# Research ethics

**Ram Seshadri**
Materials Department and Department of Chemistry & Biochemistry
Materials Research Laboratory
University of California, Santa Barbara CA 93106
http://www.mrl.ucsb.edu/~seshadri

MATERIALS RESEARCH LABORATORY
*the innovation engine for new materials*
UC Santa Barbara

University of California Santa Barbara
ConvEne IGERT
Supported by the National Science Foundation

# Part I: Issues

# Ethics

**2. a.** The science of morals; the department of study concerned with the principles of human duty. In this sense now usually construed (like other words of like formation) as *sing.*; formerly as *pl.*

.

.

.

1789 J. Bentham *Introduction to the principles of morals and legislation.* xix. §11 *Ethics at large may be defined, the art of directing men's actions to the production of the greatest possible quantity of happiness.* [utilitarianism]

(Oxford English Dictionary, http://www.oed.com)

The question, in this light: *How can we conduct research in a manner that permits the progress of science while causing the least unhappiness?* (*Cf.* Galen: *Primum non nocere*)

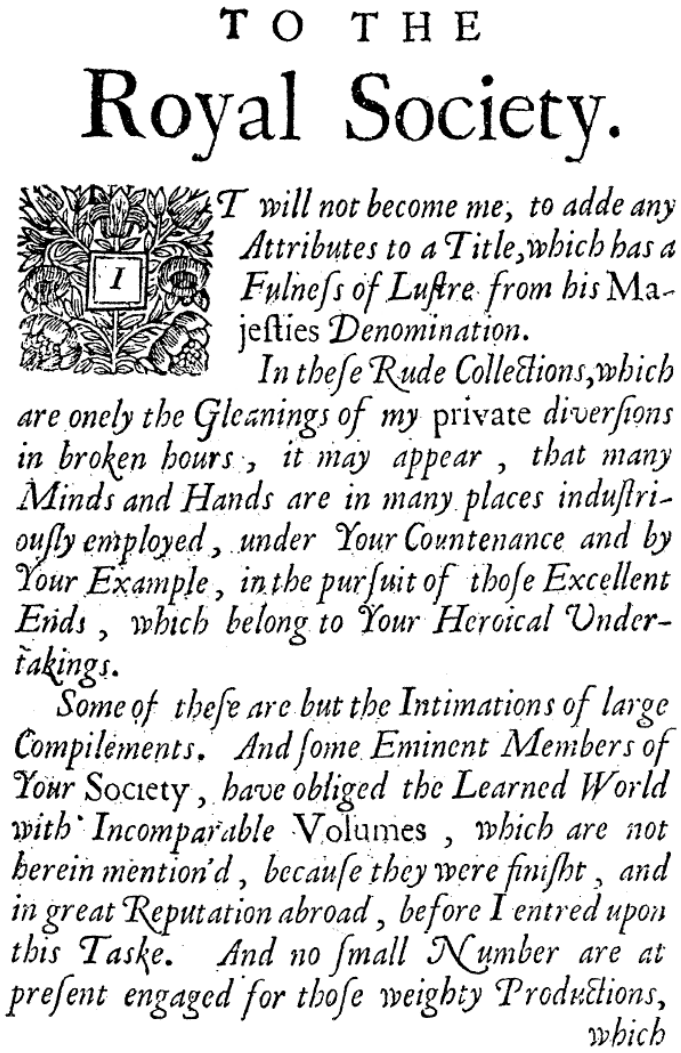
# Outline

- Why learn about ethics (the issues should be obvious !)
- What are the issues:
  - Priority
  - Copyright
  - Intellectual property
  - Cooking up data (fabrication and falsification)
  - Plagiarism
  - Pathological science
- Where are the rules posted ?
- Is there a controlling body: The ORI
- Science as human endeavor: An example

# *Why learn ethics?*

- The rules are not always obvious
- Emphasize the notion that we work towards some greater good

# *Priority: Publish or perish?*



TO THE

Royal Society.

IT will not become me, to adde any Attributes to a Title, which has a Fulneſs of Luſtre from his Majeſties Denomination.

In theſe Rude Collections, which are onely the Gleanings of my private diverſions in broken hours, it may appear, that many Minds and Hands are in many places induſtriouſly employed, under Your Countenance and by Your Example, in the purſuit of thoſe Excellent Ends, which belong to Your Heroical Undertakings.

Some of theſe are but the Intimations of large Compilements. And ſome Eminent Members of Your Society, have obliged the Learned World with Incomparable Volumes, which are not herein mention'd, becauſe they were finiſht, and in great Reputation abroad, before I entred upon this Taske. And no ſmall Number are at preſent engaged for thoſe weighty Productions, which

The "Epistle Dedicatory" of Henry Oldenberg, the first editor of *Philos. Trans.* **1** (1665) 1.

From http://www.jstor.org

Oldenberg promises that should authors publish in his journal, it would help not only in making their work well known, but would also ensure their priority.

The beginning of *publish or perish* ?

UC SANTA BARBARA
science & engineering

# *Priority: Publish or perish?*

The historical context in Oldenberg's time: New worlds were being discovered, new lands being mapped, new species found, new planets ...

Doing something for the first time was deemed very important, as it still is.

Priority is hugely important in every endeavor of note (Wright Brothers, Lindberg, Amundson, Hillary-Tenzing, Watson-Crick ...)

Much of the acclaim that researchers achieve is in reporting something new before others do. Often, the establishment of priority is fraught with controversy

# Copyright: *Cf.* legal issues

Ownership of published or creative work: software, articles, music, fiction ...

With whom does it rest ?

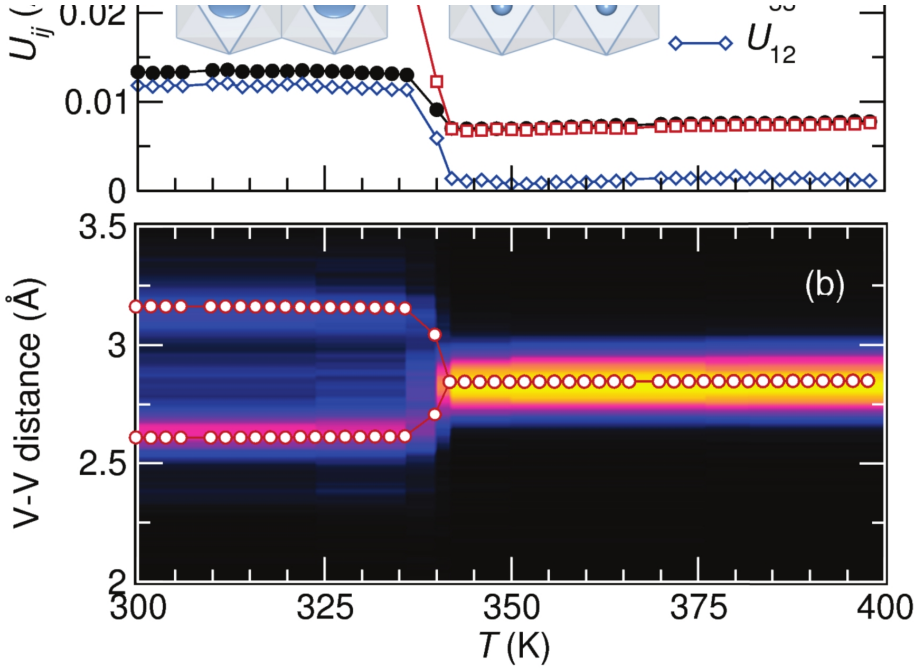
Most journals insist that copyright be *transferred* to them upon publication. Once transferred, the writings/figures belongs to the journal publisher. The publisher does not own the intellectual content however.

Consequences:

- One cannot use, even in a thesis, text or figures which have been published in a journal
- Certainly, one cannot reproduce figures from the works of others without explicit permission, usually indicated below the figure

*Music, art etc. handled differently*

# Copyright: *Cf.* legal issues




From the PhD thesis of Daniel Shoemaker (2010)

"Reproduced with permission from reference 136, ©2010 by the American Physical Society."

Figure 4.3: (a) Thermal parameters ($U_{ij}$) obtained from PDF least-squares refinement as a function of temperature reveal abrupt changes at the transition temperature. Thermal ellipsoids (99%) for neighboring V polyhedra in the $c$ direction are shown above and below the transition temperature. (b) V–V bond distances from the least-squares refinement (points) overlayed with a map of the V–V distances obtained from RMC modeling. Reproduced from reference 136, © 2010 by the American Physical Society.

# Intellectual property: *Cf.* legal issues

Who owns your work (in terms of ideas, outcomes, possible revenues which could be generated ...) ?

In UCSB, it is the **Regents, University of California**

Office of Technology & Industry Alliances
342 Lagoon Road, Mail Code 2055
Santa Barbara, CA 93106-2055

A researcher cannot, under normal circumstances, take away work from the lab where he/she worked as an undergraduate or graduate student or post-doctoral fellow. Under certain circumstances, this can be a complex issue.

Leave lab books in the lab !

# Cooking up data (Fabrication, falsification...)

Don't do it !

Various levels at which this is possible:

- Where everything is false (the clear case)
- Where results are exaggerated
- Minor fudging: When you claim to have done experiments five times, instead of the three which you actually did
- Sloppy science: Did you think of all the things that could be improved ? All the things that could have gone wrong. Be your strongest critic.

## and Plariarism (collectively FFP)

*Plagiarize,*
*Let no one else's work evade your eyes,*
*Remember why the good Lord made your eyes,*
*So don't shade your eyes,*
*But plagiarize, plagiarize, plagiarize -*
*Only be sure always to call it please 'research'*

Tom Lehrer *Lobachevsky*

Plagiarism is when you present someone else's work as your own. Always be aware that you should not only not plagiarize, you should also never give the appearance of plagiarism.

For example, NEVER reproduce sentences from other works in your writing, unless you explicitly (by using quotes "") indicate that the words are taken from some stated source. Also be completely honest in referencing other peoples work. Avoid reselling/ repackaging your own work or writing.

# Laws: FFP is a crime !

**Federal Civil False Claims Act**

First enacted during the Civil War in response to fraudulent practices of contractors supplying the Union Army.

Under the FCA persons, which includes organizations, are prohibited from:

1. Knowingly presenting or causing to be presented to the federal government (or agent or employee of the federal government) a false or fraudulent claim for payment or approval;

2. Knowingly making, using or causing to be made or used, a false record or statement to have a false or fraudulent claim paid or approved by the federal government; and

3. Conspiring to defraud the federal government by having a false claim allowed or paid.

# Pathological science

Term coined by Irving Langmuir (1957) to describe research on topics such as N-rays and ESP.

"These are cases where there is no dishonesty involved but where people are tricked into false results by a lack of understanding about what human beings can do to themselves in the way of being led astray by subjective effects, wishful thinking or **threshold interactions**. These are examples of pathological science. These are things that attracted a great deal of attention. Usually hundreds of papers have been published on them. Sometimes they have lasted for 15 or 20 years and then gradually have died away."

Pathological science flourishes in many fields. Polywater, cold fusion (?) ...

# Conduct guidelines from professional societies

**ACS Ethical Guidelines to Publication of Chemical Research**

**...**

An essential feature of a profession is the acceptance by its members of a code that outlines desirable behavior and specifies obligations of members to each other and to the public. Such a code derives from a desire to maximize perceived benefits to society and to the profession as a whole and to limit actions that might serve the narrow self-interests of individuals. The advancement of science requires the sharing of knowledge between individuals, even though doing so may sometimes entail forgoing some immediate personal advantage.

With these thoughts in mind, the editors of journals published by the American Chemical Society now present a set of ethical guidelines for persons engaged in the publication of chemical research, specifically, for editors, authors, and manuscript reviewers. These guidelines are offered not in the sense that there is any immediate crisis in ethical behavior, but rather from a conviction that the observance of high ethical standards is so vital to the whole scientific enterprise that a definition of those standards should be brought to the attention of all concerned.

We believe that most of the guidelines now offered are already understood and subscribed to by the majority of experienced research chemists. They may, however, be of substantial help to those who are relatively new to research. Even well-established scientists may appreciate an opportunity to review matters so significant to the practice of science.

...

# Are the guidelines easily followed?

- *Sometimes yes*:
  - 1. An author's central obligation is to present an accurate account of the research performed as well as an objective discussion of its significance.
- *Sometimes no*:
  - 11. The co-authors of a paper should be all those persons who have made significant scientific contributions to the work reported and who share responsibility and accountability for the results.

# Controlling body:

http://ori.hhs.gov/

- Run by the Department of Health and Human Services
- Investigates fraud
- Website lists other governmental organizations concerned with misconduct
- Website lists investigators who have had sanctions imposed against them (don't get on this list !)

*DISPLAY PDF*

# Moral particularism

1789 J. Bentham *Introduction to the principles of morals and legislation.* xix. §11 *Ethics at large may be defined, the art of directing men's actions to the production of the greatest possible quantity of happiness.* [utilitarianism]

(Oxford English Dictionary, http://www.oed.com)

as opposed to the view that right and wrong (conduct) are intrinsically understood

Jonathan Dancy video

# Storytime: *Science as human endeavor (errare humanum est)*

The discovery of the double helical structure of DNA (Watson and Crick, 1953)

*Nature* **171,** 737-738 (1953)
WATSON, J. D. & CRICK, F. H. C.
**A Structure for Deoxyribose Nucleic Acid**

"It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material."

"... been stimulated by a knowledge of the general nature of the unpublished experimental results and ideas of Dr. M. H. F. Wilkins, Dr. R. E. Franklin and their co-workers at King's College, London."

# *Apropos* Dr. R. E. Franklin

Rosalind Elsie Franklin (1920-1958)

X-ray crystallographer

The story in a nutshell: Watson saw the X-ray image of DNA acquired by Franklin and her student Gosling *before* he and Crick wrote their paper. The image provided them vital clues. This was never revealed to her, or in the paper.

When it was revealed to the world, it was done so in a manner that downplayed her role.

UC SANTA BARBARA
science & engineering

# *Apropos* Dr. R. E. Franklin

- What was the proper course of action for Watson and Crick to have followed after they saw the X-ray image ?
- Did Watson and Crick exploit Franklin's work because she was a woman ?
- Did Franklin feel cheated ?
- Is there a moral to the story ?
- How should we remember Franklin and her contributions ?

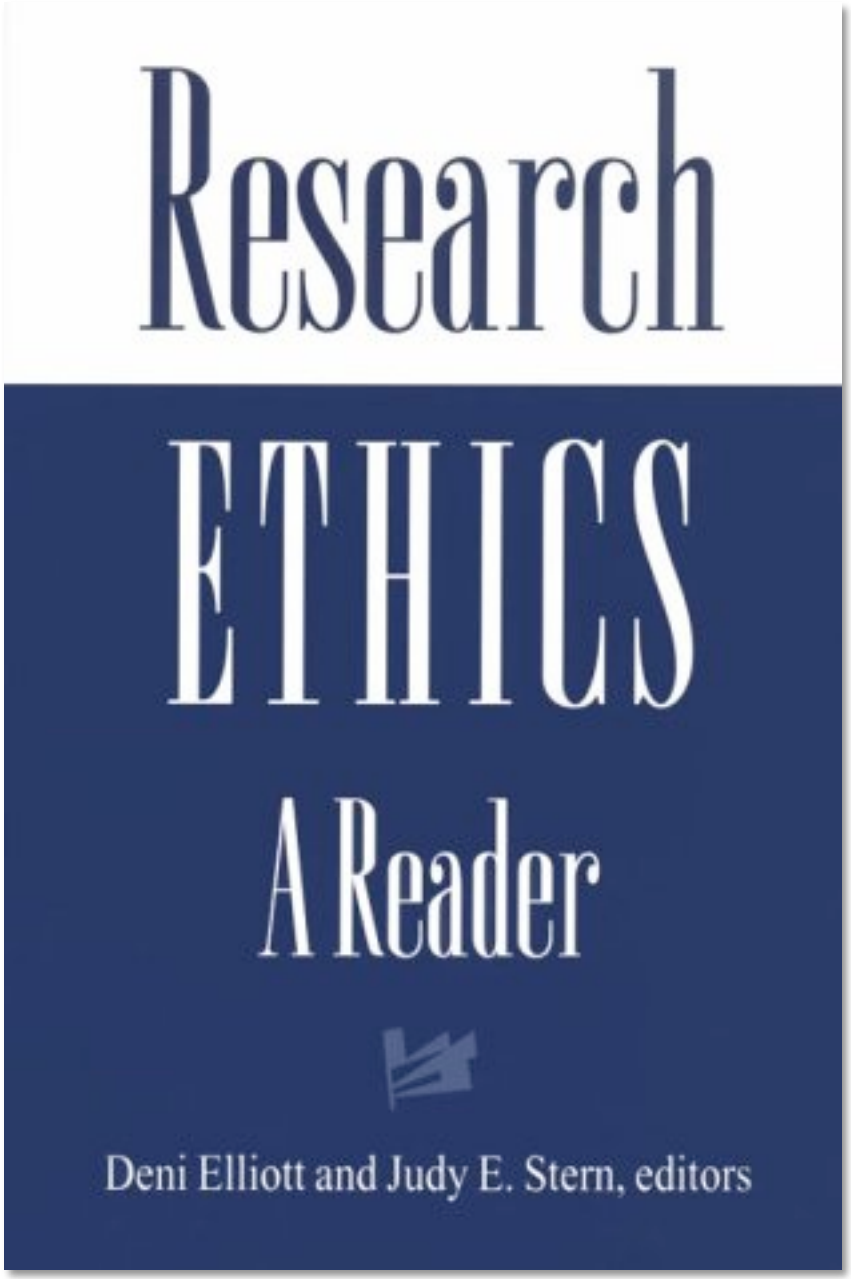
**FROM MACROMOLECULES TO BIOLOGICAL ASSEMBLIES**
Nobel lecture, 8 December 1982 by Aaron Klug
"I can claim no credit for the choice of my first subject, tobacco mosaic virus. It was the late Rosalind Franklin who introduced me to the study of viruses ... It was Rosalind Franklin who set me the example of tackling large and difficult problems. Had her life not been cut tragically short, she might well have stood in this place on an earlier occasion. "

# DNA and Franklin references:


- The Double Helix, James D. Watson, Mentor, Penguin 1968.
- Eighth Day of Creation: Makers of the Revolution in Biology, Horace Freelan. Judson, Cold Spring Harbor Laboratory Press, expanded edition 1996.
- Rosalind Franklin and DNA, Anne Sayre, W. W. Norton, 1978.
- Rosalind Franklin The Dark Lady of DNA, Brenda Maddox, Perennial, 2003.

# Part II: Teaching

# Teaching ethics: Does it do any good?




40% of respondents strongly agreed that, "by the time students enter graduate school, their values, and ethical standards are so firmly established that they are difficult to change."

James Rest (Minn.): Moral development continues to change throughout formal education. Development plateaus when a person leaves school.

# Teaching ethics in the IGERT

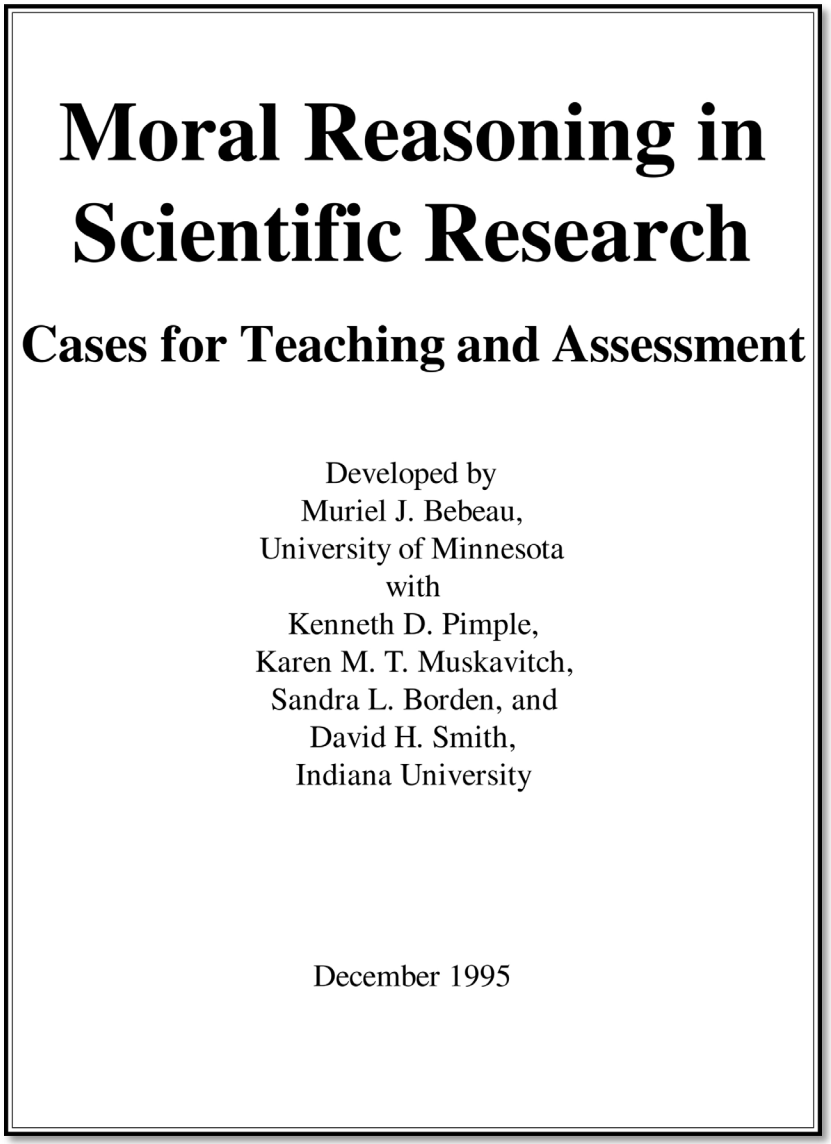
**Professor Roy Smith ECE, UCSB**

Cases (both fictional and non-fictional) are presented to the students, who are required to examine ethical issues associated with the cases, and to present arguments in the format of a debate which is then summarized. Students are expected to argue pros and cons. *The emphasis is on moral reasoning.*

Case studies have been developed by Muriel J. Bebeau (University of Minnesota), with Kenneth D. Pimple, Karen M.T. Muskavitch, Sandra L. Borden and David H. Smith (Poynter Center, Indiana University). They can be found online at the Poynter Center website:

http://poynter.indiana.edu/mr/mr.pdf

# Moral reasoning



**Moral Reasoning in Scientific Research**

**Cases for Teaching and Assessment**

Developed by
Muriel J. Bebeau,
University of Minnesota
with
Kenneth D. Pimple,
Karen M. T. Muskavitch,
Sandra L. Borden, and
David H. Smith,
Indiana University

December 1995

"Some students in ethics courses cannot see the point of all the disputation and discussion. They have a hard time distinguishing meaningless gobbledygook from carefully crafted moral argument – both seem like just a bunch of words.

...

For such students, the bedrock for conceptualizing moral problems is deficient. They are likely to have low moral judgment scores. They are strangers to the basic enterprise of constructing a moral argument."

# Moral reasoning

## *Developing a Well-Reasoned Response to a Moral Problem in Scientific Research*

**Muriel Bebeau**

How does one decide whether a response is well-reasoned? What criteria apply? Can the adequacy of a response to a moral problem be reliably judged? These are questions of concern to students in an ethics course. Responses can be judged based on these criteria:

(A) Whether the response addresses each of the issues and points of ethical conflict presented in the case or problem;

(B) Whether each interested party's legitimate expectations are considered;

(C) Whether the consequences of acting are recognized, specifically described (not just generally mentioned), and incorporated into the decision; and

(D) Whether each of the duties or obligations of the protagonist are described and grounded in moral considerations.

# Moral reasoning

## *Developing a Well-Reasoned Response to a Moral Problem in Scientific Research*

**Muriel Bebeau**

How does one decide whether a response is well-reasoned? What criteria apply? Can the adequacy of a response to a moral problem be reliably judged? These are questions of concern to students in an ethics course. Responses can be judged based on these criteria:

(A) Whether the response addresses each of the issues and points of ethical conflict presented in the case or problem;

(B) Whether each interested party's legitimate expectations are considered;

(C) Whether the consequences of acting are recognized, specifically described (not just generally mentioned), and incorporated into the decision; and

(D) Whether each of the duties or obligations of the protagonist are described and grounded in moral considerations.

# The Bob Bailey case (handout)