

Ethics Discussion

“The only ethical principle which has made science possible is that the truth shall be told all the time. If we do not penalize false statements in error, we open up the way, don’t you see, for false statements by intention. And of course a false statement of fact, made deliberately, is the most serious crime a scientist can commit.”

Baron Charles Percy Snow, *The Search*, Charles Scribner’s Sons, New York, 1958 (original copyright 1934), p. 273.

1.0 Expected Learning Outcomes

- Understand the ethical standards expected in performing and publishing scientific research.
- Understand the importance of following ethical standards both personally and for the benefit of the broader scientific community.
- Examine several case studies to determine how these standards could be applied to sample ethical questions.

2.0 Grading

- The pre-class quiz on ethics – 30 pts.

Note: that this may look like a regular reading quiz, but it goes well beyond a reading quiz. It is intended to get you started thinking about ethical questions before the class discussion.

- Participation in the class ethics discussion – 60 pts.

3.0 Introduction

To introduce the ethics discussion you can first see [Calvin’s ethics dilemma \(15 September 2013\)](#) (that’s Calvin of Calvin and Hobbes). Or, from the scientific standpoint, you may want to learn about [the great mathematician Lobachevsky as told by Tom Lehrer](#). After you view the video, you should probably look up Lobachevsky on Wikipedia. He was a very accomplished mathematician.

Ethics is a difficult, and quite serious, topic. Even being accused of unethical behavior can haunt you for the rest of your life thanks to the infinite memory of the Internet.

Ethical decisions are not as simple as one might imagine. For instance, in the BYU Studies article “[Moral Choices and their Outcome](#)” (BYU Studies, v. 30, no. 2, pp. 17-31, 1990, <https://byuscholarsarchive.byu.edu/byusq/vol30/iss2/3/>), William R. Swinyard and Thomas J. DeLong discuss the differences in the basis of moral choices between students at BYU and those at the National University of Singapore. The effect of cultural differences is quite pronounced. And yet we try to define what constitutes ethical behavior for scientists on a worldwide basis.

4.0 Ethics resources

The following references are intended to give a basis for scientific ethics from a variety of viewpoints. Several of them are statements from particular scientific societies regarding what they consider ethical behavior. Others are articles discussing the question.

Since this is a physics class, I would recommend that you review two of these in particular.

- [APS Guidelines for Professional Conduct](http://www.aps.org/policy/statements/02_2.cfm) (http://www.aps.org/policy/statements/02_2.cfm) is a short statement adopted by the American Physical Society regarding scientific, and specifically publishing ethics. It is closely related to the statement by the American Institute of Physics and the American Geophysical Society.
- [Ethics resources from the American Physical Society](http://www.aps.org/programs/education/ethics/resources.cfm) (<http://www.aps.org/programs/education/ethics/resources.cfm>) contains links to books and studies on ethics. Probably the most useful for a student is the “[Ethics Case Studies](http://www.aps.org/programs/education/ethics/)” (<http://www.aps.org/programs/education/ethics/>) that illustrate some of the ethical dilemmas you may encounter both as a student and as a scientist.

For those in other fields of science, the following professional ethics statements may also be of interest.

- [Statement of ethics and responsibilities of authors submitting to AIP Journals](http://publishing.aip.org/researchers/policies-and-ethics/) (<http://publishing.aip.org/researchers/policies-and-ethics/>).
- [Professional and ethical standards for the AAS \(American Astronomical Society\) journals](http://journals.aas.org/policy/ethics.html) (<http://journals.aas.org/policy/ethics.html>).

- [Online Ethics Center for Engineering and Science](http://www.onlineethics.org) at the National Academy of Engineering (<http://www.onlineethics.org>).
- [American Mathematical Society Policy Statement on Ethical Guidelines](http://www.ams.org/about-us/governance/policy-statements/sec-ethics) (<http://www.ams.org/about-us/governance/policy-statements/sec-ethics>)
- [The ACM \(Association for Computing Machinery\) Code of Ethics and Professional Conduct](http://www.acm.org/code-of-ethics) (<http://www.acm.org/code-of-ethics>)
- [Ethical Guidelines for Statistical Practice](https://www.amstat.org/asa/files/pdfs/EthicalGuidelines.pdf) (<https://www.amstat.org/asa/files/pdfs/EthicalGuidelines.pdf>)
- [IEEE \(Institute of Electrical and Electronics Engineers\) Code of Conduct](http://www.ieee.org/about/ieee_code_of_conduct.pdf) (http://www.ieee.org/about/ieee_code_of_conduct.pdf)
- [ASME \(American Society of Mechanical Engineers\) Code of Ethics of Engineers](https://www.asme.org/wwwasmeorg/media/ResourceFiles/AboutASME/Get\%20Involved/Advocacy/Policy-Publications/P-15-7-Ethics.pdf) (<https://www.asme.org/wwwasmeorg/media/ResourceFiles/AboutASME/Get\%20Involved/Advocacy/Policy-Publications/P-15-7-Ethics.pdf>).
- [AGU \(American Geophysical Union\) Scientific Integrity and Professional Ethics](http://ethics.agu.org/files/2013/03/Scientific-Integrity-and-Professional-Ethics.pdf) (<http://ethics.agu.org/files/2013/03/Scientific-Integrity-and-Professional-Ethics.pdf>).
- [American Chemical Society, The ACS Style Guide, Chapter 1, “Ethics in Scientific Publication”](https://pubs.acs.org/doi/pdf/10.1021/bk-2006-STYG.ch001) (<https://pubs.acs.org/doi/pdf/10.1021/bk-2006-STYG.ch001> or <https://doi.org/10.1021/bk-2006-STYG.ch001>)

The remaining references may help to illustrate some of the concerns regarding scientific ethics and some possible responses to observed ethical concerns.

- The National Academies of Sciences has released several books on ethics in science in both print and electronic form. These include:
 - *Fostering Integrity in Research* (2017). This can be downloaded from <https://www.nap.edu/catalog/21896/fostering-integrity-in-research>.
 - *On Being A Scientist: A Guide to Responsible Conduct in Research: Third Edition* (2009). A PDF version can be downloaded from <https://www.nap.edu/catalog/12192/on-being-a-scientist-a-guide-to-responsible-conduct-in>.
 - *Integrity in Scientific Research: Creating an Environment That Promotes Responsible Conduct* (2002). Download the PDF from <https://www.nap.edu/catalog/10430/integrity-in-scientific-research-creating-an-environment-that-promotes-responsible>.

- *Responsible Science, Volume 2: Background Papers and Resource Documents* (1993). This can be downloaded from <https://www.nap.edu/catalog/2091/responsible-science-volume-ii-background-papers-and-resource-documents>.
- *Responsible Science, Volume 1: Ensuring the Integrity of the Research Process* (1992). Download this from <https://www.nap.edu/catalog/1864/responsible-science-volume-i-ensuring-the-integrity-of-the-research>.
- [Ethics and the Welfare of the Physics Profession](#), *Physics Today* **57**(11), 42, 2004 (<https://doi.org/10.1063/1.1839376>).
- [An interesting opinion on “scientific misconduct”](#) by David Goodstein, published in *APS News*, June 2010, v. 19, no. 6 (www.aps.org/publications/apsnews/201006/backpage.cfm).
- [Who Owns a Scientist’s Mind?](#), *Physics Today*, 71(7) 42 (2018) (<https://doi.org/10.1063/PT.3.3972>).
- [A Retraction: We Gave Bad Advice](#), an article by Adam Marcus and Ivan Oransky on what to do if you suspect scientific misconduct. This is actually a retraction of a previous article “How to Report Alleged Scientific Misconduct” (http://www.labtimes.org/labtimes/ranking/dont/2015_06.lasso).
- [The European Code of Conduct for Research Integrity](#) (http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf).
- [Self-plagiarism case prompts calls for agencies to tighten rules](#), Eugenie Samuel Reich, *Nature* **468**, 745, 2010 (<https://doi.org/10.1038/468745a>).
- [Ethics in Engineering](#), an article by Eric Butterman at the American Society for Mechanical Engineering (<https://www.asme.org/engineering-topics/articles/engineering-ethics/ethics-in-engineering>).
- [An interactive video produced by the Health and Human Services Office of Research Integrity](#) (<http://ori.hhs.gov/TheLab/>). You get to make decisions in the position of Research Integrity Officer, Graduate Student, Postdoc, or Principal Investigator and see what the outcomes of those decisions are.

And two references from the journal *Applied Physics* giving examples of a retraction and an erratum for previously published work.

- [Retraction: “Nucleation-controlled low-temperature solid-phase crystallization for Sn-doped polycrystalline-Ge film on insulator with high carrier mobility \(\$\approx\$](#)

550 cm²/Vs)” [Appl. Phys. Lett. 112, 242103 (2018)] (<https://doi.org/10.1063/1.5046407>), a retraction of an earlier article because some experimental mistakes rendered the results and conclusions incorrect.

- **Erratum:** “Insights into collaborative separation process of photogenerated charges and superior performance of solar cells” [Appl. Phys Lett. 109, 043906 (2016)] (<https://doi.org/10.1063/1.5046186>), an erratum indicating that the authors and collaborators had published three closely-related papers at nearly the same time including duplication of one figure and significant similarities in the samples. They apologized for improperly dividing the work between several publications which is “...not in the best interest of readers...” (quoted from the last sentence of the author’s statement).

If you are curious about other fields, Dallin H. Oaks gave a speech at the beginning of the third year of the BYU Law School’s existence. It was titled “[Ethics, Morality, and Professional Responsibility](#)” (BYU Studies, v. 16, no. 4, pp. 507-516, 1976, <http://scholarsarchive.byu.edu/byusq/vol16/iss4/7/>).

It is a very enlightening view of what should be expected in the legal profession.

The Business Ethics group at BYU has developed the book *The Business Ethics Field Guide: The Essential Companion to Leading Your Career and Your Company to Greatness*, by Brad Agle, Aaron Miller, and Bill O’Rourke. They discuss a broad range of typical ethical problems that can arise in business. Many of these are also a problem in the STEM fields. Their list of 13 common ethical problems (essentially the Table of Contents for the book) can be found at <https://www.ethicsfieldguide.com/pages/about-us>.

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