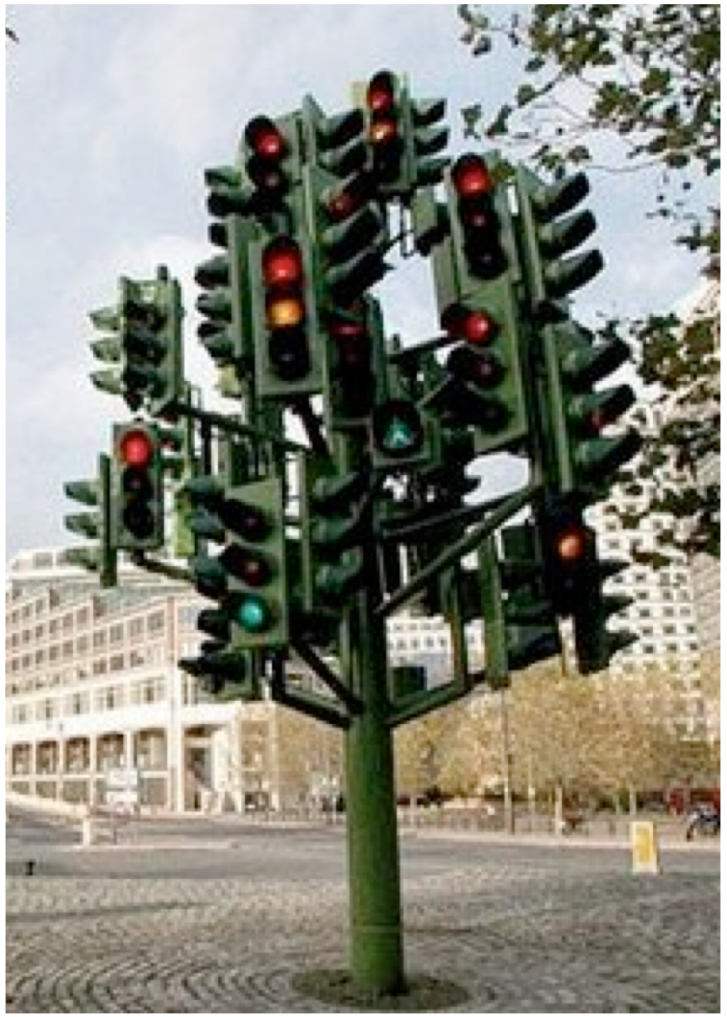
- *Calculus based trust* – built on calculations of the relative rewards for trusting or losses for not trusting
- *Competence based trust* – built on the confidence in people's skills and abilities, allowing them to make decisions and train others
- *Identity based trust* – built on an assumption of perceived compatibility of values, common goals, emotional/intellectual connection

Leaders Set Clear Expectations

Provides a scaffold for building deeper trust

There are no secrets or surprises and there is a strong platform for discussion

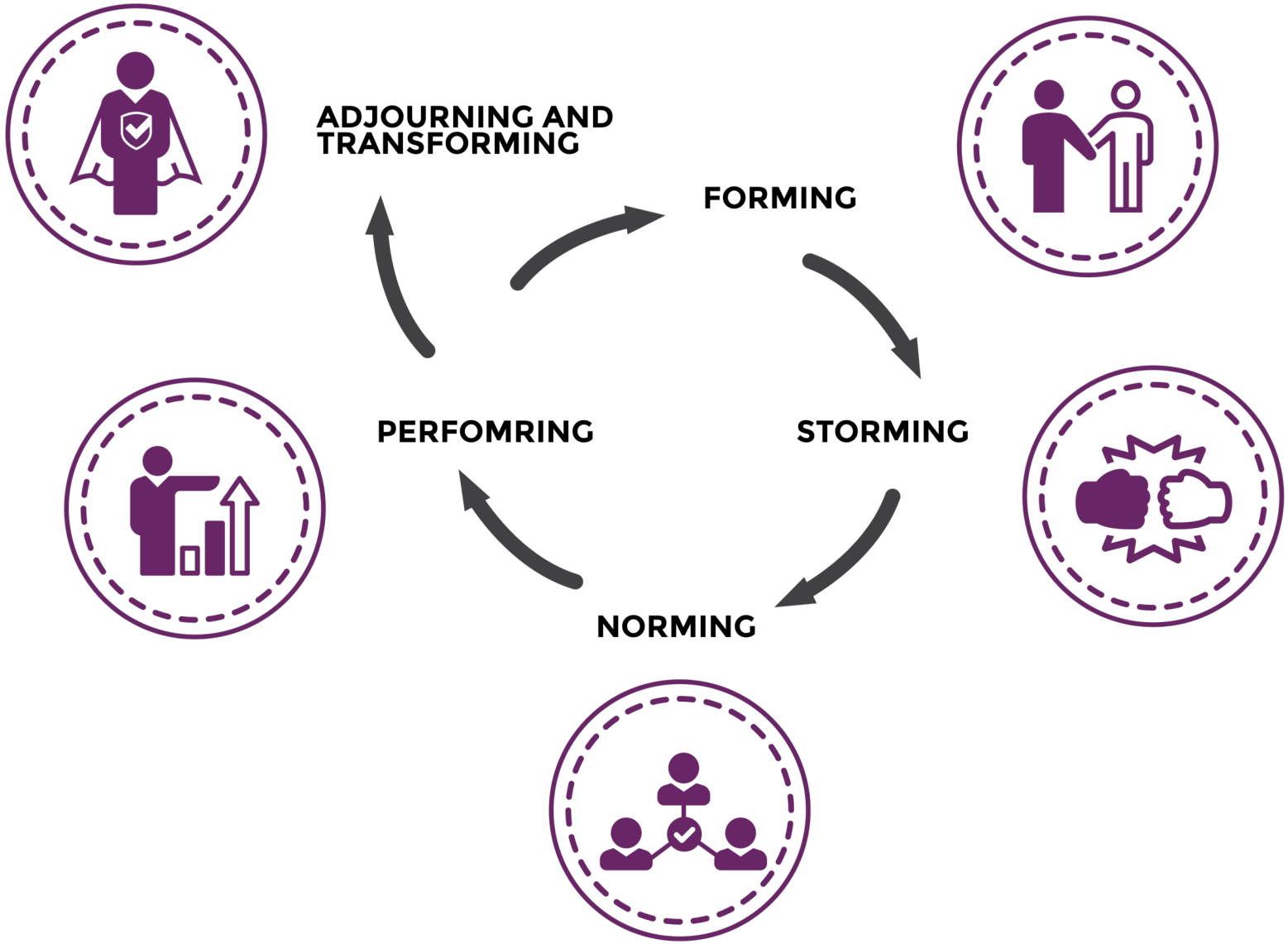
- Communication
- Regular Meetings with Clear Agendas
- Authorship
- Conduct of Investigation, Research…
- Technical Support
- Career Development
- Evaluation Criteria, etc….



Tools for Setting Expectations

- Collaborative Agreement
  - Jointly created agreement among collaborators: can be formal or informal in its creation
- “Welcome Letter”
  - Provides a scaffold for building deeper trust including: what you can expect of me, what I expect of you, what to do if we disagree
- Institutional Agreements
  - Offer letters, pre-tenure agreements, joint appointment letters, etc…
  - All ways of putting on paper how one will be recognized and rewarded in the context of their collaborative work

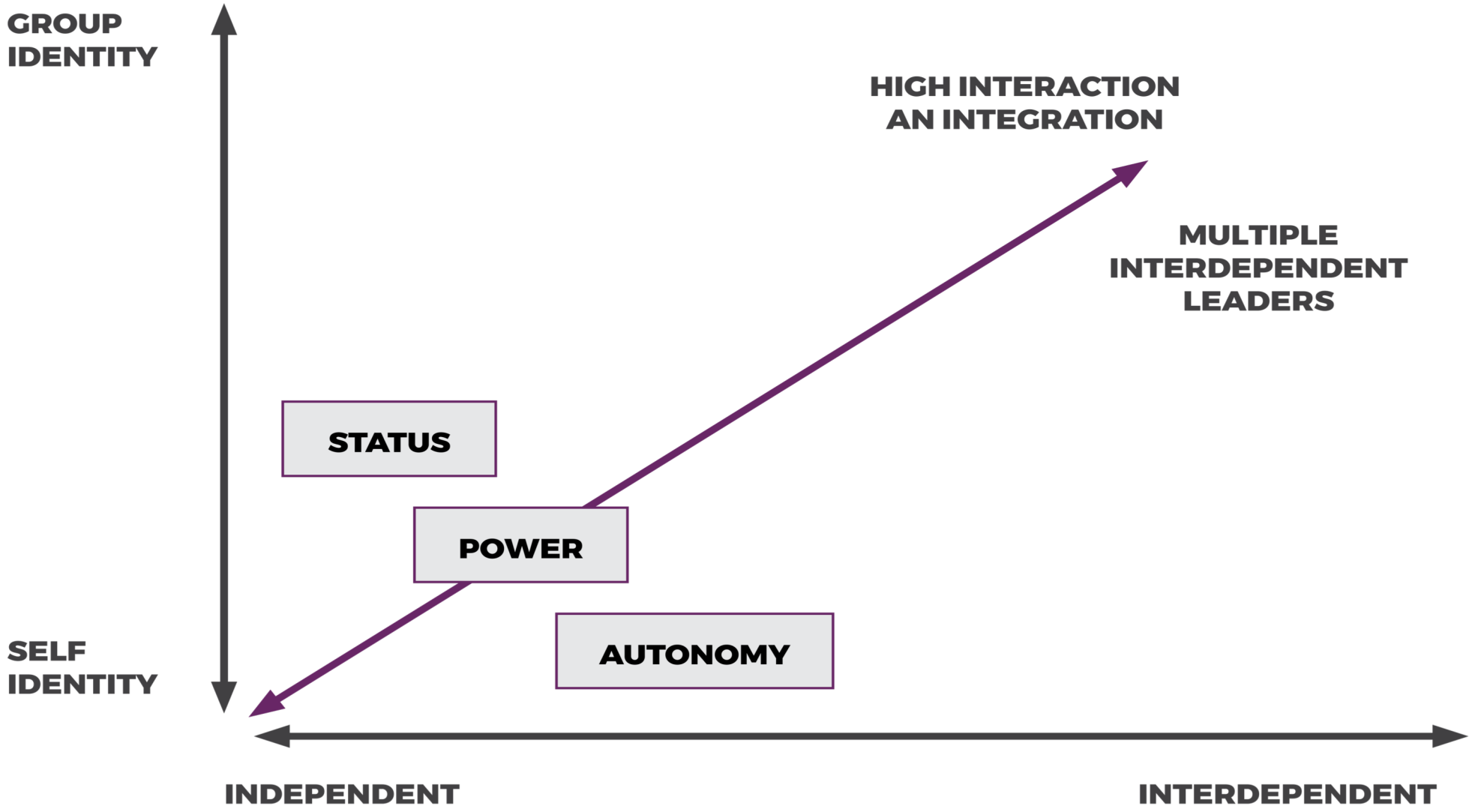
Model of Team Development



“The greater the proportion of experts a team had, the more likely it was to disintegrate into nonproductive conflict or stalemate.”

Gratton and Erickson, HBR, November 2007
https://hbr.org/2007/11/eight-ways-to-build-collaborative-teams

Collaboration Introduces Threats



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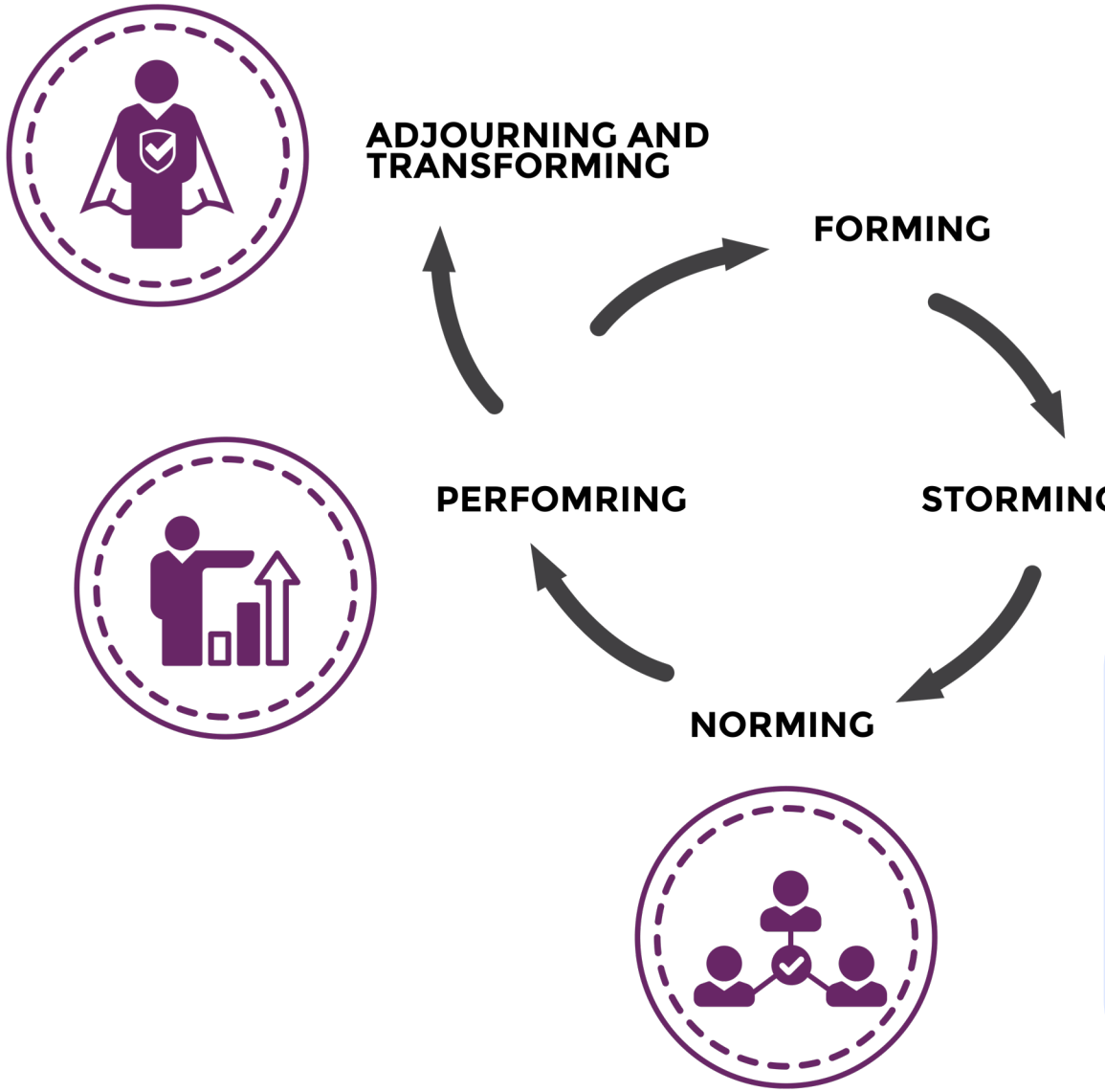


Threats:
- **Power**
- **Status**
- **Autonomy**

Challenges:
- trust, personality styles, style under stress, style in conflict, competition for power, autonomy, status, language, culture, and poor listening

Team Science is an Exercise in Diversity

- Different perspectives
- Varied experiences
- Range of expertise
- Challenging methodologies/approaches
- Questioning interpretations, results, etc…

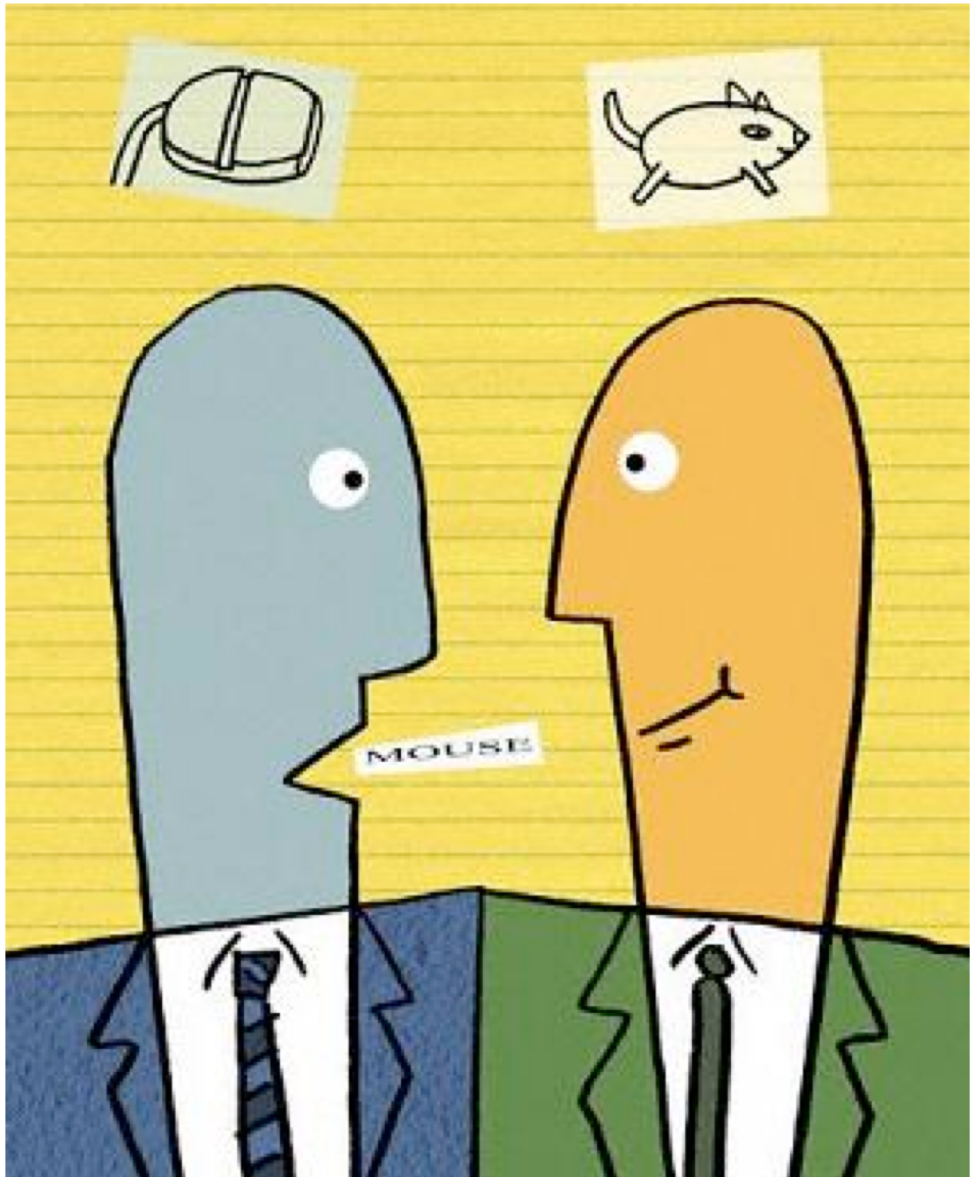
Team Composition and Bios

a) Team Members: Ex 1
    a) My postdoc and I are the initial members. Once funded, we'll identify additional team members.

b) Team Members: Ex 2
    a) Chemical Engineer, Environmental Engineers (2), and Materials Science Engineers (2)

c) Team Members: Ex 3
    a) Biomedical scientist, physicist, economist, agricultural engineer, president of the Organic Farmers Association, organizational/team consultant*

Communication Skills

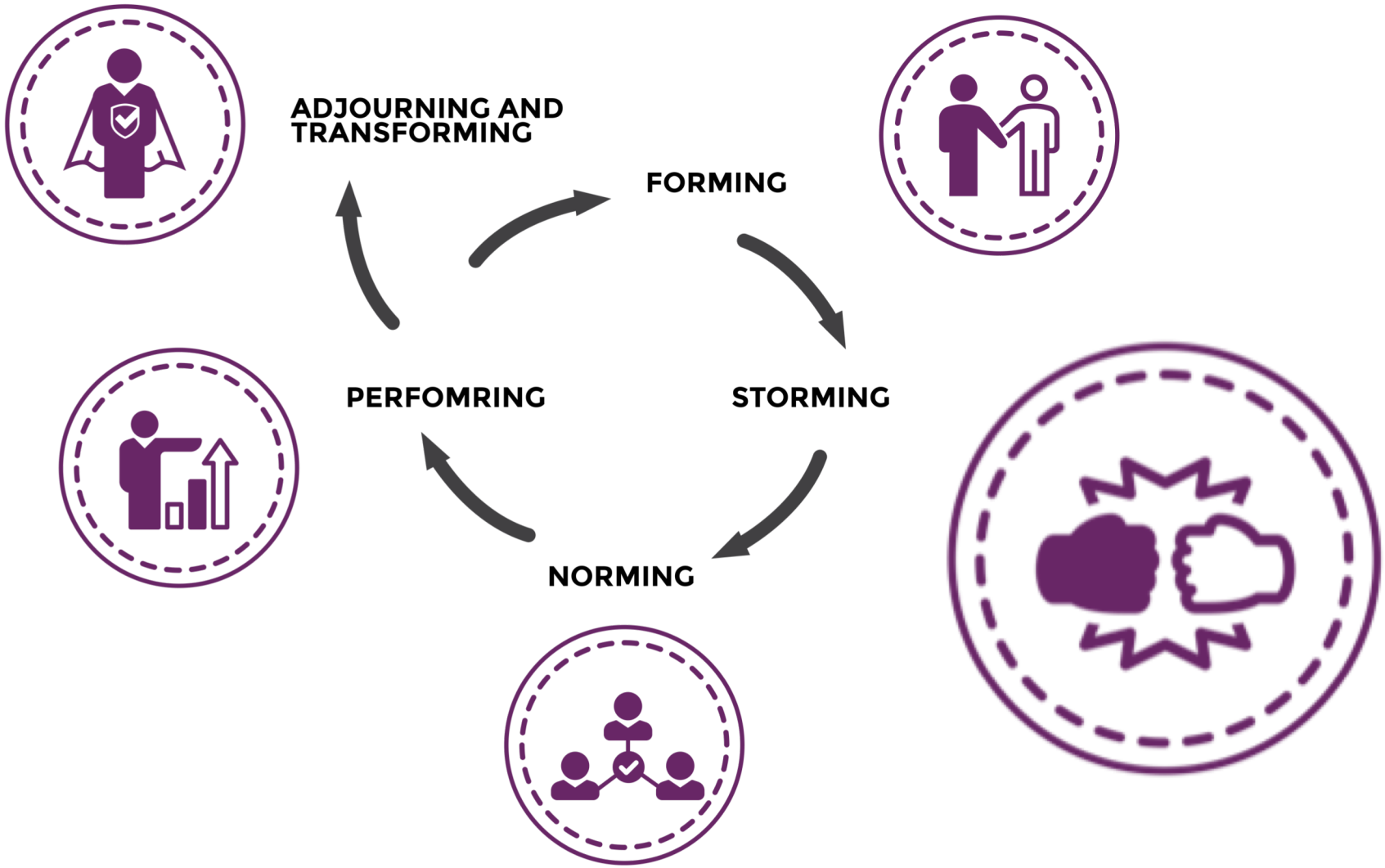


Have you ever…..

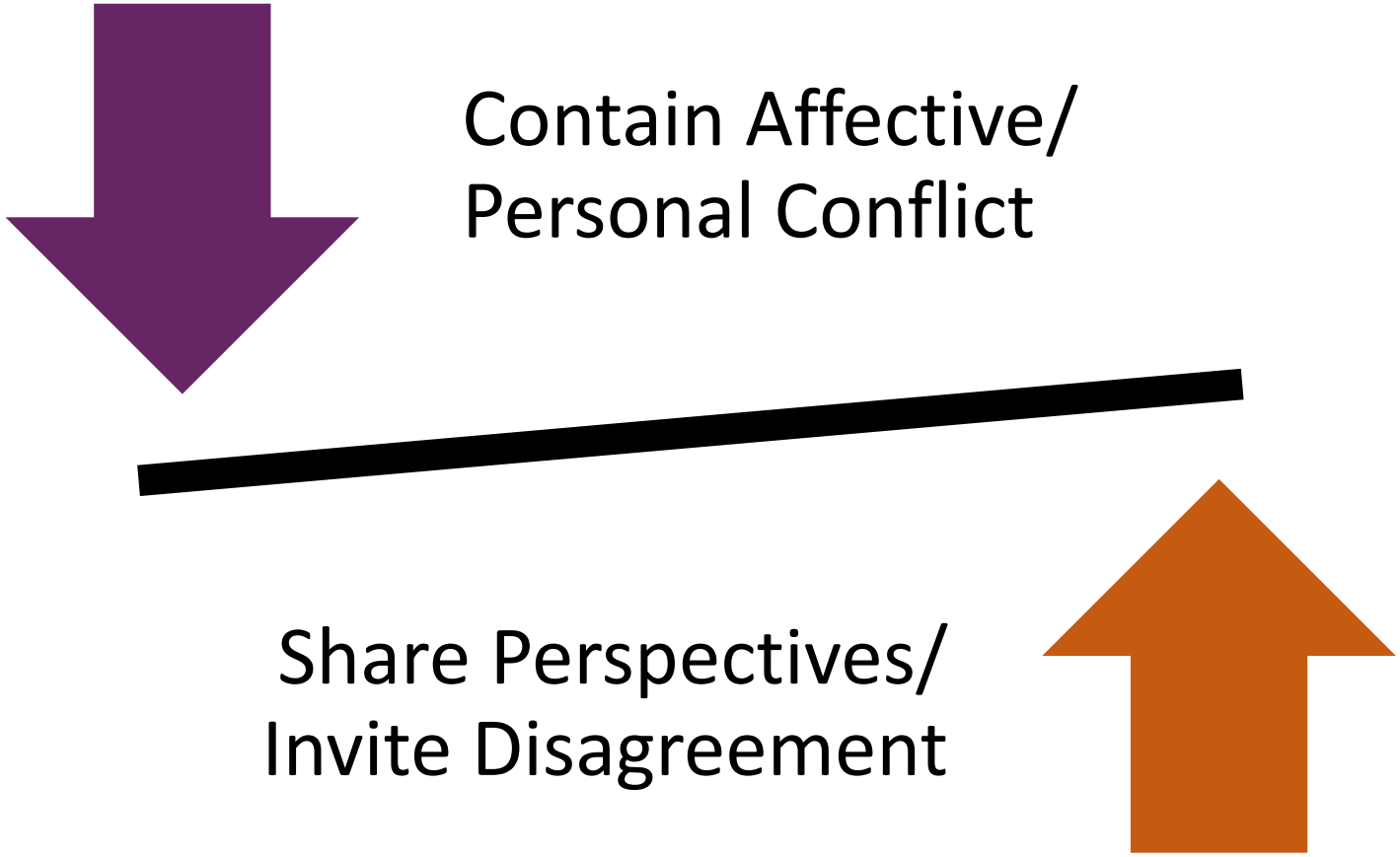
You can’t listen if people won’t speak up

- Case Study: Adopting a new technology in a clinical procedure room

Model of Team Development



Productive Collision



When Styles Clash

- No two people have the same work, communication, or conflict styles
- Tensions arise when two people have very different styles AND when they have very similar styles
- Everything is worse when you or the group are “in the heat of the moment”
  - Often occurs when we are low on energy, are experiencing fatigue, dealing with physical or psychological stress, illness and life transitions (HALT)
- We need an approach for defining and discussing these differences

Having A Difficult Conversation

- Plan the conversation – be clear as to why you are having the discussion
- Let the other person know your goal in having the conversation – start with the “third” story
- Try to understand how the difference developed
- Decide together how to move forward

Difficult Conversations

- Will get easier with practice
- Start small … little “wins”
- Develop your personal approach/style and master it
- Start tackling the bigger stuff …

- Practice, practice, practice….

Mutual Learning Approach

Values

- Transparency
- Curiosity
- Informed Choice
- Accountability
- Compassion

Assumptions

- I have information, so do other people
- Each of us sees things others don't
- People may disagree with me & have pure motives
- Differences are opportunities for learning
- I may be contributing to the problem

Based on work by Roger Schwarz and Associates

Behaviors Aligned with Mutual Learning

State views and ask genuine questions

Share all relevant information

Use specific examples and agree on meaning of words

Explain reasoning and intent

Focus on interests, not positions

Test assumptions and inferences

Jointly design next steps

Discuss undiscussable issues

Based on the work of Roger Schwarz and Associates

Eight Behaviors for Smarter Teams

Scientific Review: Team Science Expert

- Team member identification
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  - Interests/motivations/”interviews”
- Team building and management
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  - Team Development
- Effective leadership
  - Shared Vision
  - Research Plan
- Interdisciplinary/Transdisciplinary /Convergent
  - Disciplinary backgrounds relevant to complexity of the problem
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- Communication skills
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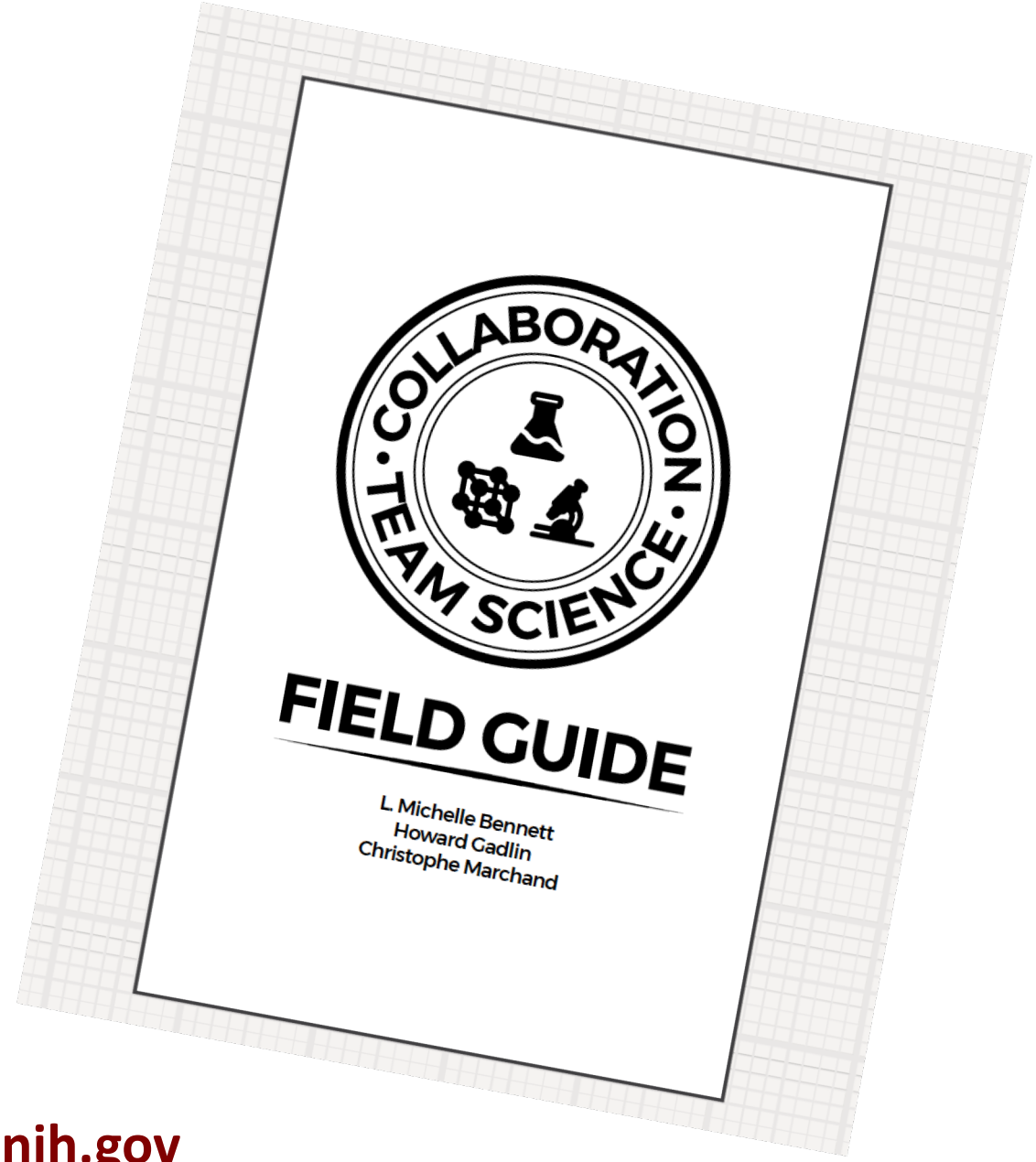
Sharing Credit

- Howard Gadlin
- Christophe Marchand
- Samantha Levine-Finley

Feedback:

LMBennett@nih.gov



teamscience.nih.gov

END

Elevator Speech

- You are in the elevator with a member of your institution's leadership who just acquired a 1M gift from a donor. She is looking for projects to fund and she asks you to explain your project and the expected impact.

- What do you say?

  (you have 30 seconds)

Groups of Three

Person 1: Describe the overall vision for a project you are working on

Person 2: Listen actively – tell the others what you heard

Person 3: Is the vision clear? What is missing? Is it too broad? Too narrow?

Storming

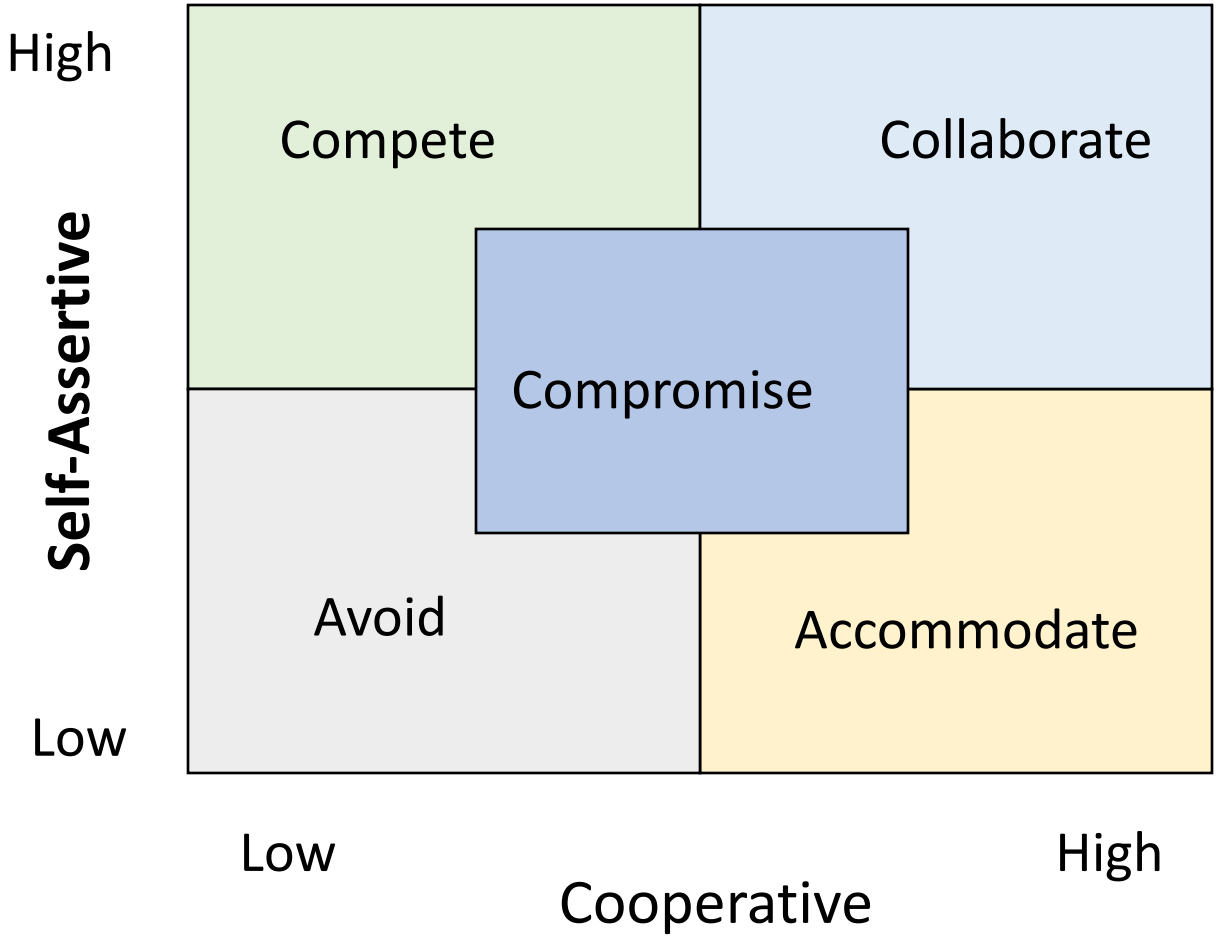
"We felt we had built up a better understanding by clarifying, justifying and arguing."

Braken and Oughton, Trans Inst Br Geogr, 2006

Debate	Dialogue
Assuming that there is a right answer, and that you have it	Assuming that many people have pieces of the answer
Combative: participants attempt to prove the other side wrong	Collaborative: participants work together toward common understanding
About winning	About exploring common ground
Listening to find flaws and make counter-arguments	Listening to understand, find meaning and agreement
Defending our own assumptions as truth	Revealing our assumptions for reevaluation
Seeing two sides of an issue	Seeing all sides of an issue
Defending one's own views against those of others	Admitting that others' thinking can improve one's own.
Searching for flaws and weaknesses in others' positions	Searching for strengths and value in others' positions
By creating a winner and a loser, discouraging further discussion	Keeping the topic even after the discussion formally ends
Seeking a conclusion or vote that ratifies your position	Discovering new options, not seeking closure

from *Leading through Conflict: How Successful Leaders Transform Differences into Opportunities by Mark Gerzon*

Conflict Styles



Thomas-Kilmann

Conflict Model

Each difficult conversation is really three

- The “what happened?” conversation
  - truth, intentions and blame
- The “feelings” conversation
  - feelings are an intrinsic part of difficult conversations
- The “identity” conversation
  - Am I competent? Am I a good person? Am I worthy of recognition for my efforts?

Leaders Must Pull Many Elements Together

- Trust
- Building a Team
- Shared Vision
- Setting Expectations
- Getting and Sharing Credit
- Managing Conflict
- Communication
- Harnessing Diversity
- Team Dynamics
- Challenges
- Fun
- Leadership

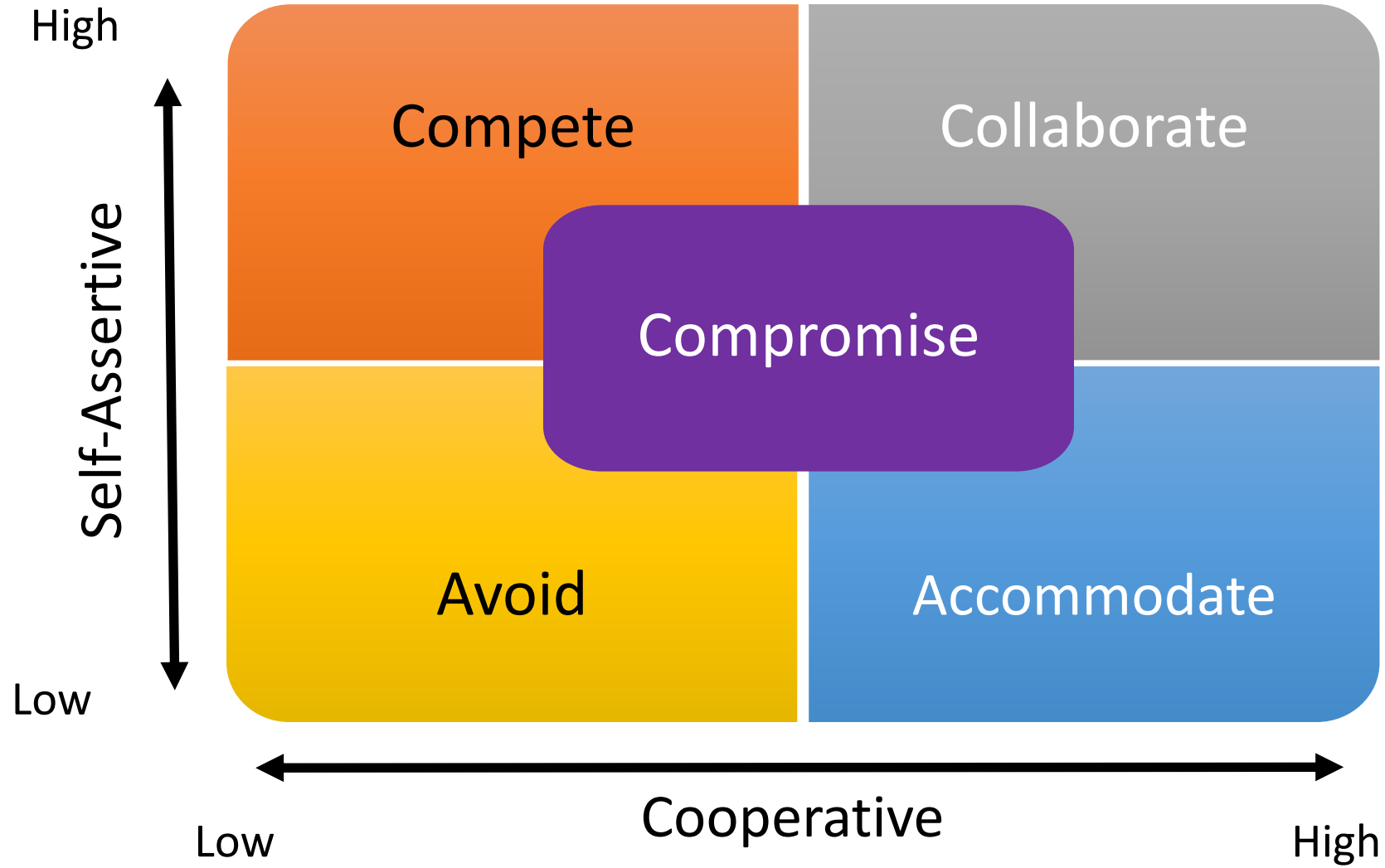
50

What Motivates Collaboration? Experience Matters

- *Less experienced:* cooperation/coordination
  - focus on sharing information, compatibility of goals, common tasks (such as quickly solving problems)
  - opportunity to be mentored, solve problems (task level), share resources, share ideas
- *More experienced:* collaboration
  - enhanced respect and understanding of collaborators (unity)
  - opportunity to mentor, build networks, to enjoy the stimulation of working with others, and problem solving (complex challenges)

Mallinson, Lotrecchiano, Schwartz, et al. *J Investig Med*, 2016

Conflict Styles



Thomas-Kilmann Conflict Model

Conflict Styles

- *Competing*: pursues individual concerns at the other person's expense. This is power-oriented mode, in which ones uses whatever power seems appropriate to win one's own position
- *Accommodating*: neglects Individual concerns to satisfy the concerns of the other person
- *Avoiding*: does not immediately pursue individual concerns or those of the other person - does not address the conflict.
- *Collaborating*: an attempt to work with the other person to find some solution which fully satisfies the concerns of both persons.
- *Compromising*: objective is to find some expedient, mutually acceptable solution which partially satisfies both parties. It falls on a middle ground between competing and accommodating.