

How to convince natural science PhD students that ethics is important

Ragnar Fjelland

Centre for the Study of the Sciences and the Humanities (SVT)
University of Bergen

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The Study of ethics as part of research training – current practices
and future requirements
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Theory of science and ethics

- Mandatory for all PhD candidates at the Faculty of Mathematics and Natural Science
- Started autumn semester 2004
- Earns 3 credits
- Offered spring and autumn semester
- Approx. 50 candidates take the course every semester



Instruction

4 lectures (8 hours)

4 seminars (8 hours)

3 “modules” (out of 8—9 offered on specific topics, 6 hours)

2 written assignments

1 essay

All the instruction, including the written assignments, are concentrated into two weeks.

Essay submitted within two weeks after the last lecture.



Science: The Endless Frontier

1944: President Roosevelt's letter to the director of the Office of Scientific Research and Development, Vannevar Bush

1945: The report submitted to president Truman



Summary of the Report

Scientific Progress is Essential

"Progress in the war against disease depends upon a flow of new scientific knowledge. New products, new industries, and more jobs require **continuous additions to knowledge of the laws of nature**, and the application of that knowledge to practical purposes. Similarly, our defence against aggression demands new knowledge so that we can develop new and improved weapons. **This essential, new knowledge can be obtained only through basic scientific research.**"



C. P. Snow: *The Two Cultures* (1959)

Chap. 4 The Rich and the Poor

"The main issue is that the people in the industrialised countries are getting richer, and those in the non-industrialised countries are at best standing still: so that the gap between the industrialised countries and the rest is widening every day. On the world scale this is the gap between the rich and the poor."



John Ziman: “Why must scientists become more ethically sensitive than they used to be?”, Science Vol 282/1998: 1813

- Science has traditionally been governed by a “no ethics” principle.
- Makes a distinction:
 - academic science
 - industrial science



Academic science

- Traditional social contract: autonomous, addresses theoretical problems.
- The “no ethics” principle does not imply that science is not governed by norms and values.



Robert Merton's norms (1943)

- communism
- universalism
- desinterestedness
- originality
- (organized) skepticism



Industrial science

- Not detached from society.
- Is likely to encounter ethical problems.
- They are regarded as too important to be left to the scientists.



- This division of science into two distinct cultural traditions, located in different types of institution, is highly schematic. Nevertheless, it shows that science has, as a whole, been insulated from ethics for two quite distinct reasons. On the one hand, academic scientists are supposed to be indifferent to the potential consequences of their work. On the other hand, industrial scientists do work whose consequences are considered too serious to be left in their hands.



Ziman: “Post-academic science”

- We can no more keep up a distinction between academic and industrial science
- “One of the virtues of the new mode of knowledge production is that it cannot brush its ethical problems under its carpet.”



- ➔ Michael Gibbons, Camilla Limoges, Helga Nowotny, Simon Schwartzman, Peter Scott og Martin Trow: *The new production of knowledge. The dynamics of science and research in contemporary societies*. London: SAGE Publications 1994



The new situation according to Gibbons et al

Mode 1

- theoretical/ academic
- disciplinary
- homogeneous
- hierarchical
- autonomous

Mode 2

- applications
- transdisciplinary
- heterogeneous
- less hierarchical and more flexible structures
- socially accountable



Jane Lubchenko: "Entering the Century of the Environment: A New Social Contract for Science", *Science*, Vol 279, 23 January 1998

Michael Gibbons: "Science's new social contract with society", *Nature* 402/1999.

- ➔ Society "speaks back" to science
- ➔ "Socially robust" knowledge



Important steps towards the present situation 1

- The atomic bomb
- The Pugwash declaration initiated by Bertrand Russell and Albert Einstein
- Letters to the United Nations by Albert Einstein (1947) and Niels Bohr (1950)



PBS
HOLLYWOOD PRESENTS

starring

Stephen Rea

Daniel Craig

and Francesca Annis

COPENHAGEN

DVD



Important steps towards the present situation 2

Experiments carried out by Nazi doctors in concentration camp during World War II

- Freezing / Hypothermia
- Genetics
- Infectious Diseases
- Interrogation and Torture
- Killing / Genocide
- High Altitude
- Pharmacological
- Sterilization
- Surgery
- Traumatic Injuries



- World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects (originally 1964, with later revisions)
- Key term: informed consent
- Can be downloaded from: <http://www.wma.net/e/policy/b3.htm>



The Wannsee Conference 20 Jan. 1942: “Die Endlösung” (the “Final Solution”)



The participants:



7 (out of 15) of the participants had a doctoral degree.



Guidelines for research ethics in science and technology

Prepared by The National Committee for Research Ethics in Science and Technology (NENT)



The overriding obligations of research

1. Research must be conducted in accordance with human rights.
2. Research must be conducted in accordance with sustainable development and respect for the environment.
3. Research must promote peace.
4. Research must promote and take part in the development of democracy.
5. Research must promote greater global justice in the distribution of wealth through the spread of information.



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Research results and their usage must be shared in their entirety to society at large, both nationally and internationally and with developing countries in particular. Information about research must in principle be made accessible to all. Researchers have an ethical responsibility to spread information to disadvantaged countries, interest groups and concerned parties when such information may make a difference in rectifying an imbalanced distribution of wealth.



6. The researcher and the research institution are responsible for exercising honest research practices.

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This entails that:

a) Researchers and research institutions do not accept scientific fraudulence, either in the form of forgery, manipulation or the selective presentation of data from research conducted by themselves or others.

b) Researchers and research institutions do not tolerate plagiarism of research.



c) Researchers and research institutions make data accessible to others for verification within a certain period of time.

d) Researchers present research done by others in a balanced and honest manner.



Types of scientific misconduct

- Fabrication: making up data
- Falsification: manipulating data
- Plagiarism
- Ghostwriting
- Honorary authorship



Some recent examples of scientific misconduct

- Jan Hendrik Schön (Germany): condensed matter physics and nanotechnology
- Hwang Woo-suuk (South Korea): stem cell research
- Jon Sudbø (Norway): cancer research



8. The researcher must respect the contributions of other researchers and follow standards for authorship and cooperation.

The researcher should follow good publication practice. Honorary authorships are unacceptable. Rightful authorship is considered to be defined by three criteria:

- a) All the authors must have made a significant and directly academic contribution to at least two of the four components of a typical research project:
 - i. Concept or design
 - ii. Data collection and processing
 - iii. Analysis and interpretation of data
 - iv. Written formulation of substantial parts of the work



b) Secondly, all the authors should have critically read through the different drafts and approved the final version.

c) Thirdly, all the authors should be capable of defending the work in its entirety (though not necessarily all the technical details).



The Vancouver guidelines

- Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication
- Can be downloaded from <http://www.icmje.org/>



Daniel Sarewitz: *Frontiers of Illusion. Science, Technology, and the Politics of Progress* (1996)



From the table of contents

Chapt. 2. The Myth of Infinite Benefit

Chapt. 6. The Myth of the Endless Frontier
– Endless Frontier, Finite Earth

Chapt. 8. Science as a Surrogate for social Action



Sarewitz's conclusion

The scientific and technological development has not fulfilled the expectations created by Vannevar Bush's report.





Two obstacles:

- The world is finite
- The world is complex

Therefore, it is important to recognize

- limits
- uncertainty



10. The researcher must clarify the degree of certainty and precision that characterizes the research results. In particular, the researcher must take care to clarify the relative extent of the results' certainty and validity, as well as to indicate any elements of risk or uncertainty that may be significant for possible uses of the research results.

Researchers are traditionally accustomed to presenting knowledge demands critically and in context. Researchers are not as accustomed, however, to presenting elements of risk and uncertainty.

Instead of a conclusion

From Vannevar Bush: *Science: The Endless Frontier* (1945)

to

Barry Commoner: *Making Peace with the Planet* (1990)



This semester the course had the following modules:

Kuvvet Atakan: Living with a constant earthquake threat: the earthquake risk in Istanbul

Ragnar Fjelland: Classics in the philosophy of science: Karl Popper

Ragnar Fjelland: Classics in the philosophy of science: Thomas Kuhn

Matthias Kaiser: Risk and the Precautionary Principle

Matthias Kaiser: Values and Governance of Science and Technology (Value Isobars)

Alessandro Rossini: Computer Science and Society

Roger Strand: Concepts of Probability

Roger Strand: Ethical and social aspects of bio- and nanotechnology



Essay

1. Give a short description of your own field and your own doctoral project. A non-specialist should be able to understand the description. (You may use the one you wrote for the first assignment, or a modified version of it.)
2. Find a problem (or a few related problems) from your project/field that corresponds to a problem addressed in one or more texts in the reader. It may, for example, be the question of what is real, uncertainty, simplicity-/complexity, ethical problems, science/society etc. Give a description of the problem.
3. Give a summary of the relevant text(s) in the reader, concentrating on the problem you have selected.
4. Relate this to your own project, and discuss similarities and differences between the two.



Requirements: Approx. 5 pages, 10.000 char., 1800 words

You are free to search the Internet or use any available source. But always refer to your sources, and if you quote, always insert quotation marks. However, do not use too much time putting together fragments from various sources. The texts in the reader should offer sufficient material for you to complete the essay successfully.

If you search the Wikipedia, you will find the following description of an essay: "An essay is usually a short piece of writing. It is often written from an author's personal point of view. Essays can be literary criticism, political manifestos, learned arguments, observations of daily life, recollections, and reflections of the author." Therefore, a personal style is not only permitted, but encouraged. The four points above are meant as a guideline for the organization of the essay. However, you are free to organize it in a different way if you find it more convenient.



- Vannevar Bush: “Science: The Endless Frontier” (1945), letter of transmittal and President Roosevelt's letter to Bush, retrieved from <http://www.nsf.gov/od/lpa/nsf50/vbush1945.htm>
- Michael Gibbons: “Science's new social contract with society”, *Nature* Vol 402, Supp, 2. December 1999: C81 – C84.
- John Ziman: “Why must scientists become more ethically sensitive than they used to be?”, *Science* Vol 282/1998: 1813
- Robert May: “Risk and uncertainty”, *Nature* 411/2001: 891
- The National Committee for Research Ethics in Science and Technology (NENT): Guidelines for research Ethics in Science and Technology.
- Ragnar Fjelland: “Facing the Problem of Uncertainty”, *Journal of Agricultural and Environmental Ethics* 15/2002: 155 – 169.
- Beverly Paigen: “Controversy at Love Canal”, *The Hastings Center Report*, June 1982: 29 – 37.
- Robert May: “The Best Possible Time to be Alive: The Logistic Map”, in Graham Farmelo (ed.): *It Must Be Beautiful. Great Equations of Modern Science*, London: Granta Books 2003: 28 – 45.
- Robert Crease: “This is your philosophy”, *Physics World*, April 2002: 15 – 17.
- Ernst Mayr: *What Makes Biology Unique?*, chapt. 4, “Analysis or Reductionism?”, Cambridge: Cambridge Univ. Press 2004: 67 – 82.
- Henry Pollack: *Uncertain Science...Uncertain World*, chapt. 7, “I'm not quite sure how this works...”, Cambridge: Cambridge Univ. Press 2003: 105 – 125.



Evaluation spring semester 2010

Would you have taken the course if it had been voluntary?

Yes: 14

No: 23

Undecided: 2

If your answer is "no": According to what you know now (after having attended the lectures and read some of the literature), would you have taken the course?

Yes: 19

No: 3

Undecided: 3

To be more specific: Did you find the course interesting?

Yes: 39

No: 0



What do you think of the general approach of the course (selection of topics)?

Good: 35

Bad: 1

Did you find the lectures clarifying?

Yes: 37

No: 1

The seminars have been a mixture of discussions in small groups and public discussion. Do you think it works?

Yes: 37

No: 2

