



# Research Methodology

## Ethics in Science

Lecture, 12. October, 2007



# Conducting scientific research

- On being a scientist:
  - <http://www.nap.edu/readingroom/books/obas>



# About Science

- The object of research is to extend human knowledge of the physical, biological, or social world beyond what is already known. But an individual's knowledge properly enters the domain of science only after it is presented to others in such a fashion that they can independently judge its validity. This process occurs in many different ways. Researchers talk to their colleagues and supervisors in laboratories, in hallways, and over the telephone. They trade data and speculations over computer networks. They give presentations at seminars and conferences. They write up their results and send them to scientific journals, which in turn send the papers to be scrutinized by reviewers. After a paper is published or a finding is presented, it is judged by other scientists in the context of what they already know from other sources. Throughout this continuum of discussion and deliberation the ideas of individuals are collectively judged, sorted, and selectively incorporated into the consensual but ever evolving scientific worldview. In the process, individual knowledge is gradually converted into generally accepted knowledge.
- This ongoing process of review and revision is critically important. It minimizes the influence of individual subjectivity by requiring that research results be accepted by other scientists. It also is a powerful inducement for researchers to be critical of their own conclusions because they know that their objective must be to try to convince their ablest colleagues.
- The social mechanisms of science do more than validate what comes to be known as scientific knowledge. They also help generate and sustain the body of experimental techniques, social conventions, and other "methods" that scientists use in doing and reporting research. Some of these methods are permanent features of science; others evolve over time or vary from discipline to discipline. Because they reflect socially accepted standards in science, their application is a key element of responsible scientific practice.



# Experiments and data

- What data is being collected
- How is data generated and collected
- How is data manipulated
- What choices are made in manipulation
- Mistakes vs. Intentional Changes
- “Van Maanen”
- “The Selection of Data”



# Value in Science

- Judgment
  - “Rules of law” about theories
- Prejudices
  - Limit ability to accept results
- Polywater



# Conflict of interest

- Financial interest
- Professional gain
- Confidentiality
- Disclosure of interest
  
- “A Conflict of Interest”
- “Industrial Sponsorship”



# Publications and sharing

- System of publication is not given
  - Publication only works if system is trusted
- Balance of sharing and trust
  - When to share data, initial results?
- When to publish?
  - Role of peer review
  - Considerations before publishing
- “Sharing of research material”



# Allocation of Credit

- System of “credit measures”
  - Author list
  - Acknowledgements
  - Citations
- “Credit where credit is due”





# Authorship issues

- Author list is key to credit allocation
  - Many different traditions and options
- Key issues
  - Early discussion about authorship
  - Relation between authors
  - Involvement of authors
- “Who should get credit for pulsars?”



# Errors and negligence

- Errors due to mistakes
  - Impossible to avoid all of those
- Errors due to negligence
  - Sometimes due to bad science
  - Sometimes due to pressure
  - Rarely forgiven if discovered
- “Publication practices”



# Misconduct in science

- Major elements
  - Fabrication
  - Falsification
  - Plagiarism
- Responses to misconduct
  - Investigation vs. cover-up
- “Fabrication in grant application”
- “A case of plagiarism”



# Responding to ethical violations

- Not easy to report
  - Colleagues, attention, consequences, etc.
  - Sometimes not taken seriously
- Avenues
  - Trusted friends or colleagues
  - Ombudsman, ethics council, etc.
  - Public institutions
- “A career in the balance”