

# Science: Ethics and Code of Conduct

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Prepared for the incoming graduate  
class in the Department of Chemistry  
at Wayne State University

*S. L. Brock*

## Some Definitions...

(From *MISCONDUCT IN SCIENCE: DO SCIENTISTS NEED A PROFESSIONAL CODE OF ETHICS?* Vincent N. Hammer  
[http://www.chem.vt.edu/ethics/vinny/www\\_ethx.html](http://www.chem.vt.edu/ethics/vinny/www_ethx.html))

“Professional Ethics refers to those principles that are intended to define the rights and responsibilities of scientists in their relationship with each other and with other parties including employers, research subjects, clients, students, etc.”

(R. Chalk, M.S. Frankel, and S.B. Chafer. *AAAS Professional Ethics Project*. American Association for the Advancement of Science, 1515 Massachusetts Ave. NW, Washington, D.C. 20005. AAAS Publication 80-R-4. 1980.)

“**1** ...the discipline dealing with what is good and bad and with moral duty and obligation **2 a:** a set of moral principles and values **b:** a theory or system of moral values **c: the principles of conduct governing an individual or a group.**”

(*Webster's New Collegiate Dictionary*. Springfield, Mass.: G. & C. Merriam Company. 1975)

**Aspects of the Chemist's Code of Conduct** (American Chemical Society,  
<http://chemistry.org/portal/Chemistry?PID=acsdisplay.html&DOC=membership%5Cconduct.html>)

• ***The Science of Chemistry***

Chemists should seek to advance chemical science, understand the limitations of their knowledge, and respect the truth.

Chemists should ensure that their scientific contributions, and those of the collaborators, are thorough, accurate, and unbiased in design, implementation, and presentation.

• ***The Profession***

Chemists should remain current with developments in their field, share ideas and information, keep accurate and complete laboratory records, maintain integrity in all conduct and publications, and give due credit to the contributions of others.

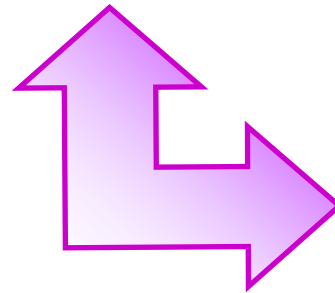
Conflicts of interest and scientific misconduct, such as fabrication, falsification, and plagiarism, are incompatible with this Code.”

## Scientific Misconduct:

Falsification: changing data

Fabrication: making up data

Plagiarism: using words or ideas  
without proper attribution



Lying

Cheating

Copying

# Falsification

Simple Definition: *Changing of data or making up data*

On the surface this looks like an obvious no-no...but what about data processing (smoothing, averaging, etc.)? Is this falsification too?

*Answer: Maybe!*

How do you distinguish between noise and signal? How do you decide how many points to leave out or include?

Use means of data manipulation that are accepted and appropriate. The most important thing is never to compromise the integrity of the data and to be appropriately critical. Be prepared to show and defend unprocessed data—never, NEVER, force the data to give the answer you are looking for! The most exciting results in science frequently come as a surprise.

RESEARCH INTEGRITY:

## **Pioneering Physics Papers Under Suspicion for Data Manipulation**

Robert F. Service

Recent discoveries at Bell Laboratories--the research arm of Lucent Technologies in Murray Hill, New Jersey--said to be of Nobel quality suddenly became mired in questions last week. Outside researchers presented evidence to Bell Labs management on 10 May suggesting possible **manipulation of data** involving five papers published in *Science*, *Nature*, and *Applied Physics Letters* over 2 years...The astounding results prompted groups around the world to attempt to replicate the work. But to date, although other researchers have made some progress, no one has reported duplicating any of the high-profile results.

*From: Science 296: 1376-1377 (News of the Week).*

# Fabrication

Fabrication: Making up data

Inexcusable under any conditions...even if you “know” what the result of an experiment will be, you can only report actual data

People who have fabricated data often report they felt great pressure to produce results.

If you feel under too great a pressure, you need to seek ways to alleviate it and/or seek a different kind of position – allegations of fabrication can ruin your career!

SCIENTIFIC MISCONDUCT:

## **Psychologist Made Up Sex Bias Results**

**Constance Holden**

The career of a promising young social psychologist lies in ruins following her admission that she "fabricated" five experiments on social discrimination that she conducted while at Harvard University... the Office of Research Integrity of the Department of Health and Human Services announced that Karen Ruggiero "engaged in scientific misconduct by fabricating data in research supported by the National Institutes of Health." "...In addition to retracting four published studies, Ruggiero is banned from receiving federal research funds or serving on government advisory committees for 5 years...Harvard psychologist Herbert Kelman says Ruggiero's admission of misconduct "came as a complete shock." He characterizes her as "very well organized, very hard-working. ... In some respects quite a perfectionist."

From: Science Magazine, Volume 294, Number 5551, Issue 21 Dec 2001, p. 2457.



# Plagiarism

Plagiarism is the use of someone else's words or ideas without proper acknowledgement

All research is based on a foundation of scientific knowledge

Anytime you write about this knowledge, you must cite the source unless the information is common knowledge

“you find the same information undocumented in at least five other sources,” or “you think a person could easily find the information with general reference sources.”

(OWL at Purdue University: Avoiding Plagiarism: Printable Handouts, [http://owl.english.purdue.edu/handouts/research/r\\_plagiar.html](http://owl.english.purdue.edu/handouts/research/r_plagiar.html))

# Rules for Avoiding Plagiarism

## Exact words vs. ideas

When you cite someone's ideas, they should be paraphrased or summarized (i.e. rewritten in your own words). The citation source should be provided.

Any time you use exact words or phrases from the citation they must appear in quotation marks. Again, cite the source.

Source: The artist employed myriad colors to illustrate the transformation from the dream world to reality

Correct usage: “myriad colors” were used by the painter to show the “transformation from the dream world to reality” (S. L. Brock)

# Mosaic Plagiarism

Changing a few words or slightly reworking sentences or paragraphs does not make a true paraphrase!

Source: The artist employed myriad colors to illustrate the transformation from the dream world to reality

Plagiarism: The painter used many colors to show the change from the imaginary world to actuality (S. Brock)

Although the words have been exchanged for similar words, the sentence structure is the same. Even though the original author is credited, this text is too close to the original to be a paraphrase!

Correct usage: Color can be an way to show transitions, and in this case, the painter uses it to show where fiction ends and reality begins (S. Brock)

Both the words and sentence structure have been significantly altered. This is a true paraphrase.

# Is it possible to plagiarize your own words?

Self-plagiarism (academic) is when you publish the same work and/or submit the same work for credit in two different classes

In the case of published work, copyright infringement issues take over:

Publication typically involves transferring copyright to the publisher (with the stipulation that it isn't being submitted elsewhere simultaneously). Once the transfer is effected, "your words" belong to the publisher. Recycling of paragraphs or phrases from your published work becomes copyright infringement!

# Consequences of Dishonesty

-Loss of integrity for yourself, and your institution

Response from a case at Piper High School in Kansas, where 28 students were given a failing grade for plagiarism, then had their grades reversed after complaints from parents

**“At out-of-town basketball games last month, Piper students were greeted with a sign that read "plagiarists," and a few students wore T-shirts that called them cheaters, Sigwing said. Some complain crowds at games have chanted "Cheaters! Cheaters!"**

**A college-educated woman who graduated from Piper six years ago recounted that she was told by a potential employer at a job interview, "You didn't get any kind of education, did you?"**

**The cheating questions prompted all 12 deans of Kansas State University to lecture school board members in a letter that said, "we will expect Piper students ... to buy into (the university's honor code) as part of our culture." “**

From: CNN.com, “Plagiarism case bedevils Kansas school”, March 19, 2002

# Consequences of Dishonesty

-Negatively impact the personal and professional lives of others

**Enron saw its fate and stock price plummet when the firm, with \$62.8 billion in assets, acknowledged several hundred million dollars of previously undisclosed liabilities. Thousands lost their pensions and life savings in Enron's swift collapse, which culminated December 2, 2001, when it filed for Chapter 11 bankruptcy protection.**

From: "Enron CEO touted company's stock in Sept. chat", CNN, January 19, 2002

# What kind of response to dishonesty can you expect at Wayne State?

- Down-grading of your score (even to a failing grade).
- Reporting of incident to your research advisor
- Letter of incident placed in your academic file
- Reporting of incident to departmental chair, college dean, etc.
  - Investigation at departmental, college, or University level.  
Possible outcomes:

➤ **dismissal of allegations**

➤ **expulsion from the University**

# What is Considered Dishonest Behavior During Exams and Cumes?

1. Talking during the exam
2. Wandering eyes-looking at other people's exams
3. Passing notes to other students
4. Consulting notes you have made prior to the exam

Any of these can earn you a fail on an exam and possible expulsion—it is essential to avoid even the appearance of impropriety!



# Whistleblower vs. Tattletale

Recognizing that the consequences of misconduct effects us all, what is our obligation if we become aware of inappropriate behavior?

It is essential to bring such concerns to the awareness of your colleagues and superiors. Ideally, those who have behaved inappropriately should be induced to come forward themselves

Although socially, we prefer to ‘mind our own business’ and do not want to be labeled as a ‘tattletale’, it is important to realize that the social demands of science obligate us act as a ‘whistleblower’ against scientific misconduct when we encounter it.

Remember, while you may be prepared to face the consequences of remaining silent for yourself, scientific misconduct hurts everybody.

# Accidental vs. Deliberate Dishonesty...

## Is it OK if you just didn't know better?

No: Our laws hold people liable for misconduct, whether they were aware of the law or not. (Besides, after this presentation we can say you do know better!)

## What about Negligence?

Misconduct due to negligence may seem more forgivable than deliberate misconduct, but it cannot be accepted either. Laziness is not compatible with the scientific method!

As scientists, we are expected to be critical of our results, and those of our peers. In order to do so, the methods employed must be rigorous and the data acquired with the greatest care. Only in this way can science advance in the search for truth.

# Openness in Science: Good for Everybody?

Science is a social activity, and its success depends on the free exchange of information.

This has been facilitated through the publication process, and credits for discovery are attributed not to the first to do the work, but the first to publish the work. In cases where there is intellectual property that is of potential financial value, patents serve the same purpose.

Nevertheless, there are still stories of ideas being stolen and credit taken from the works of others, and this has induced some questionable protectionist activity: leaving out pertinent details in publications, falsifying data to put people on the wrong track, etc. Many of these activities fall under our notions of scientific misconduct, or are at least on the border-line of being so.

# How to balance the need to share and the need to protect one's intellectual property?

Many of the protectionist activities are at least as bad (or worse!) than activities perpetrated by others to steal ideas or credit.

As research is becoming more and more interdisciplinary, it is even more important to be able to share ideas freely in order for scientific knowledge to advance.

It is essential that as scientists we take a hard line against misconduct in any form, and that appropriate punishment is made where misconduct is evident.

# References & Resources

**For information on these and other ethical concerns (conflict of interest, attribution of credit) see:**

"On Being a Scientist: Responsible Conduct in Research, 2nd ed." National Academy of Sciences (<http://www.nap.edu/books/0309051967/html/index.html>)

"The Responsible Researcher: Paths and Pitfalls" and "Honor in Science" Sigma Xi (<http://sigmaxi.org/publications/descriptions.htm>).

Office of Research Integrity website (also has good information on how to handle allegations of misconduct) <http://ori.dhhs.gov/html/publications/guidelines.asp>

American Association for the Advancement of Science website and their Professional Ethics Report (<http://www.aaas.org/spp/dspp/sfrr/per1.htm>).

"Publication Ethics, Rights and Wrongs" S. K. Ritter, C&EN vol. 79 (46), November 12, 2001, pp. 24-31  
(<http://pubs.acs.org/isubscribe/journals/cen/79/i46/html/7946sci1.html>)

"Ethics in Science" (<http://www.chem.vt.edu/ethics/ethics.html>)

"Plagiarism Q & A" (<http://www.ehhs.cmich.edu/~mspears/plagiarism.html>)

## *Ethics in Science, Scenario #1*

You and your classmates are given a take-home exam as the final exam for a course. You are permitted to use your notes, the internet, any resources you can find, but you are not allowed to discuss the course or the exam with any of your classmates during the 48 hours that the exam is administered. To this effect, each student is asked to sign an affidavit verifying that they completed the exam without any assistance from their classmates. While working alone in the library, a classmate and friend approaches you and asks you if the answer to one of the questions is to be found in the text, and if so, can you give him/her a hint as to where?

Discussion points:

If you only tell the student where to find the answer in the text, is that really cheating? After all, you didn't give him/her any answers from your own work. If it is cheating, are you to blame too, or just your classmate?

If the Professor finds out about this activity, what is a reasonable punishment for your classmate and/or yourself? Does it make a difference that you signed the affidavit?

If you refuse to give your classmate the information, is he/she still guilty of cheating? Does it really take two to cheat, or is just the solicitation of information an act of dishonesty? Are you obliged to tell the Professor of this activity, and if so, should you encourage your friend to come forward, or go to the Prof yourself?

Is your classmate really your friend if he/she asks you to be dishonest, and perhaps suffer the consequences of dishonesty?

How do you feel about take-home exams? Are they just an invitation for students to cheat, or can students conduct them honestly? What other methods might be available to the Professor in lieu of a take-home exam, but still require students to think deeply about the course material? If students had known that the punishment for an act of dishonesty is to be removed from the graduate program, would that make them more honest, or just more sneaky?

## ***Ethics in Science, Scenario #2***

You are taking two classes simultaneously, both of which have a required writing assignment involving developing an independent research proposal. You come up with an idea that will work for both classes. You write a single proposal and submit it to each of the classes for credit. Because of time constraints, you copied verbatim, changing a word here and there, text from your supporting articles into the introductory section of the independent proposal.

Points for discussion:

Which is worse, self-plagiarism in the form of turning in the same proposal to two classes, or plagiarism of other people's work? Or are they equally bad?

What if you had re-written one of the proposals so that, while they both contained the same idea and data, the words themselves were different and significantly re-arranged. Is this still dishonest? Is it plagiarism?

Since you changed a few words in the passages you took from supporting articles, is it still plagiarism? Is it better or worse if you don't cite the article the words came from?

You were asked to write an "independent" proposal. Is there really such a thing? Is it possible to produce something new and creative, while at the same time basing it on existing knowledge? How do you decide where the line is drawn?

What should the punishment be for your actions? Does it matter whether you come forward yourself or someone else turns you in?

Supposing you never get caught, is anyone really hurt by your activity?

### *Ethics in Science, Scenario #3*

You have been working hard in the lab and have finally come up with some exciting results. Your research advisor has asked you to come up with a draft of a paper to submit to a prestigious journal. You plan on showing a spectrum that is the proof of your result. When you look through your data for an appropriate spectrum, you find that the clearest and most definitive spectrum is one for a different compound. You decide to use that spectrum in the paper, but write up the text as if it were for the compound under discussion.

Points for discussion:

If the spectra are really similar looking, does it matter that you didn't show the actual data? What if the compound is very similar to that being discussed in the paper? Does that make a difference?

Should you tell your advisor that you substituted one graph for another? Is it really their concern? Who does the data actually belong to: you, your advisor, the University?

What is the appropriate 'punishment' for this activity? Who should be punished? Who is ultimately responsible?

Suppose you had carelessly mislabeled your spectra, and that is how you managed to insert the incorrect spectra into the paper. Is this still a case of misconduct? How should it be handled?

What if you elect to smooth the data for the actual compound (which has a noisy spectrum) instead of substituting the other data? Is this OK? If so, under what conditions might it not be OK?

Which is more important, the integrity of the data itself, or the ability of the data to support your hypothesis?



### ***Ethics in Science, Scenario #4***

You are giving a poster on your research at a national American Chemical Society meeting. A professor approaches you and starts to ask many detailed questions about the work you are presenting. From his/her nametag, you recognize them as one of the main researchers in your area.

Points for discussion:

How can you tell if someone is asking you questions so that they can give you better advice, or if they are probing for information to advance a program they are working on? If they are probing for information to advance their own research, is that necessarily bad if you and him/her are working on different projects? Just because they are one of the main researchers in your area, are they necessarily a competitor?

If they start to tell you about a research hypothesis they are working on, and you have preliminary data to support their hypothesis, do you discuss it with them, or keep quiet? Do you believe the most important discoveries are made by individuals or by teams? How does this influence your decision to discuss the work?

What kind of questions can you ask to find out the nature of his/her interest in your research? Is it OK to give misinformation if you feel the person is a threat to your research project, i.e. they are likely to perform the experiments and publish the data themselves?

How much are you obliged to tell? If you aren't comfortable in revealing information beyond what appears on your poster, what is the appropriate response?