Scholarship Skills

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Science And Ethics

Feynman—"Cargo Cult Science"

1974 CalTech Commencement Address

But this long history of learning how to not fool ourselves—of having utter scientific integrity—is, I'm sorry to say, something that we haven't specifically included in any particular course that I know of. We just hope you've caught on by osmosis.

The first principle is that you must not fool yourself—and you are the easiest person to fool. So you have to be very careful about that. After you've not fooled yourself, it's easy not to fool other scientists. You just have to be honest in a conventional way after that.

Feynman (2)

I would like to add something that's not essential to the science, but something I kind of believe, which is that you should not fool the layman when you're talking as a scientist. I am not trying to tell you what to do about cheating on your wife, or fooling your girlfriend, or something like that, when you're not trying to be a scientist, but just trying to be an ordinary human being. We'll leave those problems up to you and your rabbi. I'm talking about a specific, extra type of integrity that is not lying, but bending over backwards to show how you're maybe wrong, that you ought to have when acting as a scientist. And this is our responsibility as scientists, certainly to other scientists, and I think to laymen.

Ethics

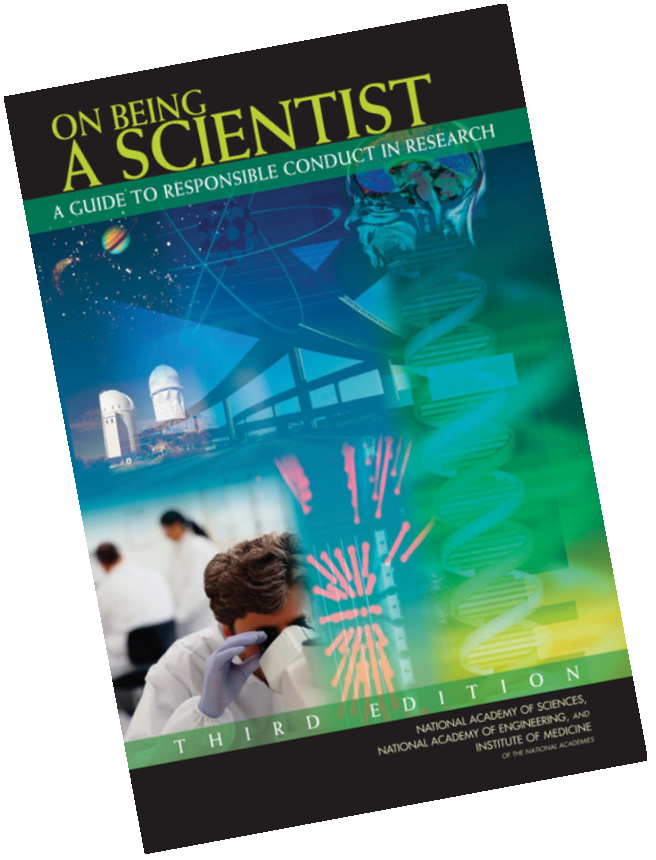
The current climate puts strong pressure on people to exaggerate results

- funding for research and development is shrinking in many areas
- more emphasis being placed on short-term benefits of results
- track record of proposer gaining more weight in evaluation

- Read: On Being A Scientist: Responsible Conduct In Research

On Being a Scientist: Responsible Conduct in Research
Committee on Science, Engineering, and Public Policy
National Academy of Sciences

– https://www.nap.edu/catalog/12192/on-being-a-scientist-a-guide-to-responsible-conduct-in



Contents

Conduct of Research

Do not interfere with the conduct of the work of others

Not okay to appropriate results from others without attribution

- if their results haven't been published, then you should get their permission

Should not hide or delay results unnecessarily

- But you are not compelled to divulge preliminary work
- May be agreements with employer or sponsor that provide them with first access

Do not attack the writings or results of another without clear, objective evidence

- It's always good to get advice here.

Errors

Errors are unavoidable in science and engineering

- Failure arising from carelessness, negligence, or failure to take reasonable precautions are largely judged the same as deliberate misstatements.
- Both are damaging to your reputation!
- Errors arising from good faith based upon the best information then available are often forgiven
- Sometimes errors arise from following standard practice, later shown to be flawed. We do the best we can.

Inappropriate Use of Statistical Methods

You should know if tests and data manipulations you apply are valid <u>for the data you are looking at.</u>

If you don't know for certain, ask

	Fred Meyer	Safeway	Ratio
Tuna	.50	1.00	2.00
Milk	1.00	1.25	1.25
Lettuce	.80	.20	.25
Average			1.16

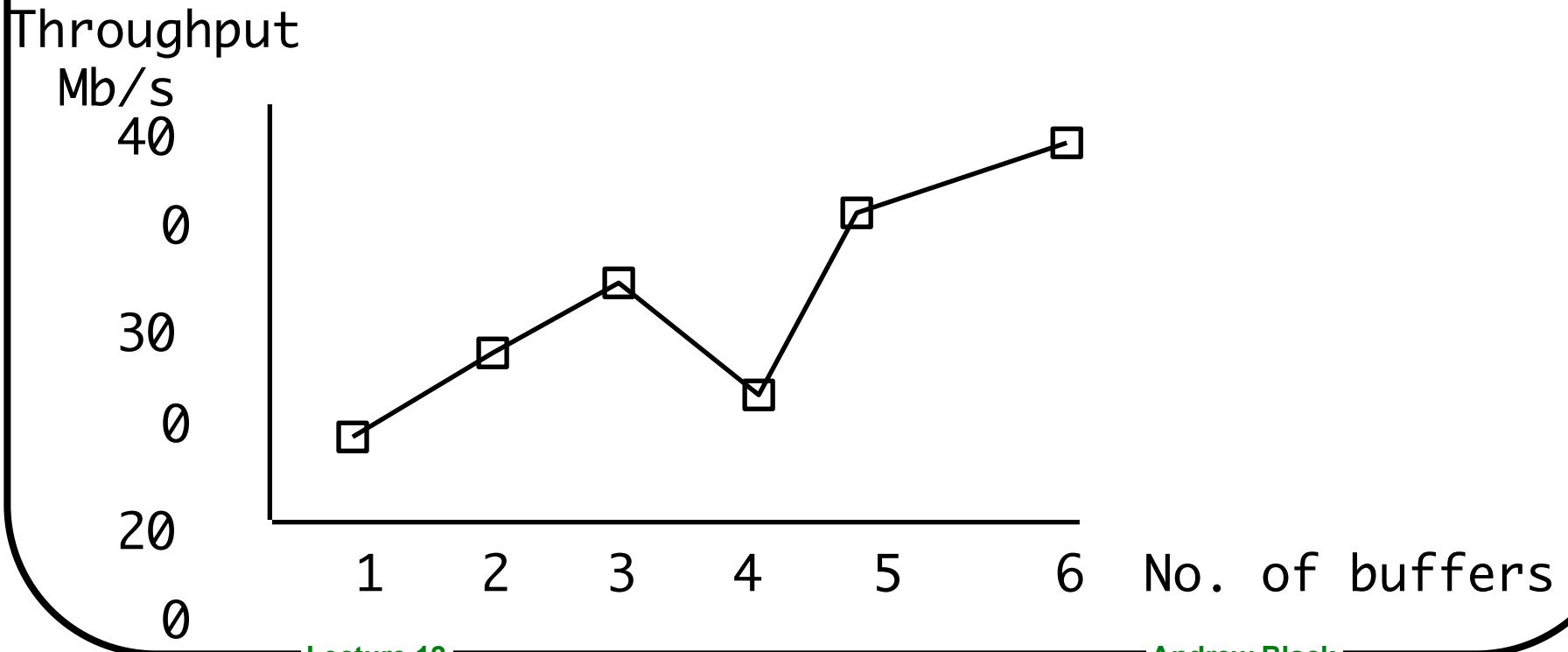
e.g., averaging ratios is invalid

Use of commercial statistical products helps avoid mistakes, <u>if you know how to use them.</u>

Parameter-Response Curves

Very hard to know if you are controlling all factors

Be reluctant to publish results that you can't explain. Gathering statistics and showing error bars can help.



Reporting Data

Questionable:

- Massaging of data
  - Unjustified excessive manipulation
  - Unjustified extrapolation
  - Inferring a trend based on too few data points
- Outliers
  - removing data values that don't fit – there are accepted approaches. Go to the literature

Downright unethical

- Fudging
  - Adding values, or multiplying by factors
- Fabrication of datasets or results (but you can use a toy data set to illustrate an idea, or benchmark an algorithm).

Not just data values

- Saying you have implemented something when you haven't
- Not reporting failures or known limitations of a technique (common transgression)
- Not reporting differences in experimental conditions

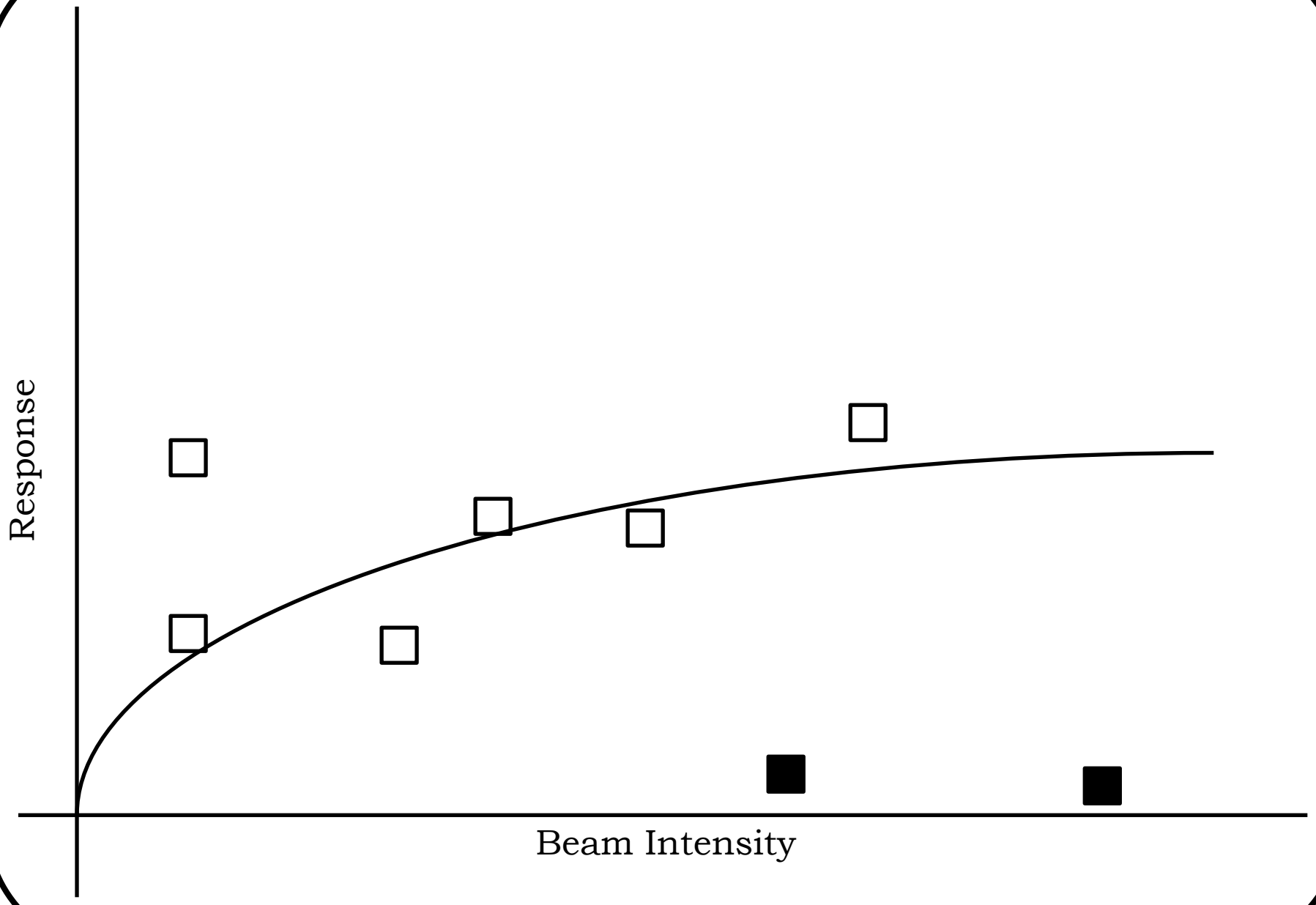
Discussion Exercise #1

from On Being a Scientist: Responsible Conduct in Research

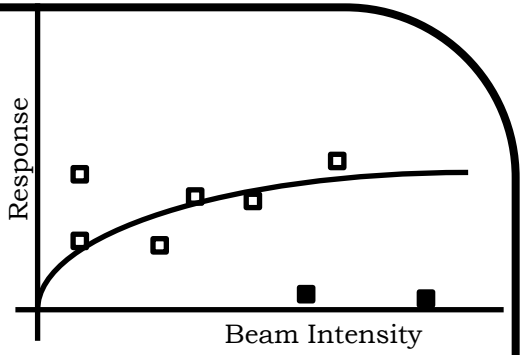
Committee on Science, Engineering, and Public Policy
National Academy of Sciences

Deborah, a third-year graduate student, and Kathleen, a postdoc, have made a series of measurements on a new experimental semiconductor material using an expensive neutron source at a national laboratory. When they get back to their own laboratory and examine the data, they get the following data points (see figure). A newly proposed theory predicts results indicated by the curve.

During the measurements at the national laboratory, Deborah and Kathleen observed that there were power fluctuations that they could not control or predict. Furthermore, they discussed their work with another group doing similar experiments, and they knew that the other group had obtained results confirming the theoretical prediction and was writing a paper describing their results.


Response
Beam Intensity

Exercise 1 continued



In writing up their own results for publication, Kathleen suggests dropping the two anomalous data points near the abscissa (the solid squares) from the published graph and from a statistical analysis. She proposes that the existence of the data points be mentioned in the paper as possibly due to power fluctuations and being outside the expected standard deviation calculated from the remaining data points. "These two runs," she argues to Deborah, "were obviously wrong."

- How should the data from the two suspected runs be handled?
- Should the data be included in tests of statistical significance and why?
- What other sources of information, in addition to their faculty advisor, can Deborah and Kathleen use to help decide?

Large Volumes of Data

What do you do when volume of data is too large to report?

- Describe all cases that were covered
- Make sure that selected data is representative
  - make selection procedure very clear
  - explain why you chose to report the particular results that you did (typical, best, worst …)

Authorship

You should share authorship with everyone with a definable contribution.

- I tend to credit everyone in the discussion at the point a great new idea comes up.
- writing the paper is a contribution.

The default is that you bear responsibility for the entire contents of a paper on which your name appears.

I view "honorary" authors dimly.

- because not a definable contribution.

***Never* add (or remove!) an author to a paper without his or her permission.**

Discussion Exercise #2

from On Being a Scientist: Responsible Conduct in Research
Committee on Science, Engineering, and Public Policy
National Academy of Sciences

Ben, a third-year graduate student, had been working on a research project that involved an important new experimental technique. For a national meeting in his discipline, Ben wrote an abstract and gave a brief presentation that mentioned the new technique. After his presentation, he was surprised and pleased when Dr. Freeman, a leading researcher from another university, engaged him in an extended conversation. Dr. Freeman asked Ben extensively about the new technique, and Ben described it fully. Ben's own faculty advisor often encouraged his students not to keep secrets from other researchers, and Ben was flattered that Dr. Freeman would be so interested in his work.

Six months later, Ben was leafing through a journal when he noticed an article by Dr. Freeman. The article described an experiment that clearly depended on the technique that Ben had developed. He didn't mind; in fact, he was again somewhat flattered that his technique had so strongly influenced Dr. Freeman's work. But when he turned to the citations, expecting to see a reference to his abstract or presentation, his name was nowhere to be found.

Discussion Questions

- Does Ben have any way of receiving credit for his work?
- Should he contact Dr. Freeman in an effort to have his work recognized?
- Is Ben's faculty advisor mistaken in encouraging his students to be so open about their work?

Discussion Exercise #3

During the course of her thesis preparation, Gertrude's advisor generates an idea for a interesting follow-on study. They agree that the new work is beyond the scope of the thesis.

A year after receiving her Ph.D., Gertrude publishes a paper on the new idea. She had not discussed the paper with her advisor, and does not list him in the acknowledgements. Does the advisor have a valid complaint. Does he have any recourse?

Discussion Exercise #4

Professor Aha's postdoc, Lutrell, begins collaborating with Professor Dormer on a problem. Aha advises that the direction is not promising, but Lutrell and Dormer complete the work and it is accepted to a prestigious conference.

Upon hearing news of the acceptance, Aha appropriates the manuscript, studies it carefully, and drafts a contribution to it. He adds his name to the (already-accepted) paper, and submits the revised version.

Is there a problem?

Plagiarism

- Obviously wrong to copy passages verbatim without attribution and quotes.
- Paraphrasing without attribution is also plagiarism
- Doesn't have to be a published or copyrighted source to constitute plagiarism
  - could be a talk, or
  - a personnel communication

Plagiarism occurs whenever you represent the work of another as your own.

Don't "acquire" ideas without discussing with the source.

Plagiarism

How to avoid plagiarism in text

- If you are quoting a short segment, put the text in quotation marks and give a citatation

  Saranbolt refers to the phenomenon as "the inevitable march of crimes" [22, p.78].

- If you are quoting a long segment, set it off in a block quote, and give a citation (how long is long?)

  According to Abbott and Song, it is clear that

  > while analyses of Hebbian learning along these lines have provided important results, direct application of these ideas to neuroscience is hindered by the fact that real neurons cannot be adequately described by continuous activity variables such as firing rates [12, p.19].

  The consequences of this observation …

Plagiarism

Do *not* simply change a few words here and there to avoid having to put text in quotes.

This is literary theft.

Paraphrase is OK, but still requires a citation

Self-Plagiarism

What about reusing your *own* text?

- Arguably not theft (if you still own the copyright), but still unethical and dishonest
  - You are giving the appearance of two contributions
- Can you reuse "generic" sections of previously published work?
  - Introduction, Future Work, Related Work?
  - Best to write them afresh, even though the ideas will not be fresh

    You may have to, if you have assigned copyright
- What about formal definitions?
  - Quote and cite

Submitting Papers

Generally *not* acceptable to submit the same or similar papers to two places simultaneously

- read the submission instructions carefully
- if you are doing so, declare the fact in a cover letter.

Be aware of the prior publication policy of a journal or conference

- most journals do not want to print something that has been previously published (even if only in electronic proceedings).

What about a more complete version of a workshop paper?

- you have the obligation to declare prior publication, and to explain the new contribution

Reviewing Papers and Proposals

You must disclose any conflict of interest to the editor or program director

Do not misrepresent your level of expertise

Review materials are *confidential*

- Do not show them to others without permission
  - cannot cite work received for review
- Do not keep materials when task is done

Unethical to appropriate ideas from review papers and proposals

- If you suspect there will be a problem, delete or return the paper immediately, without reading beyond the abstract.

Conflicts of Interest

- Science depends upon honest review of work.
- You shouldn't be reviewing things if you have a substantial or material interest in the results of the review.
- In the days of industrial sponsorship this is particularly important.

Discussion Exercise #5

from On Being a Scientist: Responsible Conduct in Research

Committee on Science, Engineering, and Public Policy
National Academy of Sciences

John, a third-year graduate student, is participating in a department-wide seminar where students, postdocs, and faculty members discuss work in progress. An assistant professor prefaces her comments by saying that the work she is about to discuss is sponsored by both a federal grant and a biotechnology firm for which she consults. In the course of the talk John realizes that he has been working on a technique that could make a major contribution to the work being discussed. But his faculty advisor consults for a different, and competing, biotechnology firm.

- How should John participate in this seminar?
- What, if anything, should he say to his advisor—and when?
- What implications does this case raise for the traditional openness and sharing of data, materials, and findings that have characterized modern science?

Discussion Exercise #6

from On Being a Scientist: Responsible Conduct in Research

Committee on Science, Engineering, and Public Policy
National Academy of Sciences

Sandra was excited about being accepted as a graduate student in the laboratory of Dr. Frederick, a leading scholar in the field, and she embarked on her assigned research project eagerly. But after a few months she began to have misgivings. Though part of Dr. Frederick's work was supported by federal grants, the project on which she was working was totally supported by a grant from a single company. She had known this before coming to the lab and had not thought it would be a problem. But she had not known that Dr. Frederick also had a major consulting agreement with the company. She also heard from other graduate students that when it came time to publish her work, any paper would be subject to review by the company to determine if any of her work was patentable.

- What are the advantages and disadvantages of Sandra doing research sponsored entirely by a single company?
- How can she address the specific misgivings she has about her research?
- If Sandra wishes to discuss her qualms with someone at her university, to whom should she turn?

Responding to violations of ethics

from On Being a Scientist: Responsible Conduct in Research

Hardest of all choices

- Act, or look the other way?
- Scientists have a responsibility to report ethical violations.
- Raising a concern is a hard thing to do.
- Allegations of misconduct must be taken very seriously. Can affect the person charged, the person making the charge, the institutions involved, and science in general

If you have concerns, discuss them with a trusted friend or advisor.

Once a complaint is in writing, many institutions are obliged by their own rules to investigate.

Discussion Exercise #5

from On Being a Scientist: Responsible Conduct in Research

Committee on Science, Engineering, and Public Policy
National Academy of Sciences

Francine was just months away from finishing her Ph.D. dissertation when she realized that something was seriously amiss with the work of a fellow graduate student, Sylvia. Francine was convinced that Sylvia was not actually making the measurements she claimed to be making. They shared the same lab, but Sylvia rarely seemed to be there. Sometimes Francine saw research materials thrown away unopened. The results Sylvia was turning in to their common thesis advisor seemed too clean to be real.

Francine knew that she would soon need to ask her thesis advisor for a letter of recommendation for faculty and postdoc positions. If she raised the issue with her advisor now, she was sure that it would affect the letter of recommendation. Sylvia was a favorite of her advisor, who had often helped Sylvia before when her project ran into problems. Yet Francine also knew that if she waited to raise the issue the question would inevitably arise as to when she first suspected problems.

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Both Francine and her thesis advisor were using Sylvia's results in their own research. If Sylvia's results were inaccurate, they both needed to know as soon as possible.

- Should Francine first try to talk with Sylvia, with her thesis advisor, or with someone else entirely?
- Does she know enough to be able to raise concerns?
- Where else can Francine go for information that could help her decide what to do?