Re-thinking scientific teams: competition, conflict and collaboration

Thoughts on the Challenges of Research Collaboration

Howard Gadlin, NIH

Max Weber

"The intellect, like all cultural values, has created an aristocracy based on the possession of rational culture and independent of all personal ethical qualities of man. The aristocracy of science is hence an unbrotherly aristocracy."

Sigmund Freud

- My emotional life has always insisted that I should have an intimate friend and a hated enemy. I have always been able to provide myself afresh with both, and it has not infrequently happened that friend and enemy have come together in a single individual, though not, of course, both at once.

Carl Djerassi *The Bourbaki Gambit*

- There is one character trait…which is an intrinsic part of a scientist's culture, and which the public image doesn't often include: his extreme egocentricity, expressed chiefly in his overmastering desire for recognition by his peers. No other recognition matters. And that recognition comes in only one way. It doesn't really matter who you are or whom you know. You may not even know those other scientists personally, but *they* know *you* –through your publications.

The pleasures of conflict

- Need to appreciate
  - How much conflict gives to people
  - How much it affirms identities
  - How it helps people position themselves in relation to others
  - The pleasure associated with hurting
  - The pleasure of revenge
  - The pleasure of creating conflict

- Today the solitary scientist – armed with the tools of a single discipline – seeking to conquer some devastating disease is largely a romantic myth. Francis Macrina
- From 1930 to 1989 the mean number of authors per biomedical research article increased from 1.3 to 6.0
- In Britain, from 1988 to 1995, the mean number of authors' addresses has increased from 1.7 to 2.0

- Multidisciplinary research – researchers in different disciplines work independently or sequentially, each from his or her own disciplinary-specific perspective, to address a common problem. (Rosenfield)
- Interdisciplinary research – a cooperative effort by a team of investigators, each expert in the use of different methods and concepts, who have joined in an organized program to attack a challenging problem (IOM)
- Transdisciplinary research – the development of a common conceptual framework that bridges the relevant disciplines and that can serve as the basis for generating new research questions directly related to the defined problem

- Collaboration – A process by which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible
  Barbara Gray

- Key concepts
- Interdependence
- Joint ownership
- Collective responsibility
- Solutions emerge from addressing differences

Problems that lend themselves to collaboration

1. Ill-defined problems or disagreements regarding definition
2. Multiple stakeholders with vested interests
3. Disparity of power or resources among stakeholders
4. Different levels of expertise and different levels of access to relevant information

5. Problems characterized by technical complexity and scientific uncertainty
6. Differing perspectives on a problem leading to adversarial relations
7. Unilateral efforts unsuccessful
8. Existing processes insufficient to address problems

Organizational Barriers to Collaboration

- 1. Review and rewards
  - A. Emphasis on first and last authored papers
  - B. Preference for independent investigator initiated research programs
  - C. Punishment of young scientists for collaborating
  - D. Need for reviewers who understand multi-disciplinary, interdisciplinary, and translational research
  - E. Need for reviewers who can recognize the contributions of researchers involved in joint research endeavors
  - F. Study sections organized by discipline

Organizational Barriers to Collaboration

2. Funding/Support

- A. Difficulty in obtaining support for high risk, long term projects
- B. Space – inadequate design (research motels)
- C. Recruitment and retention of high quality fellows
- D. Absence of training in collaborative research

Leadership

- Bringing together a talented group of people to work cooperatively to solve a problem takes time, commitment, passion, and a lot of hard work. The leader can help ….build both personal and scientific trust among the team members;…foster mutual respect for each other and each other's areas of expertise…. Without strong leadership these teams can dissipate quickly.

Communication

- Excellent communication is necessary among the team members…. Strong emphasis needs to be placed on communication. Communication includes both the topics to be discussed as well as the logistical strategies for effective interactions.

Adversarial Collaboration

- Empirical resolution of scientific disputes through a facilitated collaboration
- Jointly designed studies to speak to disputed issues and narrow or clarify differences
- Both parties agree on empirical tests for resolving a dispute and to conduct these tests with the help of a third party scientist arbiter/mediator

The adversarial collaboration process

1. Systematic review of relevant studies
2. Formulate hypotheses
3. Argue and develop procedures to test hypotheses
4. Implement procedures
5. Analyze and re-analyze data

Adversarial Collaboration

Success is measured by

- 1. Yielding surprising results
- 2. Producing insightful discussion
- 3. Generating testable hypotheses abut outstanding issues

The challenge of adversarial collaboration

- 1. Ego threatening
- 2. Possibility of being shown to be wrong
- 3. Personal animosity or competition
- 4. ideological/theoretical/ paradigmatic differences

Preconditions for adversarial collaboration

- 1. Acknowledge possibility of differences residing in procedural differences
- 2. Trusted 3rd party
- 3. Differences not too deep or too philosophical
- 4. Curiosity about differences stronger than commitment to one's position

Prenuptials for scientists: collaborative research agreements

- Categories to be covered
  - 1.goals of collaboration
  - 2. scientific parameters
    - Respective contributions
    - Research Agenda
    - Decision making
    - Authorship and acknowledgment
    - Publicity
    - Intellectual property, patents and copyrights
    - Data Management
    - Sharing materials and resources
    - Collaboration with non-signatories

Collaborative research agreements

- 3. Project management
  - Process
    - Communications
    - Dispute resolution
    - Confidentiality
  - Administration
    - Financial obligations
    - Legal obligations
    - Accountability
    - Quality assurance
    - Staffing
    - Duration and time frames

The importance of systemic factors

- Research and theory of teams and group functioning
- Critical moments in group functioning: beginning, mid-point, completion of task
- Crucial importance of doing the team set-up correctly

Network analysis

- Networks do not necessarily map onto the existing organizational structure.
- Networks cross boundaries and map
  - Communication patterns
  - Information exchange
  - Informal influence and trust

Examples of Network Problems

- Non-integrated – 2 or more sub-groups
- A low powerful person most central to group – potential bottleneck
- Isolated individuals not well used as resources
- Specific roles that need to be strengthened – central hubs, knowledge brokers, boundary spanners, critics

Types of Networks

- Knowledge networks-who has or does not have crucial information?
- Access networks –how to reach key people
- Source receptive networks – will those making inquiries be treated collaboratively
- Energy network – how does interacting with a source affect inquirer's energy level
  - Higher in energy network – better your performance
  - People well connected to energizers perform better
  - Interactions with a positive goal and greater engagment produce higher energy level

The complexities of collaboration

It is easy for a senior scientist to be collaborative and part of a team: they already have tenure. People already know who they are

Alan Leshner

Collaboration introduces into scientific work dimensions of interpersonal interaction that are not ordinarily considered very important in scientific work

The complexities of collaboration

1. Decision making processes
2. Accountability and responsibility
3. Autonomy
4. Shared ownership

Collaboration requires new social relationships/arrangements – how to integrate multiple approaches to a problem

The problems of language

- The problem of language and its pragmatics is perhaps most visible in interdisciplinary areas of research – chemical biology, computational chemistry, computational biology, bioinformatics – that span more than one field.

Konopka and Crabbe

- A question – Do concepts and paradigms from contributing fields retain their original meaning or even still make sense in the new interdisciplinary field?

The trading zone

- Emergence of a specific coordinated language
- Two dissimilar groups finding common ground
- These groups are not participating in isolated conceptual schemes and translating back and forth
- Linguistic ability to set a broader meaning aside while regularizing different lexical, syntactic and phonological communication functions

Example

- Theorists and experimentalists can agree that a particle track configuration on a nuclear emulsion should be identified with an electron yet hold irreconcilable views about the properties of the electron, or different interpretations of quantum field theory, or the properties of films. The ability to restrict and alter meaning so as to create local sense of terms that speakers of both parent languages recognize as intermediate
- Peter Galison

- **Importance of developing a common language as a prerequisite for collaborative work.**
- **As the process of translation from the conceptual vocabulary of one discipline to another proceeds members check the accuracy of their interpretations by means of metaphor and analogy. The result is a shared conceptual vocabulary, smaller and less specialized than the vocabulary of any single discipline, but enabling each network member to assimilate the work of the other into his own.**
  Kahn and Prager

Sources of Destructive Conflict

- Difficult/dysfunctional people
- Problematic interpersonal dynamics
- Problematic leadership
- Systemic problems and aspects of scientific culture

Difficult People

- A personal characteristic of an individual (behavior, attitude, circumstance) that:
  - Helped create or fuel a dysfunctional conflict and/or
  - Significantly complicated the intervention
  - Was inherent to the individual-not primarily a reaction to the behavior of another or to organizational problems in the unit or NIH

Problematic Interpersonal Dynamics

- Defective Communication Patterns
- Autonomy dramas

Defective communication Patterns

- “The autistic” pattern: absence of regular communication punctuated by occasional angry and unproductive outbursts
  - Active – An active/hyperactive communicator who insistently pressed his/her demand paired with a slow, “stingy" and laconic other
  - Passive – two very distant and uncommunicative parties

The enmeshed pattern

- Primary mode of communication was frequent outbursts of open warfare in which the parties apparently had little ability to retrain themselves or to perceive the other with any degree of objectivity or fairness

Autonomy dramas: implicit renegotiation of the transition from novice to autonomous scientist

- Cause: developmental mismatch between mentor and mentee
  - Developmental circumstances of the mentee
    - Pressure to establish scientific credentials
    - Often eager for more scientific independence
    - Dependent on mentor for resources and support
    - Push toward autonomy

Developmental circumstances of the mentor

- Senior person facing serious career pressures
- Junior scientist on the way up
- Senior scientist in twilight of scientific productivity
- Suffered recent career setbacks
- Unwilling to provide resources and support
- Actively hostile or indifferent to mentee's search

Dysfunctional leadership

- Absentee leadership – unavailable or uninvolved
- Inhibited leadership – “running scared” afraid of conflict and unable to deal assertively with difficult people
- Defensive leadership –resistant to feedback about problems; inclined to rationalize unhappiness as inevitable or a reaction of trouble-makers
- Hostile/aggressive leadership – unempathic and aggressive or duplicitous and manipulative

Aspects of scientific culture

- Emphasis on discovery, priority and “credit”
- Value differences – e.g. human welfare vs. humane treatment of animals
- Clashing scientific values – e.g. re sharing data
- High standards
- Public scrutiny
- Organizational growing pains – areas of sudden growth