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# Ethics in Research

University of Toronto  
Faculty of Applied Science  
and Engineering



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# Topics

1. Problem Statement
2. Definitions
3. Best Practices and Cases
4. Conclusion
5. For Further Reading



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# 1. Problem Statement

## 1.1 The Need

Our publics - the general public, our employers, our peers - expect us to conduct our research endeavours with integrity. If we are to pursue our research objectives freely, without regulation, we must adhere voluntarily to a code of ethics.

Failure to do so could lead to funds drying up, inability to attract and retain the best researchers and, rejection of our work by our peers at other institutions.

☑ *We need a Framework for Ethics in Research*



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# 1. Problem Statement

## 1.2 University of Toronto Policy\*

“ . . . the principle of academic freedom which allows faculty, students and staff, without fear of reprisal, to pursue questions and disseminate conclusions that may be contentious or controversial and enjoins us to foster open debate of all sides of an issue or question.”

“The complexity of our research environment also enjoins on us exceptional self-consciousness and self-scrutiny in relation to research ethics and research integrity . . .”

\**Stepping UP: 2004 - 2010*, Companion Paper 2, *Enabling research* Sect. B. *Context: The complexity of our research environment*; Office of VP and Provost, approved UoT Governing Council, 11/02/04.



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# 1. Problem Statement

## 1.3 Legal Perspective\*

“...integrity must not only be done, it must be seen to be done. As idealistic as the vision sounds, it is nonetheless perfectly realistic to expect that the intellectuals who work in universities, the people who by choosing academe have signaled a lifetime loyalty to the power and wonder of the mind, will continue to accept, as most of them always have, that whatever they do as members of the university community, they are obliged to do with integrity... I genuinely think that to a remarkable degree, given the economic, social and political pressures exerted on universities, there remains on the part of the majority of their members a commitment to principles of decency and its spiritual ancestor, integrity.”



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\* The Honourable Madam Justice Rosalie Abella,  
Court of Appeal of Ontario, 1995. See also ref. 5.2

# 1. Problem Statement

## 1.4 The Quandary

- Openness and creativity must flourish in the research environment for innovative science and engineering to occur.
- True innovation can lead to:
  - a higher academic degree
  - promotion
  - profits to be shared by all of those involved
  - recognition, even fame and fortune
- Unethical behaviour can cancel out all of this.








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## 2. Definitions


### 2.1 Research and Development



*“Research and development (R&D) is systematic investigation carried out in the natural and engineering sciences by means of experiment or analysis to achieve a scientific or commercial advance.”*



*“Research is original investigation undertaken on a systematic basis to gain new knowledge.”*



*“Development is the application of research findings or other scientific knowledge for the creation of new or significantly improved products or processes which represent an improvement in the ‘state of the art’ and are likely to be patentable.” (1)*

1 Statistics Canada, Cat. No. 88-202; page 45



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## 2. Definitions

### 2.2 Applied Ethics (non philosophers)

- Set of principles of morals, of “virtues”<sup>(2)</sup>
- Rules of (moral) conduct
- Proper, fair behaviour when dealing with others<sup>(3)</sup>



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2 Oxford Concise Dictionary

3 Applied Ethics; a Third Millenium Approach; IEEE Spectrum, Nov., 2000



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## 2. Definitions

### 2.3 Misconduct (examples)

- Screening or falsification of data and/or research results - fraud, lack of skepticism (Schon example\*)
- Plagiarism (IEEE example)
- Breach of confidentiality (Olivieri example\*)
- Misleading publication or authorship (example\*)
- Denying authorship/inventorship (example\*)
- Inappropriate co-authorship (NSPE example)
- Republication of research works without prior referencing
- Misappropriation of funds or resources
- Conflict of interest (example\*)



# 3. Best Practices

## 3.1 Golden Rule

- Do unto others as you would have them do to you.<sup>(4)</sup>

## 3.2 Golden Practice and Corollary

- Good morals build good morale.
- The path of unprincipled ethics leads to shunning, misconduct proceedings, dismissal, unemployment and isolation.



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# 3. Best Practices

## 3.3 Data Handling and Research Results Case

- D&K <sup>(5)</sup> make measurements on a new material using an expensive neutron source.
- Data fits a newly proposed theory if 2 out of 8 data points are left out.
- Power fluctuations were noted in neutron source.

Q1: How should data from two suspected runs be handled? Omit?

Q2: Should all data be used in tests of statistical significance?

Q3: How resolve?



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# 3. Best Practices

## 3.4 Plagiarism, Breach of Confidentiality and Theft of Intellectual Property

Use of another's work without permission and/or acknowledgment. Avoidance strategies:

- Establish trust with your colleagues, visitors
- Document your own creative moments
- Document meetings: who, where, when, what, outcomes, actions to be taken
- Understand essence of disclosure
- Use non-disclosure agreements as appropriate
- Make out formal Disclosures as appropriate
- Carry your notebook with you
- Use encryption and password protection as appropriate
- Lock up your IP assets
- Be prepared to whistle-blow



# 3. Best Practices

## 3.5 Disclosure<sup>(6)</sup>

### Background

- What is the field or art to which the invention applies?
- Problem solved; history of prior art attempts to solve
- Deficiencies in prior art; improvements claimed; limitations extended

### Description

- “Invention” with drawings, diagrams etc.
- Witnessed, i.e. read and understood
- Dated and correlated

### Related claims

- Derivatives

### Commercial potential

- Applications
- Competitive products or processes
- Obstacles (Devil’s Advocate perspective)

### Publications

- Public disclosure

### Funding and Contractual Rights

- Prior rights





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# 3. Best Practices

## 3.6 Conflict of Interest Case

- Assistant Professor A. presents work in progress, and obstacles faced, at an open, department-wide seminar.
- Professor A. notes that work is supported in part by Company B.
- Graduate student G. who works with Professor H. (not present) sees a solution.
- Professor H. consults to a competitor in the same field.

Q1: How should G. participate in the seminar?

Q2: What, if, to whom and when should G. say anything?

Q3: What are the implications on openness?



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# 3. Best Practices

## 3.7 Joint Authorship

- Assistant Professors A and B must publish scholarly articles regularly for promotion.
- A offers B privilege of collaborating on updating and submitting an unpublished paper based on A's graduate research in order to increase joint promotion. B's contributions were minimal.
- The paper was peer-reviewed and published.

Q1: Was it ethical for A to use previous work to demonstrate current productivity?

Q2: Was it ethical for B to accept credit for content development?

Q3: Was it ethical for A to include B as coauthor?



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# 3. Best Practices

## 3.8 Credit Where Credit is Due Case

- Masters grad student G. presents a poster at a conference describing a new test for toxicity in water by presenting samples to animal cell cultures.
- Poster judge Professor A. from another university quizzes G. extensively, and then invites G. to take a PhD with him.
- Professor A. publishes a paper on a continuous water feed capillary bio-reactor which evaluates cultured cell metabolism. G. is not referenced.

Q1: Does G. have any way of receiving credit for this work?

Q2: Should G. contact Professor A. and claim recognition?

Q3: What should G. have done and should do?

# 3. Best Practices

## 3.9 Co-invention

- PhD chemistry grad student A. develops a new protocol and a novel fixture for drawing and loading micro-electrodes. A Disclosure is submitted and the fixture is judged worthy of submission for a provisional patent.
- Fellow mechanical grad student B notes that the fixture is heavy, awkward, difficult to fabricate and may not be marketable. He sketches out a vastly superior design, and expresses interest in helping commercialization.
- In appreciation, A includes B as co-inventor.

Q1: Does B have any co-invention rights?

Q2: Should A have incorporated B's ideas in his patent filing drawings?

Q3: What rights does B have?



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## 3. Best Practices

### 3.10 Know and Confirm the Rights and Obligations of Yourself, Your Peers, Your Employer

Issues: Too much misconduct is based on ignorance. Ignorance is not a defence for professionals in a court of law.

Avoidance: Understand the perspective and potential claims of all parties.

Example: Dr. Olivieri re confidentiality



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## 4. Conclusion

- The Faculty of Applied Science and Engineering must create and maintain an environment in which high ethical standards are pervasive.
- Good ethics in research result from using best practices.
- The ethical standards of the Faculty are only as good as the performance of the weakest member - students or staff.



Be professional; know and practice good ethics in your research, and in your life practice.



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# 5. For Further Reading

- 5.1 **Integrity in Research and Scholarship**  
Policy at [www.nserc.ca/pubs/intback.htm](http://www.nserc.ca/pubs/intback.htm)  
Statement in ISBN No. 0-662-60220-X, Cat. No. CR22-29/1/1994
- 5.2 **AUCC Joint Workshop**  
Conference report at [www.nserc.ca/pubs/report.htm](http://www.nserc.ca/pubs/report.htm)
- 5.3 **Applied Ethics**  
W. Maurice Young Centre for Applied Ethics, at UBC  
[www.ethicsweb.ca/resources/sci-tech](http://www.ethicsweb.ca/resources/sci-tech)
- 5.4 **The Concordia University Controversy (Valery Fabrikant)**  
[www.adm.uwaterloo.ca/infoipa/old.html](http://www.adm.uwaterloo.ca/infoipa/old.html) (three papers)
- 5.5 **IEEE Code of Ethics**  
[www.ieee.org/about/whatis/code.html](http://www.ieee.org/about/whatis/code.html)
- 5.6 **The Online Ethics Center for Engineering & Science**  
[www.onlineethics.org](http://www.onlineethics.org)
- 5.7 **On Being a Scientist;**  
National Academy Press, Washington 1995
- 5.8 **Science and Engineering Ethics**  
On-line Journal, Opragen Publications, Guildford, Surrey, UK



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