Scientific Ethics Seminars

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The Society of Physics Students has asked that Physics Departments include some sort of ethics/professionalism component to their instruction of undergraduate students. Many institutions require their graduate students to participate in such activities, but not their undergraduates. Given the increase of undergraduate students that are participating in research at their home institutions, as part of REU and REU-type summer programs, or other internships, it is imperative that they be exposed to these issues early in their studies. One way to accomplish this is by hosting one or more seminars, or colloquia, on the subject.

Most physics departments have a regular, or semi-regular, seminar series. This time provides students the opportunity to hear about research topics that are often beyond what is covered in their class and laboratory studies. It serves to broaden their exposure to the world of physics with the hope that it will help them decide what their "future" entails: whether it is graduate school (and the choice of research area to be done there) or industry. What can be accomplished in this seminar largely depends on how much time is allotted. I have administrated many of these sessions with an hour long window. It generally allows time for two or three case studies, in addition to time for a brief introduction. If a half hour "lunchtime seminar" is the way undergraduate seminars are held, it is challenging to get more than one case study run – it might be better to span several meetings in this case. This document is intended to serve as a "users guide" for the moderator of the seminar.

At the start of the session, the moderator should discuss why s/he thinks this is an important topic to cover at a seminar. One need not go too far to find examples, real physics cases such as Schön (Bell Labs) and Ninov (Elements 116 & 118) greatly illustrate high profile cases where the scientists have committed egregious ethical violations. These acts greatly affected the reputation their otherwise ignorant coworkers and the process of science itself. I think it is important to

remind students that most scientists would not dare consider such extreme behavior, but there are many instances of "bending the rules" and "convenient interpretations" that occur every day that undermine the process of science and the respectability of scientists. One set of statistics that I like to report during my introduction comes from the June 2005 issue of Nature Magazine. In a survey administered by the National Institutes of Health, one third of the respondents admitted to participating in a behavior that would have likely been considered sanctionable. And this was among those willing to respond to this survey – how many might have chosen not to respond for the very reason that they had committed an offense that they didn't want to admit to. Many, but not all, of the violations reported involved human research protocols. Admittedly, such issues are rare in physics. However the point is, I think, well illustrated: people make poor judgments all too often.

The Society of Physics Student has put on its webpage a list of case studies that can be used by physics departments. Some of them come from other sources, such as the National Academy of the Sciences; others are from "in house." All of the "in house" cases are based on true stories, those from other sources are probably also based on things that actually happened. The subject material spans a wide range of topics: proper handling of data and uncertainties, authorship practices, conflicts of interest, and refereeing paper or grants, to name a few. As mentioned earlier, in a one hour period, I plan on having three ready to go, although extended discussions often limit me to covering only two. Select cases that are not likely to lead to repeated discussion: in one hour there isn't really the need to cover two cases involving data handling.

When presenting the cases, use a computer or overhead projector to display the case to the audience. Alternatively, you can provide handouts that have the cases already printed out (a discussion on the ethics of perhaps needless reproductions will be held at another time). After giving the audience time to read the study, start a discussion. Here are some general rules to keep in mind:

- Moderators need to read the material very carefully and fully understand it. There is no better way to kill a discussion than to appear to (or actually be) unaware of what you're

discussing. Pay attention to little details – we all know that the general stuff is easy, details make problems hard.

- Invite everyone: undergraduates, graduates, post-docs, and faculty. A broad cross-section of experience is much more likely to lead to a dynamic discussion than if the room is only full of undergraduates that have not likely thought about this material.
- Invite debate. In many cases, you might find that there isn't consensus in the group. If there seems to be broad consensus, don't be afraid to play devil's advocate by identifying the grey areas. If there is a debate to be had – let it happen. Things aren't always in black and white; some items have many shades of grey. This most often happens when there are "gaps" in the story that people try to fill in by assumption; don't forget that favorite little expression about what happens when you assume….
- Try to identify situations that may be similar to the case study that come from your own life. In my experience, nothing nails a situation home as much as when you present a real life situation to the group that is similar to what you've been talking about. In this light, don't be afraid to create your own case studies from your own experiences.

Presentations of this sort have been among the most rewarding that I've given. I have rarely had students some to me and asking me about details of talks I've given on laser spectroscopy a year or two after the talk. However, I have been contacted by students, both former and current, when they've been faced with a situation that seems "a bit off" in their research or other professional endeavors. It is my hope that their caution has come from what they learned in these seminars. But when it comes down to it, I'm just glad that their thinking about their responsibility as a scientist.