

HONESTY IN SCIENCE

We live in a world where ethical dilemmas abound, and where people with good lawyers can get away with, well, murder. Even scientists, a group of people once regarded as beyond reproach, are being accused of data fabrication, plagiarism, and the like. This appendix is intended to be a guide to navigating some of the ethical dilemmas you might encounter in this course.

Data Fabrication

Students in science classes are sometimes tempted to create or alter their data. The varieties of possible crimes are numerous, ranging from the truly heinously criminal "I didn't have time to do the study, so why not just make up some results?" to the tragic "I wrote my results down on a scrap of paper towel and now I can't find them anywhere and the report's due tomorrow" to the oh-so reasonable sounding "This one data point is way off from the others and I could make a lot more sense out of the results if I just left it out". Is it wrong to succumb to these temptations? Why or why not? How should one deal with these and similar situations?

It is always wrong to fabricate data, no matter what the reason. The value of a scientific study depends on the quality of the data that it contains and the care with which they are interpreted. Making up data makes a study worthless, turning an honest inquiry into an empty exercise.

How then to deal with the situations described above? Obviously, one has to organize one's time so that one is able to accomplish the things one has to do. In collaborative labs, it seems unlikely that situation one (no time) will even arise, since lab partners will watch over one another's progress. (Thank you, Big Brother!) What about situation two (lost data)? Well, make sure that you always write your data down in a lab notebook that has your name and phone number on it, and give copies of your data to your lab partners. If despite these precautions (or if you don't take these precautions) you find yourself in this situation, contact your lab instructor and plead for advice. (See the section on [Plagiarism](#) for another way not to solve this dilemma, as well as a constructive solution).

What about situation three (omitting an outlier)? Is it ever okay to leave out a point that doesn't conform to the trend? Well, it is sometimes okay to leave out a point. For example, if you are doing a bacteriological study and you sneeze onto one of the Petri dishes, you can be pretty confident that results from that dish will differ from the non-sneezed-on ones. Throw it out before you even collect the data from it (number of colonies, or whatever). Explain in your methods that you discarded one plate because it was accidentally contaminated. But what if you had no reason to expect that one of your samples was going to be odd, and then found that it gave you a weird result? Well, you're stuck with it. Include it, discuss it, speculate about why it was odd, decide to dismiss it if you can make a reasonable case for doing so -- but leave it in your report! Remember that your grade does not depend on how "pretty" your data are, but rather on their integrity and the logic, thought, and good sense you apply to their interpretation.

Plagiarism

This term applies broadly to any activity in which one represents another's work, words, or ideas as his or her own. You are probably aware that if you take a sentence or more from another source without putting it in quotes, you are committing plagiarism. But you may not be aware that there are quite a few more varieties of plagiarism, and that these are also unethical and should be avoided. For example:

1. You use several paragraphs from a book on aquatic ecology in your aquatic report, but you are careful to put them in quotes, and to list the name of the source in your Literature Cited section. That's okay, isn't it? NO. Why not? Because in college you are supposed to be learning to do your own thinking. Using someone else's undigested thoughts, no matter how apt, doesn't demonstrate that you've learned how to do anything but be a parrot. It certainly doesn't demonstrate that you really understand the ideas you're writing about. In most scientific writing, the only time it makes sense to quote a source verbatim is when you want to draw attention to the specific words an author has chosen to use.
2. You find that the Office of Technology Assessment has produced a great reference for your ivy report, Harmful Non-Indigenous Species in the United States. It reads, in part, "Distinguishing between "good" and "bad" nonindigenous species is not easy. Some species produce both positive and negative consequences, depending on the location and the perceptions of the observers. Purple loosestrife, *Lythrum salicaria*, for example, is an attractive nursery plant but a major wetland weed." Knowing that you should not quote it word-for word, you write in your report:

Telling the difference between "good" and "bad" alien species is difficult. Some species create both beneficial and harmful effects, depending on the place and the viewpoints of the observers. For example, purple loosestrife is a pretty garden plant that is a major weed of wetlands (Office of Technology Assessment, 1993).

Have you solved the problem? Well, no, not in a way that leaves you any intellectual integrity. You've demonstrated that you know how to use a thesaurus, but not that you've learned how to compose original ideas. This is called paraphrasing, and while not technically illegal, it isn't very impressive writing. Unless you can express an idea in your own words, your instructor can't be certain that you understand it. To remove all doubt about this, digest the source and incorporate its gist into your paper in your own original way, without using its words or sentence structure. For example, with the above, you might write:

Alien species often have different effects in different situations. Purple loosestrife is a good example of an individual plant that is a noxious weed in some areas, yet cultivated in gardens in others (Office of Technology Assessment, 1993).

Notice that you still need to cite the source of this information, because this is something you did not know before you read the report.

To avoid plagiarizing or paraphrasing accidentally, be careful how you take notes from

the sources you read. If you write directly quoted phrases or sentences into your notebook, you might get home from the library, reread them, and think you made them up yourself. If you're copying quotes, put them in quotation marks to remind yourself who the author was (i.e. not you!). Then, when you write, read your notes, then close your notebook, and compose from scratch, without having your notes in front of you. Then there will be a much greater chance that your words and organization will be your own.

3. No matter how hard you think about it, you can't decide how to interpret your data. You talk to your TA Serena, who says "It looks to me like there's a negative relationship between distance from the sewage outflow and the turbidity of the water. Look, graph these two variables against each other and see what you see." Well, lo and behold, it looks great. What should you do? In your paper, it is absolutely fine to describe this relationship and discuss it. But when you get to the Acknowledgments section, be sure to say "Serena helped us to notice the relationship between distance from the sewage outflow and turbidity". If you don't acknowledge Serena's insight, you are committing an act of intellectual dishonesty -- you are pretending that her idea was yours. Great scientists don't come up with all their own ideas; honest scientists admit that they don't.
4. You've lost your data. Your roommate, who did a very similar study, is gone, and his report is on his desk. You copy the relevant data, changing the figures just a little to make them seem different. Is this wrong? Well, of course it is. You stole something that belonged to someone else. What should you have done instead? Gone to your lab instructor and explained the problem. What she might have suggested is: "let's talk to your roommate, who did a similar study. If he agrees, you can use his data, but you'll need to do your own analysis and interpretation. Just make sure that you acknowledge that he, not you, collected the data." The difference between these two scenarios is that, in the legal one, you have the permission of both the data's owner and of your instructor to "borrow" the data.
5. Your roommate lost his data. You have done a very similar study. He comes to you and asks if it would be okay for him to use your data. You'd like to stay friends with him. What should you say? You should say, "I'm not very comfortable with that idea. Why don't we go talk to my professor and see if they think it's ok?" Yes, this makes you very uncool. But you're going to have to live with yourself for a lot longer than you're going to have to live with your roommate.

What are the penalties for data fabrication or plagiarism?

There are psychic penalties, of course. In addition to those, there are academic penalties, ranging from a reprimand to a failing grade on the assignment or in the course. Their strength depends on how serious the instructor and the College judge the offense to be. Be aware, however, your professors are obligated to refer *all* cases of suspected dishonesty to the College Honor Board. See the Lewis and Clark [Pathfinder](#) and the College [Code of Conduct](#) for full descriptions of how cases of academic dishonesty are handled.