Responsible Conduct of Research Training in the Bucknell University Department of Physics & Astronomy

I. INTRODUCTION

These notes are taken from RCR sessions conducted with summer research students in the Department of Physics & Astronomy in 2014, 2015, and 2016. The training was required for those students receiving funds from NSF, but all students participated, independent of funding source. Carol Burdsal (from the Bucknell Office of Sponsored Research) was consulted, and attended the group discussions in 2014.

The design of this training was informed by the materials provided by Marshall Thomsen (Eastern Michigan University) on his website: *Ethical Issues in Physics — Getting Started* (`http://people.emich.edu/jthomsen/Ethics/Perspective.htm`) and takes advantage of material from the American Physical Society *Ethics Case Studies* web-page (`http://www.aps.org/programs/education/ethics/`). Live links and additional material are available at `http://www.eg.bucknell.edu/physics/reu/rcr/`.

There are several goals for this training:

1. make the broad range of issues of RCR visible to the students, and highlight those issues that might affect them directly as young researchers;

2. highlight the subtleties of RCR — it's more complicated than "don't fabricate data," "don't plagiarize," and "don't steal";

3. get students to react to case studies;

4. highlight consequences of misconduct;

5. highlight institutional issues related to RCR: there are accepted professional standards, and there should be well-publicized procedures for dealing with misconduct and unethical behavior.

The discussions have been useful, and we will continue this kind of training for all summer research students, independent of source of support.

II. RESOURCES

Assigned Readings:

- American Physical Society Guidelines for Professional Conduct
  `http://www.aps.org/policy/statements/02_2.cfmi`;
- M. Thomsen, *Ethical Issues in Physics — Getting Started*
  `http://people.emich.edu/jthomsen/Ethics/Perspective.htm`;
  includes a bibliography of relevant materials.
- American Physical Society Ethics Case Studies
  `http://www.aps.org/programs/education/ethics/index.cfm`

Additional Resources

- American Physical Society Ethics Education Resources,
  `http://www.aps.org/programs/education/ethics/resources.cfm`
- Articles on our RCR website.

III. PRE-ASSIGNMENT (BEFORE FIRST GROUP DISCUSSION)

Before the first session on RCR training, the students all receive the following email:

> `Summer Research Students,`
>
> `Next Monday's Skill Session will be in Olin 266 at the usual time (3:00). The topic will be the Responsible Conduct of Research (RCR), a.k.a. research ethics. This is an important topic --- important enough that training in RCR is a requirement on all NSF grants.`
>
> `Through assigned readings, a little bit of lecture, and some group discussion of some case studies, we will`
>
> - `introduce you to the wide range of areas in the practice of science in which ethical questions arise,`

- introduce you to some of the subtleties of the Responsible Conduct of Research (it's not all black and white),
- introduce you to a few issues that are important to students, (both undergraduate and graduate), and
- discuss appropriate responses when ethical issues come up.

In preparation for Monday's skill session we ask you to read the attached articles. The first article by David Resnik introduces the question "What is Ethics in Research & Why is it Important?" and the second is the *American Physical Society Guidelines for Professional Conduct.*

ASSIGNMENT: Before the Skill Session send an email with a brief response to the reading. You should specifically address the following questions:

Q1: Name some examples of actions that are ethical, yet unlawful, and actions that are lawful, yet unethical.

Q2: The article by Resnik discusses several specific ‘‘cases." In which of these cases is the ethical course of action obvious, and in which is it not so obvious? Support your response with a brief explanation.

Marty

IV. RCR GROUP SESSION(S)

A. Discussion of Resnik reading and responses

1. Discuss items from student responses to Question 1 in assignment above.

2. Throw out some other items for Question 1 in assignment above to get students thinking (if they didn't come up already)

   - Civil disobedience. Lawful? Clearly not (by definition). Ethical? Not so clear. Need more information? Perspective of time? What about consequences? Who is affected? Who wins? Who loses? What about Edward Snowden?
   - Research adviser who drops student after 2 years of seemingly ok relationship? Lawful? Yes. Ethical? Not so clear; need more information.
   - Classified military research on nuclear weapons?
   - Use of single data set out of context? (Think global warming, or creation science.)

3. Discuss items from student responses to Q2 above.

   - Case 1 — Drug trials. Clearly unethical. Others depend on results. Professional standards, such as 5σ detection, let others know what you really mean.
   - Case 2 — Mistake in paper. Gray area. How big a mistake counts. Faculty talked about personal experience with mistakes in paper.
   - Case 3 — Sharing of complete data set before its time. Less clear. Examples from astronomy where instrument developers get first crack at data (rules are spelled out in this case).

4. Summarize, and Translate to RCR:
   We have been discussing actions along the axis of

   $$\text{Lawful/Unlawful} \longleftrightarrow \text{Ethical/Unethical}.$$

   In the conduct of research, we articulate some of these ideas in terms of the following distinctions:

   $$\text{Misconduct/Not Misconduct} \longleftrightarrow \text{Ethical/Unethical} \longleftrightarrow \text{Responsible/Irresponsible}.$$

When conduct on federally-funded research rises to the level of misconduct, it can't be handled "in-house," i.e., within a research group, or within a department. Suspected misconduct must be reported to the the institution (i.e. the person designated by university), and institution must have procedures in place. [Hand-out Bucknell procedures.] Misconduct has consequences for the accused researcher, the supervisor/department, and the university. Researchers found guilty can be debarred from federally sponsored research; students implicated can forget about grad school.

B. Some Myths

- **Myth #1:** It's simple — just don't falsify your data.

  RCR extends way beyond this simplistic description. And there are complex questions regarding falsification of data. What is data? What is it to misrepresent data? Must every scrap of data be included? (Talk about PHYS 310 data. Talk about Millikan and quantized charge.)

- **Myth #2:** It's all subjective; just one person's opinion.

  There are many gray areas in RCR, but professional standards provide a common starting point for discussions, improving outcomes. Well-articulated institutional procedures provide a framework for working through difficult issues (refer to Bucknell procedures).

- **Myth #3:** You'll get what you need through experience in your research group.

  This has been the working model for many years. But what do you do if you suspect adviser of misconduct or unethical behavior? This model ignores the power structures and conflicting interests inherent in any research institution. Well-articulated common standards that are well publicized are important part of helping people recognize irresponsible conduct, and providing options for action. This often presents an early way out of a morass. In short, RCR by osmosis is inadequate. (This discussion caused the faculty to reflect on lots of things that occurred in their careers; some were recognized as unethical/irresponsible for the first time!)

- **Myth #4:** Science will discover the truth eventually, by the nature of its process.

Even if there is a grain of truth in this, RCR provides a more efficient path, and a path on which individuals are treated fairly, and less likely to waste time.

C. Areas in which RCR issues arise

- Publishing practices
  - Authorship
  - Citation practices and responsibilities
  - Reviewing practices and responsibilities
- Human Subjects Research (not often an issue in PHYS/ASTR)
- Workplace Culture
- Conflicts of Interest
  - Personal relationships
  - Financial
  - Scholarly (competing research)
- Bias and workplace culture
- Data
  - acquisition
  - management
  - public access
- Software (developed for research)
  - responsibility to validate
  - public access
- Mentoring
- Health and Safety

D. Discussion of some famous cases

- Jan Hendrik Schön — Egregious fabrication of data by someone touted as Nobel Prize worthy. Obvious misconduct, but what were responsibilities of his collaborators? What were the responsibilities of those reviewing his work?
- Geoff Marcy — Egregious and long-running sexual harassment in the Astronomy Department at UC Berkeley. What were responsibilities of others who might have known, or should have known? What were institutional responsibilities to prevent this kind of conduct, and to provide mechanisms to report it?

E. Introduction to possible case studies chosen for second RCR assignment (see below)

V. SECOND RCR ASSIGNMENT

The goal of this assignment is twofold. First, we want the students to see and explore the range of RCR issues (and case studies). Second, we want the students to pick one case, react to it, analyze it, and present it.

A. Text of assignment

This assignment takes advantage of the American Physical Society Ethics Case Studies web page at `http://www.aps.org/programs/education/ethics/`.

On the right side of the page is set of Ethics Case Study Topics (located under a picture of old pan balance representing the scales of justice).

1. Click on each of the Topics, and read the short description of the topic. Identify the topics that we did not have time to cover in our first Skills Session discussion.
2. Browse the Related Case Studies under each topic.
3. Pick one case study from one of the topics to investigate — the best case studies for this assignment will have at least some "gray areas." Write

a short response to the study, articulating your reactions (Who are the players?, What are the stakes for each of the players? Which actions might be considered unethical?, Which might be considered irresponsible? What could have been done to prevent the situation? What is an appropriate response? What additional information might make judgment easier? etc.)

We encourage you to work in groups when you discuss your case, but we want an independent written response from each of you.

B. Discussion of case studies chosen for second RCR assignment

In a meeting of the group, each student introduced his/her chosen case and reaction to it. This was followed by a group discussion of the case, which allowed other perspectives to be articulated by students and faculty.