

Report of the APS Task Force on Ethics Education

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Executive Summary

The charge to the committee was to advise APS on how it can best encourage physics departments to do a better job of educating their students, postdocs and faculty about scientific ethics, to investigate what materials are available for ethics education and to develop materials or adapt existing materials to aid physics departments in their efforts. The recommendations and assemblage of materials took place over a period from August 2004 to November 2005 and involved one face-to-face meeting, several conference calls, exchanges of emails, and the creation of a discussion board on the APS website. The central recommendation of the task force is to have the APS create and maintain a web site as a resource for ethics education. The central feature of the site would be a series of ethics case studies, developed by the task force, that illustrate ethical issues that are relevant to the physics community. Many of these case studies or scenarios are based on real events with names removed and other changes made to conceal the identities of the original participants. Topics would include Publication Practices, Human Subjects Research, Conflict of Interest, Data Acquisition, Mentoring, Health and Safety, Issues of Bias, and Undergraduate Concerns. The proposed website would be dynamic, as users would be able to contribute case studies, and provide comments and suggestions, which would be monitored and edited by either APS staff or volunteers. The site in addition to containing a bibliography would incorporate links to other ethics web sites, or to course materials on ethics education that are available at various sites around the country. (As an example, one of the task force members, J. Marshall Thomsen has been offering a course in scientific ethics at Eastern Michigan University). The task force envisions the use of the web site as a resource for a part of the orientation program for beginning graduate students, which is concerned with ethics. Group discussions of the issues addressed in case studies have been found to be an effective way to deliver ethics education. The case studies have been selected to illustrate various ethical issues that are not necessarily easily resolved. They obviously cannot be considered to be all-inclusive, hence the need to open the site to external contributions. This report contains suggestions for the format of the web site, the case studies, and a bibliography of web sites and other written materials. We also strongly recommend that the APS consider ways to regularly remind APS membership and particularly physics department leaders (chairs, institutional ombudsmen and heads of research) of these professional conduct guidelines. These reminders should be done annually.

In summary the Task Force on Ethics Education recommends the following:

- APS should create and maintain a web site as a resource for ethics education
- APS should consider ways to regularly remind APS membership of the APS professional conduct guidelines.
- APS should consider a site oversight committee composed of both APS staff and APS members. The function of the committee would be (1) to vet new case studies (2) to plan ethics activities at APS meetings.

Table of Contents

Topic	Page
I. Introduction	4
II. Formats and Templates for the Proposed APS Ethics Web-Site	5
A. The Opening Page	5
B. A Proposed Topics Page	5
Example A: Publication Practices	6
Example B: Research with Human Subjects	6
C. Case Studies Templates	7
Example A: Human Subjects Research	7
Example B: Authorship	8
D. Invitation to Contribute a Case Study	9
E. Other Considerations	9
Appendix A: Selected Resources	9
Appendix B: Additional Case Studies	11
Acknowledgements	29

I. Introduction

Research in physics depends on widely held values of integrity and honesty among participants. Without these values the enterprise becomes suspect and its results are mistrusted. Trust can only occur if there is a shared expectation of a respect for truth. Events over the past few years involving gross falsification of data and subsequent claims for discovery based on false data, have shaken this trust and have cast a shadow on the enterprise of physics research. But beyond these high profile instances of clearly inappropriate behavior, there are numerous situations that physicists routinely encounter which require decisions with an ethical content. It is essential that steps be taken to make sure that the values of science are understood and underlie the actions of all participants in the physics research enterprise. The community cannot take for granted that all of its members will behave ethically.

Ethics education is essential to the intrinsic health of the enterprise as well as for the need to assure public trust, as physics research as we know it requires public funding. It is useful to draw the analogy between ethics education and safety training. Undoubtedly most physicists have an inherent desire to be safe, but the extent to which safety procedures are practiced in the lab depends on a range of factors, including prior experience and an understanding of what appropriate procedures are and what harm may come from failing to follow them. Formal safety training is often useful to fill in the gaps not filled by prior experience. Likewise ethics education can play the role of providing information not available from prior experience. This role is especially important for those just beginning in the field.

Ethical behavior in some instances is compromised by pressures to publish and discover, as well as by the prospect of financial gain from commercialization of certain research discoveries. The problem is complicated because researchers may be confronted with choices in which the ethical route is not obvious. There are also differences between practices in various sub-disciplines, especially in the area of authorship, which can be confusing. For example, the decision as to who should be named as author on a paper and the order of authors may vary between sub-disciplines. The highly specialized nature of contributions to some aspects of modern research may make it impossible for all contributors to a specific piece of research to be fully aware of all of the subtleties of its parts. This has been true for some time in what we refer to as “big physics” as well as in “little physics” which is being carried out by increasing large, and specialized groups of investigators. This enhances the need to assure that the various contributors are being truthful and forthcoming in crafting their contributions.

Certainly fundamental ethical behavior within the norms of our society is something that derives from earlier experiences than those of young adulthood. On the other hand, it is important that as scientists we make certain that all participants in research activities are aware of what is appropriate. It is no longer sufficient to take for granted that they do. For this reason the Task Force recommends that there be a regular distribution of professional conduct guidelines. The Task Force has put together a collection of case studies to provide an introduction to some of the

issues that practicing physicists might encounter. We recommend that these be incorporated in a web site that can serve as a resource for an ethics workshop perhaps in a group-learning format as part of orientation programs for beginning research students. A workshop of short duration is by no means a substitute for a full course on scientific ethics.

II. Formats and Templates for the Proposed APS Ethics Web Site

In developing possible case study templates, we realized that the format for the case studies was strongly linked to the website format. We make four suggestions. The first suggestion (Section A) describes a possible very general format for the web site opening page with the ethics topics listed and clickable. The second suggestion (Section B) describes a format for an ethics topic page. That page is also clickable for individual case studies. The third suggestion (Section C) is a possible template for the case studies. We have provided two examples using our existing materials: publication practices and human research. The last suggestion(s) (Section D) is about one of the suggested opening page features, which invites users to contribute possible case studies to the web site. Section E contains some general remarks about possible funding

A. The Opening Page

We understand that APS has web developers on staff who will design a beautiful home page. We suggest that the following features be on this page.

Disclaimer: (to be written by APS staff, since it is their web site, to the effect that while we have done our best to provide thoughtful analysis based on existing standards in the community, these pages nevertheless contain our opinions)

Introduction (See I)

Topics (all clickable)

- Publication Practices
- Human Subjects Research
- Conflict of Interest
- Data Acquisition
- Mentoring
- Health and Safety
- Issues of Bias
- Undergraduate Concerns

Contribute a Case Study (clickable)

Comments and Suggestions (clickable)

Links to other ethics education web sites

B. A Proposed Topics Page

We suggest that each of the topics pages begin with an upfront general discussion and that the various case studies be clickable.

Example A: Publication Practices

Introduction:

The APS Guidelines for Professional Conduct state that authorship should be limited to those who have made a significant contribution to the concept, design, execution or interpretation of the research study. All those who have made significant contributions should be offered the opportunity to be listed as authors. Other individuals who have contributed to the study should be acknowledged, but not identified as authors. The sources of financial support for the project should be disclosed.

Plagiarism constitutes unethical scientific behavior and is never acceptable. Proper acknowledgement of the work of others used in a research project must always be given. Further, it is the obligation of each author to provide prompt retractions or corrections of errors in published works.

The case studies in this section are designed to explore some of the subtleties that may arise in the application of these standards. (All items in the list below will be clickable)

- Intellectual Property 1
- Intellectual Property 2
- Authorship
- Refereeing
- Publication
- Publication and Data Ownership
- Peer Review: Fairness even if it hurts
- Collaborative Research
- Data Acquisition

Example B: Research with Human Subjects

While it is not frequent, occasionally physicists perform research involving human subjects. Examples of such research include: educational studies, biophysics investigations, and surveys.

Federally funded institutions are required to have appropriate procedures in place to ensure that the health and privacy of human subjects are protected. Institutions generally have one or more committees set up to review proposals for research involving human subjects. Certain types of minimal risk research may be exempt from oversight, including some forms of education-related research. However, the investigator is not allowed to make the determination of exempt status on his own; the institution's human subjects review board makes that decision. The regulations governing human subjects research are lengthy and complex. Fortunately, another requirement of federally funded institutions is that they make human subjects research training available. Taking advantage of these training resources is likely to be a more efficient way of finding out the information of most relevance to you.

Detailed information may be obtained from the Office for Human Research Protections in the U. S. Department of Health and Human Services.

Some of the ethical issues are explored in the case studies (ALL CLICKABLE)

Education Research 1
Health and Safety
Research Management
New ones possibly needed

C. Case Studies Templates

The template we suggest for the case study page is the following:

Title
Keywords:
Description of Problem:
Questions:
Discussion:
Useful Links
Contact us with a comment (Clickable)

Only the last item is clickable. We included many possible elements. Not all case studies need to have all of the elements, but the template should have space for all of the options possible. This template would be a clickable blank on the home page and users could fill in their own ideas for relevant case studies.

Example A: Human Subjects Research

Title: Education Research
Keywords: human subjects

Case: Suppose you have a strong interest in physics education, and in pursuit of that interest you want to assess the effectiveness of two different strategies for running recitation sections in large introductory physics courses. The professor who runs the course agrees that both of your proposed strategies have educational merit and that you can try them out on two independent sections of the class. At the end of the term, you discover a clear difference in test performance between the students in the two different groups. You want to give a talk at an American Association of Physics Teachers meeting about your results.

Discussion Question: What steps do you need to take in order to ensure the privacy of the students is adequately protected?

Discussion: While many physicists never face issues associated with human subjects research, those who do education-related research or who take surveys of the physics community may face such issues. Every university that receives federal funding is required to have a review board to

oversee research involving human subjects. Research on how students respond to different teaching methodologies would fall under this category. Federal regulations exempt education research from formal oversight provided the results are intended to improve one's own instructional delivery and provided the results are not disseminated outside one's own institution. Other specific conditions may apply.

Generally, a university will require faculty and students to submit for review any research project involving human subjects, regardless of whether the researcher believes the project is exempt. The review board may then decide that the project is exempt or it may make specific recommendations to ensure the rights of the subjects are appropriately respected. Typical precautions include having a plan to ensure the privacy of the subjects is maintained and a mechanism for obtaining informed consent from the subjects prior to the start of the project.

Useful links: For further information on human subjects research, visit the Office for Human Research Protections (<http://www.hhs.gov/ohrp/>) .

Example B: Authorship

Title: Authorship

Key words: authorship, collaborations

Case: You are involved in collaboration, and research results are about to be published.

Discussion Question: What factors will determine if you will be listed as an author, and if so, where your name will appear on that list?

Discussion: The size of the collaboration will make a difference. Large-scale collaborations, such as high-energy physics experiments involving hundreds of people, tend to have more clearly defined procedures for deciding who will be listed as an author and in what order. While it is useful to have a common understanding at the start of collaboration, often this understanding is not explicit at the beginning of a small-scale collaboration. Nevertheless, the APS standard applies: all who make a meaningful contribution to the scientific work should have the opportunity to be listed as an author.

What contribution is considered significant from a scientific perspective is not always clear, particularly when technical work is involved. Lab technicians are generally not listed as authors if their prime responsibility it is to maintain equipment. On the other hand, a beginning student may first do primarily similar technical tasks while getting a feel for the experiment, and it is not unusual for their name to be put on a paper for performing very similar work.

Standards for determining the order of authorship vary widely from field to field. In most fields, having the lead author position is considered most desirable and likewise would be indicative of having made the greatest contribution to the paper. The lead author is often, but not always, the individual who took responsibility for writing the first draft. However, traditions vary from field to field and collaboration-to-collaboration, so it is difficult to generalize. If position on an authorship list is of concern to you, it may be wise to explore this issue early on in collaboration.

Lastly, it is important to remember that being listed as an author carries responsibility, not only during the research and writing, but also after the paper has appeared in print. If an author becomes aware of a significant problem in a paper, then that author has a responsibility to make reasonable efforts to correct the written record.

Useful Links: See the American Physical Society Guidelines on Professional Conduct and the supplementary guidelines on Responsibilities of Coauthors and Collaborators.

D. Invitation to Contribute a Case Study

All good web sites are dynamic, responding to new issues and concerns that arise. To let the users be part of the ethics site, we have included a blank template, which could be used to contribute a possible case study. Including this as part of the site implies that there will be some site oversight, possibly by an APS committee or APS staff. There should be a contact (a member of the committee) whose responsibility would be to respond to comments and questions in a timely fashion. The committee could meet at one of the big meetings to vet possible contributions. This same committee could be responsible for planning possible ethics education workshops that the task force has discussed.

E. Other Considerations

We may want to consider testing some or all of these case studies on students. Sometimes a discussion will bring out points that need to be clarified or additional points that need to be addressed.

The APS may want to consider seeking funding to keep the case study site active (as opposed to static) for the next few years. With a modest amount of funding, one person could be in charge of screening new case studies and comments on existing case studies. While a larger committee (the whole task force perhaps) should be involved in providing input into content, it might be useful to have one person responsible for producing the final, edited version of the additional material to be posted on the site. ORI and NSF support ethics education programs.

Finally, a workshop on Ethics Education should be offered at the March and April meetings in 2007.

Appendix A: Selected Resources

Responsible Conduct in Research Instruction:

www.rcr.emich.edu/,

Marshall Thomsen's Collection of Ethics Resources:

www.physics.emich.edu/mthomsen/ethtaboc.htm

Sigma Xi, "The Responsible Researcher: Paths & Pitfalls

www.sigmaxi.org/programs/ethics/ResResearcher.pdf

Sigma Xi: “Ethical Challenges and Practical Solutions for Managers in Research”

Sigma Xi: “Honor in Science”

"On Being a Scientist"

<http://www.nap.edu/readingroom/books/obas/>

National Academy Press, Washington, D. C., 1995

Science Ethics Resources (before 1997)

<http://www.chem.vt.edu/chem-ed/ethics/index.html>

Patricia Bolton's Chapter on Scientific Ethics

<http://64.233.167.104/search?q=cache:tN2HEOdYti8J:www.sc.doe.gov/sc-5/benchmark/Ch%252016%2520Scientific%2520Ethics%252006.10.02.pdf+scientific+ethics&hl=en&client=safari>

Responsible Conduct of Research, UCSD

<http://ethics.ucsd.edu/courses/ethics/resources.html>

Scientific Ethics UCSD

<http://ethics.ucsd.edu/courses/ethics/syllabus.htm>

UNC Responsible Conduct of Research

<http://www.med.unc.edu/wrkunits/2depts/biochem/ethics/>

Yale Medical School

<http://info.med.yale.edu/neurosci/courses/ethics.html>

Duke University, Chemical Ethics

<http://www.lib.duke.edu/chem/ethics/long.html>

UIUC Research Ethics in Life Sciences

<http://www.life.uiuc.edu/mcb/580/>

APS Ethics and Values Statements

http://www.aps.org/statements/02_2.cfm

“Ethics and the Welfare of the Physics Profession,” Kate Kirby and Frances A. Houle, *Physics Today* **57** (11) 42-49, 2004

“Report of the Investigation Committee on the Possibility of Scientific Fraud in the Work of Hendrik Schön and Coauthors”

http://www.lucent.com/news_events/pdf/summary.pdf

Appendix B: Additional Case Studies

Title: Publication Practices and Authorship

Keywords: authorship, publication practices

Description of the Problem: As a graduate student, you have worked closely with a professor and her postdoc on a project studying experimental techniques in microfluidics. The project is going very well and you've even published some of your initial results. You will be graduating this spring with your master's degree. Your advisor is now writing a subsequent paper with a colleague who is developing a theory that accounts for your results. You see a draft of the paper and notice that you are not listed as one of the four authors of the paper, who are the professors and their senior postdocs. However, the paper is directly based on the work that you did and includes a new experimental plot that you created in addition to the theoretical calculations.

Question: What should you do?

Discussion: The question of authorship can seem a bit vague as you begin a research career, but anyone who made significant contributions to the research should generally be included in the author list. The specific guidelines accepted by the APS state that "all those who have made significant contributions should be offered the opportunity to be listed as authors." If you believe that you made significant contributions, one possibility is to simply ask your advisor directly whether you will be included as an author. It could be that she has not specifically thought about the author list yet or has other plans for publishing your contributions to the project. If you do not feel that you've gotten a satisfactory answer, a trusted faculty member who is not involved with your research group might be able to provide guidance on what is typical and appropriate. If that fails consulting the department head or the departmental ombudsperson would be appropriate.

Title: Conflict of Interest

Description of the Problem: You are a 6th year graduate student at a large university in the final months of your dissertation research on novel photonic materials. You are worried about your next appointment, and have applied for several postdoctoral positions in this field plus a few tenure-track assistant professorships at universities where you would like to work. To your surprise and pleasure, you are invited for an interview for a tenure-track appointment at your undergraduate alma mater, a prestigious research institution in a city where you already have connections and would love to live.

In the question and answer period following your seminar on your research, the department chair asks for detailed information about the novel material-preparation technique developed in your graduate research, and used extensively in your experiments. Your group is working on a patent application and its members have agreed not to provide details until a paper currently being

prepared is submitted for publication. Your thesis advisor will be giving the first major presentation on the technique at a major international conference in a couple months.

You answer that you and your colleagues are in the process of writing it up for publication and a patent application, and you would be glad to send them an early preprint when it is available. The question and answer period continues and concludes uneventfully and pleasantly.

After the seminar, in your private interview with the Chair, he pushes harder for this information, remarking that the Department seeks team players, willing to share information with department colleagues, and referring to your undergraduate roots and the need to prove you are one of them to be a viable candidate for the position. What should you do?

Questions: What are the interests of the various players? Where are there conflicts of interest? What are your options?

Discussion: There are a number of players: you, the chair, the university where you are interviewing, your graduate university, your colleagues in the graduate lab, your graduate supervisor, and the fast-moving field of nanophotonics. Each of these has different interests. You are conflicted because keeping your word may in the short term preclude your being hired at this institution. Your options include: giving the chair the information he requests, and not telling your group, giving the chair the information and telling your group when you get back, contacting your supervisor from the chair's office to attempt to get his permission to share the information (either she agrees or does not), talking the chair out of his urgency in a brilliantly tactful, yet convincing way, and refusing to provide information and storming out of the Chair's office. There may be others.

Although this may be difficult, it would demonstrate that you are a person of your word if you could talk the chair out of his urgency, by reminding him of your prior agreement to maintain confidentiality.

Links:

Title: Reaction to Bias

Keywords: bias

Description of the Problem: The graduate students, post-docs, and professor in your research group have spent the past week brainstorming ideas for a major new proposal to submit to the National Science Foundation. After much discussion, the professor selects Sally's idea to be the core of the proposal, and invites John to be Co-PI with him, and to take the lead in coordinating preparation of the proposal. Both Sally and John are senior post-docs in the lab. It is a real honor and a career advantage to be a PI early in one's career. By offering one of his post-docs the opportunity to be Co-PI and work with him on preparing the grant, the professor is helping launch the post-doc's career. The issue is, why didn't the professor offer this opportunity to Sally, since the core idea in the proposal was hers?

Questions: In considering this scenario, how should the different students and postdocs respond to this decision by the professor? What should Sally do? What are John's responsibilities? Is it too unrealistic to suggest to John that he express his concern to the professor?

Discussion: Postdocs are quite dependent on their advisors for future career success. The decision by the professor as presented above is biased and unethical. This is a situation in which an ethical response by John, even though it involves risk would be essential. Sally should try to talk to John and convince him to behave ethically, and speak with their professor. If that does not work, consulting with a trusted faculty member who could talk to the professor about her concerns could be an option.

Links:

Title: Data Acquisition (*Did I write it down? Oops, it might not have happened.*)

Keywords: intellectual property

Description of the Problem: You find a novel solution to an important problem posed by your advisor, however, your advisor sees this as an opportunity for him to get published, downplays the significance of the results, collates a paper and submits it before you are any the wiser (acknowledging a discussion with you, but not including you as an author). You are absolutely clear that this idea was yours, and feel suitably put out. You approach your advisor and make a complaint, but he empathizes with you and tells you to be a bit quicker with the write up next time. He tells you that's just the way of the world. You decide not to leave it there, and approach the head of the department (going up one link in the management chain). You make your complaint to him, and he asks you for evidence, but you can't provide any because you didn't keep a dated note book: all of your notes are in several ring binders, some at home and some in your desk at work. You start feeling a bit silly, and the head advises you to drop the matter.

Questions: Should you drop this? Should you chalk this one up to experience, or is there a fair way to make a claim to the results?

Discussion: Keeping accurate and dated notes of your ideas, is a critical aspect of good scientific practice. These sorts of instances come up time and again, and irrespective of their frequency, it will only serve to give clarity to your ideas for them to be accurately recorded. It is important for all scientists (from experimentalists through to computational physicists) to understand how best to protect intellectual property, and keeping good notes is certainly an important aspect. It is also important to be aware that one's intellectual property is defined as property by law and there are means for protecting new ideas. Certainly in the pure sciences, publishing the information is the surest way to obtain credit for them, and so memo writing (leading to paper writing) is a good habit to develop: scientists must write! So, what to do? At a bare minimum, it would be necessary for you to be included as an author on the paper: those were your ideas to start with, and your advisor does know that. Make a strong case to the department head that your concerns ought to be heard: collate your notes, and make them presentable. Inclusion as an author is a trivial matter, and while you might not be up-to-speed

with paper writing, it is important to at least be included. Report the issue to the Misconduct Policy Officer (MPO): on most campuses there is an official who deals with matters of intellectual property. The matter is not so straightforward, in fact, and no doubt the approach will change from case to case. Foreign nationals, for example, may feel less inclined to dispute the issue, particularly if their right to work depends on their institution supporting them. (In this case, there is probably another avenue to explore, which might naturally be a foreign national liaison at the university who could be approached for advice). Finally there is a strong argument for the student to take notes after every meeting. Notes are not of course irrefutable evidence but it might carry a little more weight with the department head if the student could produce a quote of the off hand way the professor dismisses him, especially since that quote seems to acknowledge that the idea originated with the student.

Title: Collaborative Research (*Who owns what? Agree on it first, and then be nice.*)

Keywords: intellectual property, collaboration, authorship

Description of Problem: A collaboration is established between your institution and another one half way across the country, and so it will be a rare occasion that you will interact in person. Your group will be providing some much needed simulations to help understand their experimental results. In working on the problem you discover some important physics that has been overlooked by your collaborators, so fundamental that it really needs to be published immediately. You quickly write a paper (with you as first author) on the subject with the colleagues at your institution and use the results from the experiment from your collaborators, then circulate the submission draft to your collaborators. The next morning you receive a rather terse phone call from their lead scientist telling you that if you submit the publication, the collaboration will terminate there and then, and you will lose the collaborative grant: they are outraged that you are publishing their results with you as first author.

Question: You are faced with a dilemma: publish the important discovery and ruin the collaboration, or drop the matter. What should you do? This is a matter of the breakdown of trust.

Discussion: Collaborations are awkward arrangements at best: usually an agreement is made early on as to how specifically each group will interact, and what specifically will be the roles in publication. To stray from that initial agreement is construed as underhanded, so it is necessary to spell things out explicitly ahead of time. However, there is a typical courtesy in collaborating with external institutions, and it is reasonable even in the absence of an agreement for the other group to expect to be consulted prior to submitting a paper with their data; if the data has not yet been published then some of them would normally expect to be co-authors.

Matters of breakdown of trust usually require arbitration: if the initial agreement has been broken then an outside mediator may be needed (how does one actually resolve this issue?). However, before the collaboration even begins, it is necessary for each group to be in agreement on who gets to write up what. Usually the matter can be resolved between the PI's in the two groups: in

this example improved communication between the two groups, both initially and ongoing would all new physics issues to be encountered and developed collaboratively.

Links:

Title: Peer Review (Is it important to be fair even if it might hurt you?)

Keywords: peer review, conflict of interest

Description of the Problem: Over lunch one day your advisor tells you that he is reviewing a paper unfavorably. He rationalizes that the group that is performing the work is in direct competition for funds, and so seeking to undermine the work of the other group would benefit your group. After all, funding is really tight. It is obvious to you that your advisor has put himself in a position of conflict of interest, and is not being fair in his review of an otherwise credible piece of scientific research. Your advisor further complicates the situation by asking for your input, given also that you are working directly on one important aspect of the work. You read the paper, and find it plausible. ,

Question: What should you do?

Discussion: First of all, conflicts of interest come up routinely when paper reviews are performed. It is usually necessary to report any conflict of interest when reviewing a paper, or performing reviews of a grant. Often papers are used in support of a future proposal for a grant renewal, and so publication can be very political, especially between rival groups, and particularly when there are precious few experts to review the work. Some people talk about “managing” a conflict of interest rather than eliminating it. That is, if you are doing research in a field that does not have many other people working in it, then reviewing a paper or proposal of a potential rival is almost unavoidable. The best we can hope for under those circumstances is disclosure of the conflict while making a good faith effort to provide an objective review.

So what should you do? You should discuss the issue with your advisor: is he aware first of all that he is in a position of conflict of interest? Without giving a lecture on ethics try just opening up a general discussion with your advisor about how the peer review system works. If that discussion confirms an impression that the advisor is manipulating the system, then consult another senior colleague.

Links: APS Journals Instructions to Referees, NSF Guidelines for Reviewers

Title: Reporting Violations

Keywords: plagiarism

Description of the Problem: You are a faculty mentor for an international graduate student in your department. The student is taking some classes in another department that requires written essays. He asks you to read his essay before he submits it. You routinely google his work and

discover that large parts have been lifted, verbatim, from the web with no quotation marks or citations.

Questions: What should you do?

Discussion: The currency of physics is truth. Anyone who does not understand this should not be allowed to continue in physics. It is unfortunately true that many students, from the US as well as international students do not understand that material from the web is not free but must be acknowledged with the same citation structure that is used for printed material. While ignorance of the law does not excuse breaking it, in many cases there is no intent to do wrong. It is possible that this student knows he is cheating but is claiming ignorance, hoping to escape the consequences.

There are a number of options. One would be to ignore the problem. Alternatively one could contact his teacher and discuss the problem with her. You could alert your chair that there is a “cheating” graduate student in the department. You could also tell no one else, but treat the occurrence as a “teaching moment,” working with the student to help him understand the seriousness of his action and how to correct it.

An outside observer might ask whether the department discusses plagiarism in its orientation program for its new graduate students. Another question might be whether there is a way of monitoring this student’s future behavior without irreparably damaging his future? This is a situation in which the importance of formal ethics instruction comes to the fore.

Links: Plagiarism Web Site?

Title: Publication and Data Ownership

Keywords: collaboration, intellectual property

Description of the Problem: A graduate student became impatient with the care his advisor was taking in making certain of the correctness of their joint experimental work. He decided that he could wait no longer to publish a paper. On his own, and unbeknownst to his advisor, he wrote up a manuscript and submitted it to *Physical Review Letters* with his advisor and some other students as co-authors. The editor at the time became suspicious of the manuscript, because of the writing style, and the fact that the advisor as senior author did not submit it. He phoned up the advisor and asked him if he had been a party to the submission. It turned out that the advisor did not know about it at all.

Question: What should the advisor do about the manuscript and about the student’s ethical lapse?

Discussion: This scenario involves several ethical issues, submission of a manuscript with co-authors who have not been a party to the writing and ownership of data. The actions of this student clearly violated traditional views regarding these matters. The real dilemma is that of the advisor. What should he or she have done about this student’s clear ethical violation? This is a

situation in which the student's career could be justifiably be terminated. On the other hand it could be an opportunity for the student to learn a deep lesson regarding the ownership of intellectual property and the obligations of collaboration.

Links:

Title: Publication

Keywords: dual submission

Discussion of the Problem: A newly minted Ph.D. has taken up a position at a government laboratory. His early work has been extremely successful, and on the suggestion of his group leader he put together a manuscript describing their joint work, and submit it for publication in a high impact journal. The young scientist was the submitting author. Some weeks later his supervisor came to him and told him to submit the same manuscript to a specialized journal where the time to publication might be a lot shorter, and the potential refereeing gauntlet would likely be less of a hassle. The supervisor suggested that they could withdraw their manuscript from the extra journal if the other accepted it sooner.

Questions: What should the young scientist do? What should the editors do?

Discussion: The young scientist is faced with an ethical dilemma. If he complies with his supervisor's wish, he will have the same manuscript submitted to two different journals. If he does not comply, he runs the risk of alienating his supervisor during a probationary period. In the end he chose to follow the suggestion of his supervisor. What then transpired, is that the two journals asked the same referee to read the manuscript, and as a consequence the dual submission became known to both editors. The editors are then faced with the problem of actions, which could terminate the career of the young scientist, or a more merciful approach. Do both editors have the obligation to reject the paper outright, or should the author be asked to withdraw one of the submissions, and to apologize for his actions. Is it ethical for either editor to accept the paper given the actions of the author?

Links: APS publication guidelines.

Title: Responsible Mentoring

Keywords: mentoring, disabilities

Description of the Problem: A young graduate student in the middle of his thesis research is diagnosed with a debilitating chronic disease. The recurrence of the condition results in his being absent from the laboratory for extended periods of time. Ultimately he falls seriously behind in his research. This poses a dilemma for his mentor who while wanting to be supportive of the suffering student has an obligation to his research sponsor to be productive scientifically.

Questions: What course of action should the mentor take that might not undermine the student and yet at the same time carry out his responsibilities? To complicate matters, the student is from another country, and if he loses his student status, he will have to leave the US.

Discussion: One approach the professor might take is to apply the same standards as best he or she can that other employees at the university would have. I hope someone else has something to suggest because beyond that, this situation is a real dilemma for me.

Links:

Title: Errata in Previous Research

Keywords: errata, errors in research

Description of the Problem: A research group publishes a couple of papers on an important discovery in two different high impact journals. A new graduate student is given the task of reproducing and extending the work of the advisor and a postdoc. After several weeks of experimentation he realizes that he cannot reproduce the work reported earlier. He even has an explanation for the error.

Questions: What are the optimum courses of action for the student, the advisor and the postdoc, who in the interim, has left to take up a new job.

Discussion: First, it is essential that the former postdoc and the student publish an erratum. It would be inappropriate for the new student to be a co-author of the erratum, but he, and perhaps the advisor, when the error is completely understood could publish a paper about the physical phenomena that were overlooked earlier. The student should get an acknowledgment in the erratum, but should be consoled by the fact that a new paper might come out of the corrected results.

Links:

Title: Refereeing

Keywords: conflict of interest

Description of the Problem: A young referee claimed to have been coincidentally working on the same problem that appeared in a paper he was sent to review. He made a positive review, and then went on to publish his own paper on the subject. The original author took note, and complained to the journal. When approached, the referee pleaded with the journal that his institution not be contacted, apologized profusely, sometimes tacitly admitting and sometimes denying any guilt.

Questions: What action should the journal in question have taken? Should the editors notify the referee's institution? What should the author have done to avoid this mess?

Discussion: This problem emphasizes the importance of avoiding (whenever possible) even the appearance of a conflict of interest. The author initially should have returned the manuscript unread and not attempted to referee it. The editors, given what occurred should notify the referee's institution and leave disciplinary action to it.

Links:

Title: Authorship

Keywords: authorship, collaboration

Description of the Problem: A dispute over the correct interpretation of data arose within a three-person research group. Agreement couldn't be reached, so one author (Smith) decided to publish separately. Other researchers thought they would wait to see whether Smith's paper was accepted. Smith moved to a new institution in the interim but the notice of acceptance and manuscript number were faxed to the old institution and Jones, the former research partner, learned of it. Jones then contacted the journal, said that Smith's paper was wrong, and asked to be allowed to submit an alternate version of the material.

Questions: If you were the editor, how would you respond to this problem? What if the disagreement were the result of a long-standing dispute between the two authors? How might Jones have avoided this situation?

Links:

Title: Financial Responsibility

Description of the Problem: A person's expenses are paid by a contract or grant to attend a conference at a distant location. The individual buys a tourist class airline ticket, and saves money in that fashion. He or she is also able to find a relatively inexpensive hotel room, and inexpensive restaurants for meals. On returning the person learns that there is the possibility of charging a fixed per diem that is substantially larger than the actual expenses and pocketing the difference. This is not a situation in which taking the per diem is the only option.

Questions: Where should one go to find out what the expectations are? Some institutions may have explicit policies dealing with this. That is, the option may originate with the university but not be allowed by the granting agency, or vice versa. If it is optional, should the individual take the per diem and pocket the difference, or should he or she report only those expenses actually incurred? What should a group leader or department head do to avoid uncertainty?

Links:

Title: Intellectual Property

Description of the Problem: A student finishes a Ph.D. working on a problem that has aspects that are directly patentable and solve a major problem in the disk drive industry. His new job

could be with Hitachi or Seagate, or some similar firm. He or she arrives at the new job and discovers that the work done as a student, which is in the patent process will solve the problem at his new company. If he reveals what he knows to his new employer he will be an immediate hero, but will compromise the patent process at his original institution. This step could have important financial implications for the original institution in the form of royalties

Questions: What are the relevant ethical considerations in this dilemma?" The answer could depend on missing information, such as the nature of the contract signed by the student with his institution, if any, and the nature of its intellectual property rules. This information may have an impact on what the correct ethical response.

Title: Intellectual Property

Description of the Problem: A well-known theoretician at institution A is called by an experimentalist at Institution B, to discuss what appears to be a new discovery, based on a highly original approach to the measurements in question. The discovery supports the theorist's highly controversial approach to the problem. However there is a substantial amount of work needed before the results can be submitted for publication. The theorist has been invited to present a seminar at Institution C, where he is a candidate for a position, and where competitors of the experimentalist at Institution B are found. He was not told explicitly that his conversation with the experimentalist at Institution B was privileged.

Question: What should he or she do in preparing for his visit?

Discussion:

Links:

Title: Health and Safety

Keywords: hazardous materials, health

Description of the Problem: A condensed matter experimentalist and his students were conducting experiments on thin films of common metals such as aluminum and tin. They realized that they could substantially enhance their work by switching the samples to the metal beryllium, which is highly toxic and can bring about irreversible poisoning. The procedures that they are employing with aluminum and tin would not be suitable for a toxic material such as beryllium.

Question: What responsibility does the PI have in considering the new, potentially dangerous material for the research? What role should the students have in making this decision? If there is a decision to go ahead with the work, what is the PI's responsibility in terms of providing information and training? How should he or she proceed with setting up these new experiments in a manner that might ensure the safety of his students?

Title: Research Management

Keywords: cheating on tests

Description of the Problem: Many universities have rules about uses of research funding, research involving live subjects and other areas with ethical content. In order to insure that faculty are familiar with these rules, they are required to complete a set of online tests. At a faculty meeting, one faculty member complained about the time the certification took and volunteered to give the test answers to any other faculty member who had not already taken the certification exams.

Questions: What should the meeting chair have done? If you were a faculty member at this meeting, what would you have done? Are on-line certification tests a good way to inform faculty about all of the research rules? What is the difference between this faculty member's behavior and an undergraduate who gets the answers to a test in advance and provides them to his friends?

Links:

Title: Research Misconduct

Keywords: fabrication, falsification, and plagiarism

Description of the Problem: You are a co-author on a recent paper that was rejected. The referee made a couple good points that called into question a section of the paper. The lead author, a fellow graduate student, is responsible for rewriting this section of the paper. When you read the new version, you see that he has changed some of the numbers to address the referee comments. His response to the referee is that upon double-checking the data, there was indeed a mistake and the referee was correct in noticing something was amiss. This student hopes to graduate within the next year and you are aware that he is desperate to publish something before starting a job search. You are skeptical of your lab-mate's explanation for the error, but don't have any specific knowledge of wrongdoing.

Question: What should you do?

Discussion: Mistakes can certainly occur in drafting a paper and it's unwise to make accusations before knowing the full story. If you have questions, as a coauthor of the paper, it is reasonable for you to be satisfied that the revised paper is complete and accurate. You can certainly ask your coworker for clarification without accusing him of altering the original data. If you were worried that he will feel accused in any case, this would also be a question for your mutual advisor. As the PI for this research project (and likely as someone who has refereed many papers as well), your advisor might be in the best position to judge whether the explanation is appropriate.

Alternative Problem: A PI, who is desperate to publish in order to secure a grant renewal, has just been told by his junior student of concerns about the above paper. How might or should a PI in this situation respond to this concern?

Title: Mentoring Scenario 1

Keywords: mentoring

Description of the Problem: You enter graduate school with two full years of support from a fellowship awarded by your undergraduate institution. You easily find a faculty member to work with. At the end of the second year, the faculty member tells you that she will not be your thesis advisor.

Question: What should you do?

Discussion: At this point, all you can do is find a new advisor. Going back in time, the mistake you made was to assume that the person who took your first two years of free research availability would automatically supervise your thesis work. If you have this kind of support, be very sure of the continuation of the research relationship once the support is gone.

Additional Questions: Was the behavior of this faculty member ethical? Why or why not? How is the behavior of this professor different from the assistant professor in Scenario 6? Can you design a faculty scenario for this situation that would make her behavior ethical? What should be the response of the department to this situation?

Title: Mentoring Scenario 2

Keywords: mentoring

Description of the Problem: You are a 3rd year graduate student working in theory. Your research professor has not provided you with a problem and seems uninterested in the work you are doing on your own.

Question: What should you do?

Discussion: The point to be established is whether or not the faculty member is serious about supervising your thesis research. Opening a discussion of possible thesis topics is one way of assessing the situation. Either the discussion will lead to a narrowing of thesis possibilities or it will become clear that no thesis will result. Either way you are ahead because you will have not wasted more time.

Additional Questions: What commitments were made to this student when she was accepted as a thesis student? Are the problems the student is working on interesting or is she wasting her time? What kind of supervision should a graduate student expect from a thesis advisor? Should a student expect substantive and appropriate help from an advisor or are there different supervision styles, all of which are appropriate?

Title: Mentoring Scenario 3

Keywords: mentoring

Description of the Problem (*from the student point of view*) You are a second year graduate student in physics and have just failed the qualifier for the second time.

Question: What should you do?

Discussion: The most likely reason that you are failing the qualification exam is your background in undergraduate physics. Some students, as undergraduates, do not acquire the physics framework that would support graduate work in physics. They could have been simply very good at passing exams but did not assimilate the material, or their exposure to advanced undergraduate physics might have been deficient. All possible remedies start with a discussion with the graduate program head. Once you have admitted your problems the possible remedies might include grading in the advanced undergrad physics courses or simply sitting in on undergrad courses for no credit.

Description of the Problem: (*from the point of view of the graduate program chair*) Several graduate students in the program have just failed the qualifier for the second time.

Question: What should you do?

Discussion: Students accepted for graduate study in US institutions are not dumb. If a student is failing the qualifier, you should find out why. A discussion with the student and with the student's teachers is a necessary part of the process.

Points that an outside observer might raise: Should the program chair or counselors be aware of the classroom performance of graduate students before they take the qualifier and arrange appropriate counseling and learning opportunities to insure success? What kind of counseling was offered to the students after their first failure? What is the attrition rate for graduate students in this department? Some institutions do not have a qualification exam. Are their students less able than yours? Is the success rate of their students as professional scientists less than the success rate of yours? This scenario opens up the question of whether a program uses exams to weed people out. When I was applying to graduate school, some programs had the reputation for intentionally accepting more students than would pass the qualifier or comprehensive because they needed the TAs.

Title: Mentoring Scenario 4

Keywords: mentoring

Description of the Problem: You are a minority graduate student studying at a good University. You are having trouble with your graduate coursework because your undergraduate institution did not offer intensive courses in some upper level physics areas. Your first term grades were marginal. During the second term, the faculty member in charge of the graduate program asks you to attend a physics meeting aimed at minority scientists to help the department recruit new minority graduate students. You are flattered but are worried about missing class work.

Question: What should you do?

Discussion: This may be an opportunity to open a discussion with the graduate program head about your difficulties. A straightforward admission of your problems and your worries about missing class might lead to mentoring opportunities that will help you in your classes. If the graduate chair is not approachable, then a similar discussion with your professors might also provide some positive benefits.

Points that an outside observer might raise: Is attending the meeting an appropriate (ethical) request to make to this student? If a student were worried about classroom performance, would he or she be afraid to refuse the request of his program chair? Is there a better way to recruit students to attend meetings of this type than targeting individual students? Have the graduate counselors in the department worked with this student in planning an appropriate program? If the graduate chair is not viewed as approachable by the student, why not? It is not always easy to confront personality issues in a department, but one way or another a department needs to make advisors or program coordinators available that students feel able to talk to.

Title: Mentoring Scenario 5

Keywords: mentoring

Description of the Problem: You are a student from a very small undergraduate institution, accepted for graduate study in a prestigious university. Your first year is covered by a scholarship. When you arrive, your advisors place you in the standard first year graduate classes. You have doubts about your background.

Question: What should you do?

Discussion: There are several factors to consider in this scenario. The first is the courses that you elect to take during your first term. Your options are: accept the placement because you don't want people to think you can't handle the graduate work. Insist on taking some advanced undergraduate courses your first term to check your preparation. Try a combination of graduate and undergraduate classes, focusing the undergraduate work in areas where you doubt your preparation. Which option you pick depends on your preparation. It is important to realize that you are in charge of what happens to you.

Two of the ethical concerns in mentoring are recruiting students under false or incomplete pretenses and making sure that student responsibilities are substantive and appropriate. The questions an outside observer could raise regarding the departmental behavior are: When this student was accepted, did the admissions committee discuss her deficient background? Why was she accepted with a poor background? Is the student a member of a minority group and the acceptance tokenism? The student was given a scholarship. Was this recognition of her need to spend more time on classwork than others? Is this department being pushed by the institution to enroll more under-represented students? Do the first year counselors regard the students they counsel as individuals to help or as a burdensome service assignment? This scenario is

challenging in that it represents an aspect of advising fairly realistically. How do we know if a student is under-prepared?

Title: Mentoring Scenario 6

Keywords: mentoring

Description of the Problem: *(from the graduate student perspective):* You are a 3rd year graduate student working for a faculty member you believe will chair your thesis committee. Two weeks before school begins in September, he tells you that he can no longer be your thesis chairman. In order to be supported as a graduate student, you need to have a research mentor.

Question: What should you do?

Discussion: The first thing you should do is immediately talk to the graduate program chair. Some departments have rules about amount of notice faculty research mentors have to provide graduate students before cutting them loose. What you should not do is choose a research advisor on the rebound simply to remain in good standing. This particular problem may not have an easy solution as finding a good thesis advisor requires time. You may have to seek funding outside of your department until your situation is regularized. The second thing you should do then, if the graduate chair cannot help, is look for other support in institutional bridging and support programs that need teachers with a science background. One term of this kind of support will give you the time you need to reestablish a research relationship.

Description of the Problem: *(from the perspective of an untenured Assistant Professor)* In January, a student approached you to be his thesis advisor and you agreed. During the subsequent semester you found that he was taking more of your time than you were really able to give. He was not at a point where he could effectively contribute to any of the calculations that you had in hand. He would frequently give you his own calculations for comment and, because of other time constraints; you usually were not able to read them in a timely way. While you would have preferred a student with more independence, you thought that the situation might improve over time. In May, a senior colleague in your group left and his advanced graduate student opted to stay at your University rather than accompany your colleague. You were pressured by your department to take this student. As the summer progressed, it became clear that you could not effectively deal with both students and do all of the research that was needed in order to present a good tenure profile. Your options seem to be to cut the first student loose or to keep both students,

Question: What should you do?

Discussion: One of the ethical concerns in mentoring is the recruiting of students under false or incomplete pretenses. In this case, the student was not recruited by the faculty member but was accepted as a thesis student. While there was no “pretense” initially involved, there could be a developing element of dishonesty if the student is not informed about the evolving situation. The two levels of ethical concern in this scenario are the decision to be made by the faculty member and the behavior of the department.

Points that the faculty member might consider: What commitments did you make to the younger student? Did you discuss a timeline toward a degree? Was this student given any indications that you were considering dropping your commitment to thesis supervision? Did your department behave fairly (ethically) in pressuring you to take the second student? Were you promised any extra resources for accepting her? Were you told that it would help your tenure? As the situation deteriorated, did you discuss the problem with your department chair?

Points that an outside observer might raise: Does this department have a strong commitment to developing graduate students into professional physicists? What is the attrition rate for graduate students in this department? Does this department have a strong commitment to helping assistant professors achieve tenure? Was it ethical to pressure the faculty member to accept the second student? What kind of pressure was applied? Was the treatment of the student by the department after he was terminated fair? It is true that, once the student had no thesis supervisor, he was not a student in good standing. When the student was recruited for this graduate program, what kind of assurances was he given about departmental support? Were these assurances honored when he was denied support after being terminated?

Title: Data Acquisition

Keywords: data handling, record keeping

Description of the Problem: You are a graduate student working in a lab where data is accumulated for the purposes of measuring the optical absorption of a variety of samples. For each sample there is a large data file stored on a computer in the lab. In reviewing a lab notebook from one of your predecessors in the lab and comparing that to data published by the lab, you find a gap. That is, some of the data that was published is not accounted for in the lab notebook. Furthermore, you are unable to locate the computer files for this missing data. You talk to a fellow graduate student about this situation, and he tells you that you should be very concerned about the situation and that it should be reported.

Question: How should you proceed?

Discussion: First, it is useful to recognize that there may be several explanations for the “missing” data. Among these are: the missing data was acquired by someone else who maintained a separate lab notebook and stored computer files differently. The missing data was acquired by the same person who acquired the rest of the data, but for some reason the records were not maintained in the same fashion. The missing data in fact never existed. Of these three possibilities, only the third involves serious misconduct, while the other two possibilities involve problems in record keeping.

Given the information you have at this point, it is premature to conclude that misconduct has taken place. A logical place to begin is to find out if other people were involved in acquiring data for the publication in question. If you are unable to track down the missing data this way, you could ask your research advisor about it directly. It is more likely that this is just a record keeping problem, so avoid any questions that sound accusatory. If you are unable to resolve the matter at this level, you should talk to a carefully chosen, outside party. It is not necessarily wise

to talk to fellow graduate students about the issue. It is not clear that they will have the experience or perspective to assess the situation and you may unwittingly start unfounded rumors about your lab. You could consider talking to the department head if you think he or she is an objective third party. You could also talk to your institution's Misconduct Policy Officer. Your institution's research development office can provide contact information.

Finally, it is worth noting that careful record keeping can help prevent misunderstandings. If someone else had collected the missing data, a cross-reference in the two lab notebooks would have been helpful. Similarly, if one person accumulated all of the data but the information was stored differently, that point should be noted in their lab book.

Links:

Title: Whistle Blowing

Keywords: whistle blowing

Description of the Problem: A graduate student has been working in a lab for a year on what she hopes will be her Ph.D. dissertation research. She has been troubled for the last several months by the possibility that her advisor may be manipulating data used in his publications. This past week, she has just discovered what she believes to be incontrovertible evidence that some of his published data had in fact been fabricated.

Question: What should she do?

Discussion: First it is useful to remember that available (though not definitive) evidence indicates that data fabrication is rare in physics, so while the student is likely in a position where she must take some action she should keep open the possibility that she has misinterpreted the situation. This comment, however, should not be used to justify looking the other way on the possibility that she is wrong. The question about the data needs to be resolved. If there is going to be a formal inquiry of this matter, then it will be very important to preserve as much physical evidence as possible. At some universities, lab notebooks and other relevant material are impounded immediately upon receipt of a formal allegation of research misconduct. Preserving the evidence makes it much easier to arrive at a definitive conclusion regarding the existence of misconduct or the grounds for full exoneration. With this in mind, any actions the student takes should be consistent with the goal of preserving the evidence.

A formal inquiry into a misconduct allegation is kept confidential out of respect to both the accused and the accuser. Anything the student does prior to making a formal allegation should be consistent with this principle. This means that the student should not ask numerous people for their opinion on the matter, but rather advice should be sought from one or two trusted department members or from the university official who is likely to conduct the inquiry.

Nearly every university has someone designated as their Misconduct Policy Officer (or a similar title) who has the responsibility for initiating inquiries in response to formal allegations. The student may well need to take her allegation to this official. While it is nice to try to handle

things internally (for instance working within the department), failed attempts at reaching an internal solution can make the inquiry much harder to pursue. For instance, an individual who is tipped off about a pending allegation by an attempt to resolve the issue internally has more time to cover his or her tracks and to alter or destroy physical evidence.

Title: Interface with the Public: Signing a Petition

Keywords: public affairs

Description of the Problem: In the 1980's, President Ronald Reagan proposed building a missile defense system that would provide a defensive shield for the United States. The Strategic Defense Initiative was heavily funded, opening up research opportunities for physicists, engineers, and computer scientists among others. In 1985, a petition circulated among many physics departments in the U.S. It read in part:

We, the undersigned science and engineering faculty, believe that the Strategic Defense Initiative (SDI) program (commonly known as Star Wars) is ill conceived and dangerous....

Participation in SDI by individual researchers would lend their institution's name to a program of dubious scientific validity, and give legitimacy to this program at a time when the involvement of prestigious research institutions is being sought to increase Congressional support....

Accordingly, as working scientists and engineers, we pledge neither to solicit nor accept SDI funds, and encourage others to join us in this refusal. We hope together to persuade the public and Congress not to support this deeply misguided and dangerous program.
(I added an indentation here to make sure it is clear what has been quoted)

Question: Setting aside for a moment the specifics of SDI, under what circumstances is it appropriate to sign a petition such as this?

Discussion: It is important to recognize that a key motivation for this petition is communication to Congress and the general public by scientists and engineers of their stand on an issue. Had the point been merely to refuse SDI funding, that goal could have been accomplished in silence. Signing a petition such as this then raises ethical issues associated with how physicists communicate to others outside their community. How will signatures on this petition be interpreted? Will they be interpreted as a statement of a political sentiment by a group of professionals or will they be interpreted as a statement of professional opinion on an issue of political significance? In the latter case, does signing the petition does that imply you have a certain level of knowledge and expertise in the area? To what extent is it sufficient to rely on the knowledge and expertise of others before deciding to sign this petition? At the same time, if you do believe that you are aware of reliable, relevant information in a debate over an issue of this importance, arguably you have an obligation to actively seek to share that information with others.

It is also worth considering the issue of trust. Complex societies function in part based on the trust we have for people in their area of expertise. Physicists can continue to have a positive impact on society and continue to receive support from society provided they maintain the trust of society. One aspect of maintaining this trust is making it clear when a statement is being made based primarily on scientific information about which one has some knowledge, and when a statement is being made based on political considerations. In the case study provided above, insufficient information has been provided in order to judge whether there is a scientific basis on which to sign the petition. More information is required. That in fact illustrates the point: one should not express an opinion that might be interpreted as an “expert opinion” without having acquired sufficient knowledge about the technical issues.

A second issue presented by this case study relates to the promise not to solicit a particular form of funding. Suppose you have kept up with the technical issues raised by the petition and you do feel sufficiently knowledgeable to sign it. If you are presently in a job situation that would not ordinarily give rise to your pursuing such funding, is it reasonable or is it misleading to sign the petition? For instance, if you are a beginning graduate student whose research is funded by the National Science Foundation through a grant held by your thesis advisor, there may be little need for you to apply for funding in the next few years. Is it misleading to sign a petition forswearing the pursuit of SDI funds when you had no intention of pursuing any funding anyway?

Links: Physics Today November 1985, p. 95

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