Responsible Conduct of Research: Case Studies

A component of the SAO REU summer research program

Marie Machacek & Christine Jones, July 2016

Since 2014, the SAO Astronomy REU program has carried out training in ethics as part of the professional development component of its 10-week summer research program. Here we document the activity for our own use and for the use of other REU programs. Questions should be directed to the co-directors of the SAO Astronomy REU program: Matthew Ashby (mashby@cfa.harvard.edu) and Jonathan McDonald (jmd@cfa.harvard.edu).

The ethics training consists of a single two-hour seminar held close to the beginning of the 10-week research period. The students are instructed to self-organize into teams of two or at most three students each. Each team is then told to select two case studies from the list below for the seminar. At the seminar, to be held after allowing a suitable interval for the teams to prepare, each team will lead a discussion of their self-assigned case studies. Teams will begin by describing the case study, and then will be responsible for leading the ensuing discussion. No more than 15 minutes are typically needed to complete discussion of any particular case.

For each issue, the teams will identify a 'leader' and a 'scribe.' The leader is responsible for introducing the case study, fully describing it to the group, and for leading the subsequent discussion, which is to touch on all the questions provided. Program directors are to gently guide the discussion and provide information as needed (e.g., historical backgrounds, professional standards of conduct). The scribe is responsible for taking notes during the group discussion, and (when the seminar is completed) compiling those notes into a coherent narrative that reflects the consensus or at least the breadth of student opinion expressed during the group discussion. Students are to alternate roles so that everyone has an opportunity to play both roles at least once. Finally, each team will submit a single writeup describing all their case studies to the program directors.

For more information, see https://aas.org/about/policies/aas-ethics-statement for the AAS Ethics Statement and related resources.

Example case studies as used in 2014, 2015, and 2016 at SAO, appear below.

Ethics Question 1: Author Attribution Case Study.

Background: A professor is working on a research project. You volunteer to help with the research. All of your work is purely voluntary and you receive no compensation for it. When the professor publishes the results of the research, he doesn't list you as a co-author, but mentions you in the acknowledgements section of the paper. You feel that you did a substantial amount of work but when you approach the professor he does not agree.

Discussion Questions:

• How much work constitutes co-authorship?
• Should you drop the issue or bring it to the head of the department?
• What if the student was an official and/or paid member of the research group? Would that change the issue?
• What could the student have done prior to beginning the research to have avoided this situation?

Ethics Question 2: Data Reliability and Analysis.

Background: You want to test a previously established empirical fit between two observed properties of galaxies, one that was obtained through rigorous methods and is widely accepted as valid. After collecting your data, you find that you have many outliers from the expected relation. Standard practice says you should remove these outliers (by sigma clipping, or similar methods) to better fit the expected result - but you don't have an a priori reason to mistrust these data. After conducting your analysis, you cannot discover a source of systematic error in your work which could account for these discrepancies. This result challenges previous assumptions, and you believe it is important for others to consider - but you are also concerned that your work may be flawed in some way. How do you proceed?

Ethics Question 3: Data Confidentiality and Collaboration Etiquette.

Background: You are a graduate student working with an advisor at a major observatory. Your advisor has been visited by an old friend who conducts research in a different waveband at another major facility. You were invited to speak with her about research. In the meeting you learn that your advisor has given her a copy

of the analysis code you created as well as a copy of the X-ray data used in your analysis, even though the data is not publically available for another week. You are also aware that your advisor is not the principle investigator with primary ownership of the data he shared, and you do not know whether permission was obtained from the PI to share the data. You are furious at your advisor for giving his friend your analysis code and confront him advisor about the matter. He responds "Your program came from the ideas of the collaboration so belongs to the collaboration and can be shared provided the majority in the collaboration agree." You disagree because there was no formal written agreement assigning your program to the collaboration.

Discussion Questions:

• Do you agree with what your advisor said about majority rule within the collaboration?
• Would you ignore the issue regarding the sharing of private data? If not, what should you do?
• Is the analysis code you developed your intellectual property or the property of the collaboration? If yours, what should you do about the fact that someone from a different organization has received your code without your permission?
• Consider the same scenario, however this time you know that the PI for the data wanted the data to remain confidential. Would you inform the PI for the data that the data had been given to your advisor's friend, thus potentially harming your advisor's reputation, despite the fact that the data would become public in a week anyway?
• During the meeting with your advisor's friend you learn of a position in his/her group that you want to apply for. Would you risk provoking your advisor's friend by informing the PI about the shared data?

Ethics Question 4: Teaching.

Background: You volunteer as an undergraduate teaching assistant for lower-level physics courses at your university. Your responsibilities include tutoring the students in these classes. You notice that some of the students you are helping are pressing you for too much information about the homework problems. You worry that you are doing too much of the work for them and are inadvertently hindering their learning. You are also concerned that they are receiving an unfair advantage over the other students, who are thinking through the problems on their own and are receiving as much additional information.

Discussion Questions:

1. Can you relate to this experience as either a student or a mentor?
2. What are your responsibilities as a tutor/mentor?
3. What are your responsibilities as a student seeking tutoring?
4. What teaching methods can you use to get students to think about the problem without giving away the answer?
5. How can you make sure you are treating all your students equally?

Ethics Question 5: Reporting Ethics Violations.

Background: You are a graduate student in your final year working on your PhD dissertation. You think you have developed a new way to model the influence of stellar feedback on galaxy formation. You think your simulation is groundbreaking, so you go and seek the opinion and advice of your dissertation advisor, who has been your graduate research mentor for six years. You have a good relationship with her, and she has always been an active and supportive mentor. She plans to provide a stellar recommendation, which you think will secure for you a prestigious post-doctoral fellowship with a generous stipend. Your advisor looks over your new simulation results and is very discouraging, telling you it would hurt your reputation in the eyes of your colleagues to publish them. Several months later you see your work published in the Astrophysical Journal under your advisor's name. Your advisor has stolen your ideas! However, you still need her support to obtain a post-doctoral position. What do you do in this situation? Should you report your advisor, and if so, what is the proper procedure?

Ethics Question 6: Giving Proper Credit and Co-Authorship.

Background: A student and a professor are having lunch and discussing a project in which the student is not involved. The student recalls something she just learned and makes a comment that inspires the professor to make a breakthrough. Later, as the professor writes his paper, he is unsure how or whether he should acknowledge the student's idea because the student did no actual work on the project.

Discussion Questions:

• Should the student be acknowledged?

• How much involvement is required to justify an acknowledgement?
• Is a comment as important as direct assistance?

Ethics Question 7: Data Reliability and Analysis.

Background: You have been working hard compiling a list of debris disk candidates for a volume-sensitive sample of stars. Once you have your preliminary list of candidate stars, you present your work at a conference. You then discover some errors in your data, such as saturated sources and some mis-identifications. You have a paper that you are planning to publish in the near future, and won't have time to fix your entire dataset. How do you proceed?

Discussion Questions:

• How much can we trust the data?
• How do you know that the results are reasonable?
• How do you weigh the rush to publish a new result versus making sure that it is correct?

Ethics Question 8: Data Confidentiality and Collaboration Etiquette.

Background: You are a leading scientist in a research group that is preparing to publish a paper. Your group found O_2 absorption lines in the atmosphere of an exoplanet and this paper is expected to be a significant contribution to your field. You feel that the group is so far along in the preparation of the paper that you can discuss the contents of your work with fellow scientists from other universities. Another researcher in your group learned that you divulged specifics regarding the methods and conclusions of this project, and that you shared some of the data, which was taken with a private telescope and not released to the public. He was very upset, and confronted you, stating that any unforeseen roadblocks in the publication process could delay the paper long enough for another group to scoop the project. He threatens to speak to the other researchers in order to have you removed from the research group and your name removed from the paper.

Discussion Questions:

• Do you feel that you should have avoided speaking to other researchers before the paper was published?

• Do you feel that it is appropriate for your fellow scientist to threaten such extreme action?
• What sort of obligations do you have to protect the intellectual property of the workof your group?
• When, if ever, is it appropriate to release data gathered from a private telescope?

Ethics Question 9: Teaching.

Background: You are a teaching assistant for an introductory physics course. Many of your students are first year physics and engineering majors, but many others are seniors on the pre-medical track. You observe that, due to their previous experience in scientific writing and lab work, the latter group does much better on the written lab reports.

Discussion Questions:

• Should you grade the two groups differently? If so, to what degree? If not, why?
• How should you take into account those students that come to your office hours and ask you for help? Should this affect the way that you grade them?
• As a student, is it your responsibility to seek out extra help?
• Should a high level of skill in scientific writing be expected from students in an introductory course?

Ethics Question 10: Reporting Ethics Violations.

Background: You're a grad student in the grad lounge enjoying cookie hour when a 5th year grad student, John, walks in. John looks distressed and is not enjoying any cookies. You ask John what's bothering him and he sobs that his advisor is misusing grant money. As a result, John has fewer observing opportunities throughout the year and can't finish his thesis on time. John is afraid to report his advisor because his prospects of finding another advisor this late in his career are minimal.

Discussion Questions:

• Should you and/or John confront the advisor?
• Should John report his advisor?
• If John doesn't report his advisor, should you?