

**GUIDE and CASE STUDIES  
FOR THE DVD  
“IN THE LAB:  
MENTORS AND STUDENTS  
BEHIND THE SCENES”**



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## **GUIDE TO THE DVD "IN THE LAB"**

### **GOALS AND IDEAS**

The goal of this small book and accompanying DVD is to help you to have a better experience in your laboratory by getting you to step back and take a global look at what is involved in making progress in the laboratory.

In this book and DVD, we look at personal relationships in laboratories and at suggestions for how to steer clear of scientific misconduct. We also look at the various ways labs decide whose name should go on papers – your passport to a new job in a new laboratory, or better funding for the one in which you are already working. Paying close attention to this DVD and the case studies in this book will help you to get the maximum returns from the investment you are making in laboratory work.

This book presents questions about situations that arise in laboratories. It asks you to determine possible courses of action that are both legitimate and likely to yield positive results. Determining what you would do in these situations, we hope, will help you to evaluate what you think is the right course of action for yourself in the situations that arise in your own laboratory.

In watching the DVD and doing the case studies, remember that none of us functions in isolation. Each of us has an impact on those we work with and is, in turn, impacted by others. Personal relations in the laboratory are, therefore, key. The first part of the DVD and accompanying case studies focuses on relationships and the second on how these relationships affect the process of avoiding scientific misconduct. The third part focuses on how relationships affect the process of deciding the proper attribution of authorship, including authorship in interdisciplinary collaborations.

One thing the editors of this book suggest you keep in mind when reading the case studies and acting in the lab is that, if you are not now in a position of authority, it is likely that someday you will be. At that time, you will be able to contribute to the lives of your students in ways that, right now, you might like those who are in a position of authority to contribute to your life. Some say leadership is more a state of being than a skill. If you begin to think about what is important to you in leadership now, you will have a greater chance of being a good leader when that time comes.

We also suggest that you keep in mind the idea that work should not be seen as drudgery. Seeing your work in this way leads to resentment. You will either resent the fact that the moment has arrived when you must finally perform the work, or that someone else isn't there to do the work for you.

For best results, one must love one's work and perform the work in a way that reflects this, whole-heartedly. According to an Eastern saying, when working, one will become "a flute through whose heart the whispering of the hours turns to music" (Kahlil Gibran). Once we learn to do this, when we get up in the morning, we will "look forward to the day with the same excitement that we feel on vacations" (Michael Phillips).

For many of the case studies, there will be no single right answer and there will be no single way to determine a course of action. The right answer will be specific to the person answering the question and will depend on the character and outlook of that person.

Finally, whatever your level in the laboratory, whether research technician, senior laboratory member, or principle investigator (P.I.), you have an effect on those around you. In most cases your effect on others is more pervasive than you think. Hence, improving your own practices in your relationships with others in your laboratory will help to raise the group experience to a new level.

## RECOMMENDATIONS FOR USE

This DVD contains three videos: Mentoring, Scientific Misconduct, and Authorship. Each one is intended to introduce a major topic in ethics in the laboratory. We suggest that the three videos be viewed in separate sessions of at least one hour each, to leave sufficient time for discussion. One way to engage students in discussion is to have them analyze one or more related case studies in this guidebook. Questions are provided with each case study. As mentioned above, there is seldom a single right answer to a case study question. The purpose of the questions is to help spark ideas and generate open discussion.

The topics covered in the case studies and DVD – mentoring, research misconduct, and authorship – are sometimes sensitive topics. They are topics everyone talks about, but not always openly. This DVD and book will help laboratory members to more openly engage in discussion on these and other topics relevant to laboratory work.

Note that for most DVD players there is a menu you can use to access the second and third videos directly. If you are using a TV-DVD player, pop in the DVD and then press the button labeled "menu" on your remote. Select the video you wish to see and press "play." If you have a DVD player and software and are playing the DVD on your computer, start the DVD, then bring up the menu and select the video you wish to see.

A commentary about each case study is placed at the end of this book. We place them here, out of the way, because we find that they can be an impediment to open discussion. We include them because the instructor may wish to consult them beforehand to assist in leading discussion.

These and many other relevant case studies and commentaries are available in Research Ethics: Cases and Commentaries, Brian Schrag (ed.) Bloomington, Indiana: Association for Practical and Professional Ethics; Volumes 1-6, (1997-2002). Volumes 1-3 were prepared under NSF Grant Number SBR-9241897 and Volumes 3-6 were prepared under NSF Grant Number SES-9817880.

The cases in this Guide and additional commentaries on them can be found in the following volumes of Research Ethics: Cases and Commentaries:  
Volume 1 (1997)

“Informal Discussions/Formal Authority,” pp. 7-11

“The Temporary Post-Doc,” pp. 28-34

Volume 2 (1998)

“When in Rome: Conventions in Assignment of Authorship,” pp. 1-8

“Today’s Specials,” pp. 71-81

## Volume 3 (1999)

“Whose Lab is it?” pp. 1-13

“O, What a Tangled Web We Weave!” pp. 35-46

“Truth or Consequences,” pp. 65-73

## Volume 4 (2000)

“Student Publishes,” pp. 113-120

## Volume 5 (2001)

“Patent Authorship: Whose DNA Is It Anyway?” pp. 53-61

“Preliminary Data,” pp. 83-89

“The Slave Driver vs. the Lazy Student,” pp. 96-103

## Volume 6 (2002)

“Friendship vs. Authorship,” pp. 6-11

“The Graduate Student Laborer,” pp. 12-16

“Making the Grade,” pp. 22-25

“How Much Help Is Too Much Help?” pp. 28-33.

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# DETAILED TABLE OF CONTENTS

## PART 1: MENTORING AND RELATIONSHIPS IN THE LABORATORY

### **Video (40 minutes)**

The first few scenarios in part 1 of the DVD illustrate the process of choosing a lab in which to work. In the first scenario, students Bob, Jay and Elliot discuss their views on how to choose a lab. In the second one, the two P.I.s, Drs. Becksley and Morris, explain some of the things that are important from the mentor's perspective. An emerging pattern is that the process is an individual one – different laboratory environments work better for different people. Later scenarios in part 1 show the frustration that a student, Jessica, feels when trying to "think independently" in a new laboratory. It also shows difficulties faced by Samantha, an international student, in dealing with the prejudices of another lab member. A theme throughout is the importance of good communication between students, and between students and their mentors – not to mention with their families and friends, especially when the work hours are long.

An important point to keep in mind when watching the DVD is that contacts are important, something every professional who is moving up in the corporate ladder knows. At each stage in their laboratory careers, students develop relationships. For someone who is in laboratory work for the long term, each relationship at an earlier stage can become a contact at a later one. Students are wise to trust their intuitions about which relationships will prove helpful and to foster the best of them, for example, according to the golden rule.

### **1.1 “Today’s Specials”**

This case study raises questions from a departmental perspective on some of the issues a department should consider in accepting a student. In particular, it addresses the question of whether a department should take into consideration the job market, that is, whether its graduates will be employable upon graduation, in deciding how many students to accept into the program.

### **1.2 “Whose Lab Is It?”**

This case study is about a beginning laboratory student facing the question of how much independent thinking he should exercise and how much control his mentor should retain over the specifics and overall direction of his project. An important part of answering these questions with respect to one's own laboratory is developing a good strategy or strategies for making sure that the right kind of communication takes place between oneself and one's mentor.

### **1.3 “The Slave Driver vs. the Lazy Student”**

In this case study, a graduate student performs valuable work on her mentor's projects. Surprisingly, although the student has had four years of success in the laboratory, she has published few papers and has not been the first author on any of them. As a consequence, her thesis committee refuses her permission to begin work on her dissertation. She believes her mentor is at fault, both for having too many extra-curricular activities that take her away from

the laboratory, and for submitting too few manuscripts for publication. One of the themes that emerges from this case study is that having multiple mentoring relationships, especially with faculty in one's own department, can be key to a student's progress.

#### **1.4 “How Much Help Is Too Much?”**

This case study is about a student who learns, in the fifth year of his program, that he may be on the wrong path. The case study suggests that students should evaluate their goals and progress periodically. Laboratory work is not the right career for everyone and there is no shame in changing paths when it is the right thing to do – there is only harm done if a person remains a scientist in spite of the fact that the heart is elsewhere.

#### **1.5 “The Graduate Student Laborer”**

In this case study, a graduate student has been hired by a company and is working extremely hard to write up two papers before the start of his job. On top of this, his advisor asks him to work up some data that is not his own. He does not have time to do both and is conflicted about which of these obligations to fulfill – and about whether they are, indeed, both obligations. This addresses issues concerning the importance of good communication regarding work expectations. Also important is a flexible relationship between student and mentor, which changes as the student matures in years and experience.

### **PART 2: SCIENTIFIC MISCONDUCT**

#### **Video (20 minutes)**

One of the many reasons good communication is important in the laboratory is that, in its absence, the risks of mis-reporting data, whether intentionally or unintentionally, are relatively high. Students, for example, sometimes do not understand accepted practices in data handling and need close direction.

In the scenarios in part 2, Elliot has overstepped the bounds of good laboratory practice. The other students in the lab suspect his transgression and Dr. Morris, when looking at the raw data, discovers it for himself. Jessica points out that, if the data are mis-reported, everyone in the lab is likely to suffer, especially if the paper is a high profile one. Note that in these scenarios the people who may be involved in research misconduct are students – and so not in positions of power.

#### **2.1 “Truth or Consequences”**

In this case study, as well, a student is targeted as possibly being involved in scientific misconduct. The issues it raises include the delicacy with which such matters must be handled, the importance of good relations in the laboratory, and the importance of looking for a graceful way to bring the matter forward as soon as a problem is suspected – and before the work reaches the publication stage. The mentor nearly always has the lion's share of responsibility in handling such matters, and everyone whose name is on a paper in which data is mis-reported bears responsibility.

## **2.2 “O, What A Tangled Web We Weave!”**

This is a case study in which a student, early in her graduate career, discovers that her mentor plagiarized another author. Issues raised here include, again, the importance of having multiple mentoring relationships, and how to decide if and when to change primary mentors.

Plagiarism, along with the fabrication or falsification of data, is a kind of scientific or research misconduct, a term that denotes illegal laboratory practices.

## **2.3 “Preliminary Data”**

In this case study, a second year graduate student believes her mentor has put an unwarranted spin on her data in a grant application. The student's perception of the situation differs from her mentor's and the difference persists after they have discussed the matter at length. The issues raised here include the importance of correct data reporting in grant applications, the importance of multiple mentoring relationships, and that there can be multiple interpretations of the same data, all of which are legitimate.

## **2.4 “Student Publishes”**

This is a case study about a graduate student who discovers that his mentor published the same material twice, in two different publications, i.e., plagiarized himself. Issues dealt with here include the importance of the issue of self-plagiarism and what counts as self-plagiarism.

## **2.5 “Making the Grade”**

This is a case study on plagiarism in class work. Issues here include the seriousness of student plagiarism. Because practices in other countries differ from those in this country, the notion of plagiarism and the seriousness of the act must be explained in detail to international students.

# **PART THREE: AUTHORSHIP AND COLLABORATION**

## **Video (20 minutes)**

Good communication is important in authorship decisions. This is especially true of interdisciplinary collaborations, where authorship should be discussed from the word "go." In a scenario in Part 3, we see the students embarking on an interdisciplinary project with a crystallography laboratory. This sets this stage for discussions about authorship and collaboration, both interdisciplinary and within the laboratory.

A theme that emerges in this section is that authorship practices differ from lab to lab. Where some labs have short author lists and the criteria for getting one's name on a paper are hard to meet, others are more inclusive and the criteria more relaxed. To some extent, the difference is due to the fact that authorship practices differ from discipline to discipline. But practices can differ greatly between laboratories in the same discipline, as well. To assist in giving credit where credit is due, and only where it is due, many journals are beginning to require that an explanation be given, in each paper, of each author's contribution to the project. However authorship is decided, students should at least be kept abreast of the expected authors of the papers on which they are working.

### **3.1 “Informal Discussion/Formal Authority”**

In this scenario, a student has contributed essential ideas to a postdoc's paper without the postdoc's knowledge. The P.I. requests that the student, himself, decide whether his name should go on the paper. This raises issues of how authorship should be decided and who should be consulted in the decision.

### **3.2 "When in Rome: Conventions in Assignment of Authorship"**

This case study is about a laboratory in which every paper submitted for publication is discussed by the entire laboratory, and every laboratory member's name goes on every paper. This raises questions about what might be appropriate minimal criteria for authorship and whether criteria can be too permissive.

### **3.3 "Friendship vs. Authorship"**

In this case study, a student works on a collaborative project that involves laboratories at different Universities. Although the responsibility of each individual and the expected list of authors is spelled out at the beginning of the project, responsibilities change midway through when the student's mentor plans to present the data at an upcoming conference. The student is assigned much additional work – without a compensating change in his place in the list of authors. This brings out the fact that, when collaboration involves more than one laboratory, good communication about authorship is especially important – and can be hard work. An emerging theme is that, in such cases, expectations about authorship should be made explicit before the work is begun. Furthermore, the expected list of authors should be periodically updated to reflect to changes in responsibility as the work develops.

### **3.4 "The Temporary Post-Doc"**

This case study is about a post-doc who claims to have succeeded in carrying out a difficult organic synthesis, but leaves the laboratory without publishing it. Unfortunately, his experimental procedures are poorly written and the product cannot be synthesized by his successors. When new conditions are worked out to accomplish the same synthesis, no credit is given to the post-doc in the resulting publication. The post-doc learns about the publication later and believes he has been treated unfairly. This raises the question of how to credit incomplete work. It also underlines the importance, to every student, of keeping a complete, clearly written, record of the work done.

### **3.5 “Patent Authorship: Whose DNA Is It Anyway?”**

In this case study, a P.I. discovers a cDNA with a sequence that suggests the DNA is responsible for an aspect of cell proliferation. He asks one of his graduate students to perform additional experiments. The student spends the next three years characterizing the gene and the work culminates in the submission of a manuscript for publication in Nature. The student and mentor discuss the potential commercial applications of the gene, referring to the patent submission as "our patent." After the mentor submits the application, the student discovers that she is not included as an author. This case study extends the discussion of authorship to patent authorship, raising the question of whether criteria for authorship ought to be the same for patents as it is for papers. It also raises the issue of what responsibility the P.I. has, if any, to inform lab members about patent policies.

**Note:** These cases can be accessed at <http://onlineethics.org/reseth/appe/index.html>.

## CONCLUSION

Through the case studies and the videos, the creators of this Guide and DVD expect to convey the importance of routinely communicating thoughts and decisions that affect others, listening to others, and considering all aspects of lab work from multiple viewpoints.

The case studies are intended to help you to anticipate and remedy difficulties in these areas that might otherwise take you by surprise. They are also intended to help you to consider the seriousness and breadth of the responsibilities you have towards others in the laboratory setting. They will help you to generate creative and realistic thinking about the situations that arise in your own laboratory.

The creators of the Guide and DVD hope you have fun with these videos and case studies. They hope you implement what you have learned in the laboratory setting. They hope that others, also, will learn from this video, if not directly, then by learning from the good example you set before them.

S. H. Vollmer

Birmingham, Alabama  
Winter 2004

# CASE STUDIES

## 1. 1 Today's Specials

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### Part 1

Professor Steve Hill and his wife, Karen, had just sat down at their table and begun to study the menu.

"Hi, there. My name is Jake, and I'll be your waiter. Allow me to tell you about today's specials"

Looking up from his menu Dr. Hill looked as if he had seen a ghost.

"Jake, what are you doing working in this place?"

"Hey, Dr. Hill. Hello, Karen. Well the funding for my post-doc over at the research center was not renewed, and other employment options in academia have not come up. The mortgage company isn't very sympathetic, so here I am. I am trying to remain optimistic that something will surface, but I needed to pay the bills in the meantime."

"I must say that I'm rather surprised to see you here. You should have let me know you were going to be out of a job. Perhaps I could have been of some assistance," Hill replied.

"Well, I felt as if I had exhausted those connections after grad school, and I didn't want to seem as though I couldn't take care of myself," Jake explained.

After a fine meal and an exceptionally large tip, the Hills discussed the encounter as they headed home.

"I thought that once you got your Ph.D., a job was supposed to be waiting for you," Karen commented.

"Perhaps that's how it used to be, but not anymore. I had heard from some of my other students that the job market had become a bit saturated, but this really hits close to home. Jake was an excellent student!" Hill said.

Hill enjoyed an illustrious career as a marine ecologist. He had been a mentor to many students, the majority of whom went on to successful careers. He wondered, though, whether his research program had become a bit dated. Although other specialties had become more prosperous, he was reluctant to subscribe to them. He was always able to obtain funding and lure quality graduate students, making him a valuable and esteemed member of the faculty.

At a faculty meeting the following day, Hill spoke openly about the situation. "Perhaps there might be a problem with an over-abundance of professionals in biology. Good students are having trouble finding jobs and I wonder whether we bear some of the responsibility. Perhaps the department should consider limiting the number of graduate students that are accepted."

"Now, Steve, you know the grad students are the bread and butter of the university. We should continue to recruit and take on the best and brightest, as long as we can bring in the funding with them. I don't want to hear another word about this," replied Dr. Butz, chair of the biology department.

## Discussion Questions

1. Does the department have a responsibility to devote resources to collecting data on the job placement of its graduates?
2. Should Hill raise this issue at the faculty meeting?
3. Should the department have a responsibility to make information on job placement available to prospective students?

## Part 2

Upon returning to his office, Hill learns that his latest pre-proposal has been accepted. Hill had promised a prospective student, Mike Bowman, that he would call him as soon as he got any information about the proposal. Having the proposal funded would allow Mike to be accepted into the graduate program at the university and work in Hill's lab. However, Hill is concerned about the future job prospects for Mike and is wary about taking on more students. He picks up the phone and makes the call.

"Hi, Mike. This is Steve Hill. I'm calling to let you know that I received some feedback about the proposal I had told you about. I'm really not sure whether I will receive the funding, and I think it is in your best interest to reassess your other options."

"That's too bad, but thanks for the consideration. Let me know if anything changes."

## Discussion Questions

1. Was Hill's phone call appropriate, given that he intended to act with Mike's interests in mind?
2. How else might he have conveyed his message to Mike?

## Part 3

Later that week, Hill is stopped in the hall by Dr. Alice Devorak, a junior faculty member.

"I just received a phone call from a bright young man, Mike Bowman. He was inquiring about whether I had any interest in taking him on as a new student. He mentioned that he had been in contact with you as well, but that it did not look very promising. Can you tell me why?"

"He seemed bright, but his ideas and talents did not seem to be well aligned with my research program."

With a puzzled look, Devorak continued, "The interesting aspect of the conversation I had with him is that he somehow got the feeling that reason was related to the status of your latest NSF proposal. It was my understanding that you had received favorable feedback about the pre-proposal you submitted."

Hill decided to tell Devorak the actual circumstances surrounding his reluctance to take Mike as a student. Alice listened intently. At some level, she agreed with Hill's concerns. However, she also thought that Mike deserved to hear the real reason the Hill had turned him

away. She planned to call Mike later and explain the situation. At that time, she would also explain that she was not in a position to take on any more students.

On her way back to her office, she ran into Butz, who requested a brief meeting with her regarding her upcoming progress report. Devorak met him in his office.

"Hello, Alice. Please sit down," Butz said. "I have been pleased with much of the work you have done in the years that you have been here. Recently, however, your production has dropped off a bit. I need to be up front with you that a great deal of your success in this department will hinge on your level of productivity. You have adequate funding, but you do not seem to be putting out enough manuscripts or bringing students into your lab."

Alice replied, "I appreciate the feedback. Part of my hesitation in taking on more students is that I enjoy being involved in the research, and not just writing proposals and manuscripts."

"Well, of course, I encourage you to stay involved in the research, but I really must emphasize the importance of raising your productivity. Your funding situation certainly has room for another student, and I would encourage you to follow up in that regard," Butz said.

Upon returning to her office, Devorak noticed the note paper with Mike Bowman's number. She had promised to return his call this afternoon. She picked up the receiver and dialed Mike's number.

"Hi, Mike. This is Dr. Devorak."

"Oh, hello. Have you made any decisions about taking on any new students?"

"Well. . . ."

## Discussion Questions

1. What should Devorak say to Mike? What responsibilities does she have to the university? to Butz? to Mike? to Hill? to herself?
2. Would it be appropriate for Devorak to discuss Hill's reasons for not taking on Mike as a student?
3. Are individual faculty members in a position to affect the number of new Ph.D.'s entering their field? If so, is Hill's action an appropriate way to go about instituting a change?
4. Who decides whether such a change is needed?

## 1.2 Whose Lab Is It?

Cast of Characters:

Alex Archibald, Graduate Student Assistant Professor Beverly Baker

Syphilis, which is caused by the bacterium *Treponema pallidum*, occurs in 3.2 per 100,000 U.S. inhabitants. Biomedical research groups at a major health care center have determined that the cambin protein is essential for infectivity, the capacity of the bacterium to cause syphilis.

## Scene 1

- 9 a.m., Monday, Baker lab's weekly meeting

Professor Beverly Baker:

Alex, how is the expression and purification of the cambin protein going? We have to hurry and produce active protein as soon as possible, because several big labs are hot on our trail. We don't want to get scooped on this, since it's a big part of the grant renewal I am preparing. This funding is necessary for your dissertation. Purified protein will strengthen our application and make it clear we can do the proposed work.

Alex Archibald:

Well, the initial steps worked fine, but the later ones are giving me trouble. Your protocol doesn't seem suited for cambin, and tends to inactivate it.

Beverly:

Let me take a look at what you have been trying. [Scans Alex's notebook.] It seems to me that we need to dialyze much more slowly due to the unique properties of cambin. The method you have been using most likely results in aggregates that precipitate out.

Alex:

I tried doing something similar to your suggestion and found no real improvement. I read several articles that suggested adding small amounts of CTAB detergent to minimize aggregation. I might try that. What do you think?

Beverly:

Don't try CTAB. I want you to focus your effort on my purification technique. This method is unique to our lab and is a cornerstone of our work and of the grant proposal. No other labs use a detergent-free method. I developed this method, and my lab has used it for many other proteins. The last summer student also wanted to change protocols for her project, but eventually worked out the purification conditions using my protocol as a guide. [Beverly jots several changes to the method.] Try this.

Throughout the week, Alex performs the requested experiments, which fail to produce the desired result. Frustrated, but eager to overcome this technical obstacle, he comes in on the weekend and ponders what to do. Should he contact his professor at home and discuss the results? Should he wait until the next lab meeting? Alex finally decides not to bother his adviser; he decides to test the effect of CTAB on the solubility of cambin.

## Scene 2

- Monday lab meeting, one week later

Alex:

Good News! I got a yield of nearly 90 percent active protein from the new purification protocol! I cannot believe it works so well. As far as I can tell, this is the highest percentage ever seen in this lab!

Beverly:

Wonderful! That will put you in a great position to move right along with the experiments you have planned and get out a manuscript before our competitors do. In addition, my grant renewal can hardly be turned down with these preliminary results. So what did it?

Alex:

I tried the purification with several modifications, as you suggested last week, with no luck. So over the weekend I came in and experimented with CTAB. After a few trials, it worked!

Beverly:

Alex, I told you explicitly not to do that! Why did you directly go against me? I am in charge of this lab, and the use of proteins purified without detergents is central to our unique position in the field! Without funding, we can all go home. I do not appreciate you doing things behind my back. From now on, never conduct experiments without my explicit approval! All you've done this weekend is waste your time, and the time and money of my laboratory!

## Discussion Questions

1. Did Alex make the right decision in testing the effect of CTAB? Why or why not? If not, are there any circumstances in which testing with CTAB would be justified?
2. What criteria should be used to determine whether Alex's actions were appropriate? Does the fact that the protocol is the basis of Beverly's niche in the protein field play a role? Assume that Alex did not observe any improvement in the yield when he tried CTAB. Should he still report his result to Beverly?
3. Does Beverly have the authority to control all research conducted in her lab? Does this right extend equally over graduate students, post-docs and technicians? Should Alex report the incident to his dissertation committee?
4. Tenure-seeking professors are often under greater pressure than established faculty, particularly with respect to obtaining funding in a limited amount of time. Would this pressure justify Beverly's viewpoint that experiments must be done her way?
5. A second relevant issue is budget restrictions that threaten to close existing labs. If Beverly's method significantly improves her chances of funding, does that justify her insistence on use of her method?
6. As a future independent investigator, what are Alex's rights and responsibilities? What expectations should he have regarding his adviser's authority? What are Beverly's responsibilities toward those in her lab (grad students, post-docs and technicians)? How might these responsibilities vary?
7. Could this situation have been avoided? Who should have taken responsibility for avoiding this unpleasant confrontation? In retrospect, what could either Alex or Beverly have done? In the future, what could both parties do with regard to this incident?

## 1.3 The Slave Driver vs. the Lazy Student

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Eileen Patton, a fourth-year engineering student, has just been denied permission by her thesis committee to begin writing her dissertation. In general, the committee considered her a strong Ph.D. candidate with good classroom and laboratory performance, but found a surprising absence of abstracts and papers. Citing this lack of publication, the committee advised her to focus on her project for at least another year before meeting again.

Patton is frustrated. She feels that she is ready to begin the dissertation, and she thinks her adviser, Dr. Laura Santiago, is a slave driver who can never be satisfied. Patton's presentations at various biotech firms have been well received and have resulted in both research money and equipment, but none of her work has been published. Abstracts of her work presented at national conferences list her adviser's name as first and presenting author. Santiago has asked her write up her results on many occasions, but she has told Patton she will not submit the work without the approval of the industrial collaborators who are sponsoring the work.

Patton knows her department usually requires Ph.D. candidates to have at least one first-author paper before a degree is granted. She feels her chances to graduate in a timely fashion and get a competitive position are severely diminished by her lack of publication. Patton and Santiago have experienced conflicts over Patton's numerous vacations and extracurricular activities, which Santiago regards as distractions and evidence of Patton's lack of dedication. In addition, Santiago has been unsuccessful in attracting new students the past two years, and Patton suspects she would like to delay her departure for as long as possible.

Santiago had an extremely successful post-doc and is the youngest person ever to receive a tenure-track position in her department. During her four years as associate professor, she has won numerous awards, and the head of her department has often publicly complimented her on her work ethic and commitment to research. Santiago's affiliation with various companies has attracted significant research funding and equipment that benefits her lab and the department as a whole.

Patton, her first graduate student, has been pushing her to submit manuscripts for publication. Santiago believes the work to date is good, but not enough has been done. If Patton would only focus on her work and put in more effort, Santiago is sure Patton could get more of the high quality data required. Santiago doesn't want to jeopardize her fine reputation and funding by submitting inferior manuscripts. If Patton wants to graduate sooner, Santiago feels she can either start working harder or try to graduate without publishing. If the committee requires it, Santiago is prepared to continue supporting Patton until the time is right to publish, which, she admits, may still be two or three years in the future.

### Discussion questions

1. Are Santiago's standards unreasonable? Is Patton's work ethic lacking? What are some possible "objective" criteria for determining when a Ph.D. has been completed? What, if anything, can the committee members do to resolve this conflict?

2. How could an institution prevent situations like this one? How can a department or institution encourage good adviser/student relationships?
3. Santiago does not want to publish Patton's work because she feels that publication will not benefit her own career. What, if any, are her obligations to her students' careers?
4. Suppose Santiago's industrial collaborators do not want the work to be made public. How does that affect Santiago? How does it affect Patton? Does Santiago's relationship to industry have priority over her relationship to her students?

## 1.4 How Much Help Is Too Much?

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The Department of Chemistry at Anywhere University (AU) has established a number of requirements for the Ph.D. degree, including successfully completing several courses, engaging in original research and publishing the results, and passing a number of cumulative exams. These exams are given three times a semester and cover the four major areas of chemistry. In order to meet the requirement, students must pass exams in more than one area. It is the department's policy that the topic and the identity of the faculty member preparing the exam remain secret until exam time.

### Part 1

James is a graduate student who is just completing his second year in the AU chemistry program. When he first enrolled in the program, the requirements for completing the Ph.D. were explained to him.

James decided to join the research group of Dr. Brown, a senior member of the department and chose a project that Brown said would produce results and not be difficult. Although James did not like the project, he began the experiments and continued them on Brown's assurances of results.

Now two years into his graduate career, James has completed the required courses for his degree, but has failed to pass a single cumulative exam. Seeing that one of his students is in trouble, Brown decides to aid James on the exams. As a faculty member Brown knows who will be giving the upcoming exams. Brown begins to suggest to James exactly which articles and books would be helpful in preparing for the exam, a clear violation of departmental procedure. Over the next year James is able to score well on all of the exams he takes and completes his requirement. Although many of the departmental faculty and students are aware of this situation, no one challenges Brown.

### Discussion Questions

1. What are advisers' responsibilities when they see that students are struggling? What are the responsibilities of the student? The department?
2. How much help should Brown (or any professor) provide? What determines the appropriate level of help when a student is struggling?

3. When faculty or students are considering complaining about unfair or unequal treatment, what issues should be considered in determining a course of action? Are any issues specific to the faculty? the students?

## Part 2

Three more years pass, and James is finishing his fifth year in the program. James has put in long hours and worked hard, but his experiments have failed to yield reproducible results. Brown and James meet to discuss his impending graduation. During the meeting Brown reminds James that he needs to publish in order to complete the departmental requirements. As the meeting progresses, James indicates his lack of interest in continuing the project. Brown concludes that it is time that James finished and moved out of the lab, but he realizes that James cannot graduate without assistance. Therefore Brown decides that he will add James's name to a paper that he (Brown) is writing based on data collected by an undergraduate. Although James has not contributed in any way to this research, he agrees to the plan.

## Discussion Questions

1. What are the criteria for authorship?
2. Is James's effort in a failing project sufficient reason to include him on the manuscript? Why or why not?
3. Brown encouraged James to begin the project initially. What is his responsibility when the project fails to yield reproducible results?

## Part 3

Once the article is published, James begins to write his dissertation. Although the literature portion of the dissertation is his own, the research chapters are simple expansions of the paper to which his name was added and which he has studied thoroughly. At his defense, James makes his presentation and is asked to leave the room while the committee discusses his accomplishments. During this discussion, the members of the dissertation committee conclude that James has not completed the minimum requirements for the degree (i.e., conducting and publishing original research). However, many of the committee members are friends of Brown. With some lobbying, the committee decides to award the degree to James.

## Discussion Questions

1. What are the dissertation committee's responsibilities? Did James's committee fulfill these responsibilities?
2. What are the expectations of a person with a Ph.D.? Does James meet these expectations?
3. What are the consequences, if any, of awarding James the Ph.D.?
4. What alternatives are/were available to the dissertation committee?

## Part 4

After his graduation, ABC Chemicals hired James to work on drug discovery. While James was interviewed like every other candidate, the strength of his recommendations secured him the position. After only six months, however, it was clear that James was incapable of completing even the simplest research tasks. He has cost the company time and resources by failing to complete his experiments. One of ABC Chemicals' senior scientists, Dr. Georges, is a former student at Anywhere University. Georges decides to call his former adviser; after a brief conversation, he learns the story of James's graduate training. Incensed that AU would award James a Ph.D., Georges immediately calls the department chair as well as the dean of the graduate school threatening to inform the American Chemical Society (ACS) if some action is not taken. Fearing a loss of certification, the dean sends a memo to the chair indicating that he should "take care of the problem."

### Discussion Questions:

1. Should James's Ph.D. be revoked? Can it be revoked? Would revocation of his degree undermine the assumption that the faculty will be fair and impartial in their evaluation of students?
2. What, if any, action should be taken against Brown? the other sources of James's letters of recommendation?
3. Should the journal to which the paper was submitted be alerted that James's name was added to the paper inappropriately?
4. Should the ACS be alerted to this incident, or should Georges wait until he hears from the chair about what will be done? What criteria could be used to determine his course of action?
5. What alternatives are/were available to Georges?
6. Should ABC Chemicals develop a new company policy to ensure that recently hired employees are competent?

## 1.5 The Graduate Student Laborer

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Joe McGrath is a second year graduate student who will begin to write his master's thesis at the end of the term. Joe has worked extremely hard during the two years of his master's program, regularly working six or seven days a week. The effort has paid off, however; Joe already has four publications with two additional papers in preparation and, most importantly, a starting date for a new job at a small pharmaceutical company. The company is very excited to have hired Joe because they are starting a new initiative and need Joe's expertise to get the project off the ground. This situation puts Joe on a very tight time schedule to finish his last set of experiments and write his thesis, but the job is exactly what he had hoped for.

It is Friday afternoon. For the past week, Joe has put his experiments on hold. Instead, he has been making graphs and figures for a presentation that Dr. Smith, his research adviser, will be making at a conference the following Wednesday. Smith has requested specific figures based on data from experiments completed by Joe and his predecessors in the lab. At 3 p.m., Smith comes into Joe's office and says, "I hate to ask you to work on a weekend, but will you come in and work tomorrow? It is really important that the presentation is ready on Monday."

Joe hesitates. He was a bit taken aback by Smith's request, because he almost always comes into the lab Saturday mornings, "Isn't Smith aware of this after two years?" he asks himself. Furthermore, he had planned to start the last set of experiments he needs for his thesis, which he has been delaying all week.

Finally, Joe replies, "Yes, I can come in and finish up these figures tomorrow." "Thanks, Joe," Smith says. "I really appreciate the fact that you have spent so much time compiling and analyzing the data collected by Dave and Frank, who left without finishing their degrees; without that information, the presentation would have been very thin. By the way, I've decided to list you as the fourth author on the presentation, because it was the other students who actually collected the data," Smith says. Although Joe feels disappointed that he will be listed as the last author on the presentation, he doesn't want to quibble about whether doing the data compilation and analysis was more significant than collecting the raw data.

After discussing a few more details about the presentation with Smith, Joe closes the conversation by saying, "Well, have a good evening and I'll see you tomorrow!" Smith stops as he is leaving the lab and replies with a surprised tone, "I'm not working tomorrow."

Should Joe spend Saturday making the figures for the presentation, or should he start his experiments as planned?

## Discussion Questions

1. Is it appropriate for Smith to ask Joe to work on Saturday? Is it appropriate in light of the fact that Smith is not going to work? Are there valid reasons why Smith might ask Joe to work although he is not planning on working himself?
2. Would it seem less onerous a request to complete the figures and graphs at the sacrifice of his dissertation work if Joe were compiling and analyzing data from his own experiments rather than data from students who left the program?
3. What are the proper roles and responsibilities of graduate students in preparing presentations that include the entire research group's efforts?
4. What are appropriate criteria for authorship?
5. Is data collection always more significant than data compilation and analysis?
6. Should Joe ask to be placed higher on the list of authors? How should he approach Smith about his concerns?

## 2.1 Truth or Consequences

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### Part 1

Peter Hogan and Sally Wheeler are both graduate students in Dr. Larson's laboratory. Although both are in their fourth year of graduate study, neither has published a manuscript, and both are beginning to worry that if they do not publish soon, they will be unable to get first-rate postdoctoral positions.

Finally, Peter's project begins to look promising. Through the use of genetic engineering, Peter has succeeded in generating a few knockout mice. These mice no longer have any working copies of the gene SLAM; the gene SLAM is completely "knocked out." Now Peter can move on to analyses of cellular function and development in the knockout mice to try to determine what role SLAM usually plays in a normal mouse.

Peter completes a preliminary examination of one knockout mouse. He is excited to find that several important cell types appear to have abnormal function. Dr. Larson is also excited by the data. He tells Peter that he has heard of several other laboratories that are competing to produce and analyze the same type of SLAM knockout mice. "Peter," Dr. Larson says, "we must confirm your initial findings as quickly as possible. If these results are correct, and we get our data written up first, we could get into a big journal like *Nature*."

Although only a few mice are available to study at this point, Peter and Dr. Larson agree that they must push ahead and work quickly but carefully. There will only be enough mice for two sets of experiments. In order to study as many cell types as possible, Dr. Larson decides to move Sally onto the project to assist Peter. Her research was still not progressing, and Dr. Larson believed that even a second author status on a big paper would help her career. Peter does not think much of Sally's work habits, but he agrees with Dr. Larson that it would benefit them both if she investigated one aspect of cellular function that Peter had not yet examined. Dr. Larson tells Sally that if her data are informative, she will be included as the second author on their manuscript.

Sally's project involves harvesting blood samples from the mice and carrying samples to a nearby building that houses the equipment needed to perform her cell function tests. During this time, Peter sacrifices the mice and conducts experiments on the tissues of interest. Because the mice have been sacrificed, there is no way for Sally to collect more cells from the mice.

Sally completes the first set of experiments and is thrilled by what she sees. She creates a graph of her data and shows it to Peter and Dr. Larson. It appears that SLAM has an unsuspected critical role in blood cell function, supporting their hypothesis that SLAM is required for the normal function of many cell types.

On the day that the experiments are being repeated, Sally calls Peter from the other building. "Peter," she says frantically, "are you sure that you didn't mix up the mice before I collected the blood?" "Yes, I'm sure," Peter cries. "But why?" "I'm not seeing the same trend as last time," Sally answered. "I think you must have mixed up the mice!" Peter thinks quickly

about what to do. "Sally, just bring back any remaining blood this time, and I can do additional genetic tests to determine which sample is which."

However, when Sally returns to the lab several hours later, she does not have the leftover blood. She tells Peter that she had figured out her mistake and knew which sample was which, so she had thrown out any cells that remained. There is no way for Peter to verify her results without obtaining more mice, which they currently do not have. Sally tries to calm Peter and shows him a graph she had made, which clearly shows the same cell function trend as her first experiment.

Dr. Larson is ecstatic about the new data and tells Peter to begin writing up the manuscript. Although Peter does not want to accuse Sally of lying, he is no longer sure of the validity of her data. Later that day, he flips through Sally's notebook, trying to determine how she had done the experiment, but all he can find is the finished graph. In contrast, the entry for the first experiment has procedural notes and computer printouts from the equipment Sally had used to analyze her samples. Is it possible that Sally has purposefully altered her data to reflect the trend she wanted to see? If she had done nothing wrong, why had she thrown out the remaining cells, and why is the computer printout missing from her notebook? Peter is unsure of what to do.

## Discussion Questions

1. Should Peter ignore his misgivings and write up the manuscript incorporating Sally's graph? Why? What are his other options?
2. What are Peter's responsibilities as the first author of the manuscript?
3. What are Sally's responsibilities as a contributing author?
4. How, if at all, did Dr. Larson's actions contribute to this problem?

## Part 2

Now assume that in order to avoid creating conflict in the lab, Peter wrote up the manuscript using Sally's graph. The manuscript was published in *Nature*, and created quite a stir in the scientific community. However, in the next six months, Peter was dismayed to read several publications by competing labs that contradicted Sally's data. It had even been suggested at a national conference that Dr. Larson's lab had performed their experiments poorly or had misrepresented their data. Peter now felt certain that Sally had falsified her data.

## Discussion Questions

1. Have Peter's options changed significantly from those open to him in Part 1? Why?
2. Now that the paper has been published, are the decision-making criteria different? What are some of these criteria?

## 2.2 O, What a Tangled Web We Weave!

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Bonnie Hogan, a doctoral student in the department of History and Philosophy of Science, is an active member of the Council of Graduate Students (COGS) at her university. She has a research assistantship with Dr. Todd Simpson, who is also her dissertation adviser. Ms. Hogan chose Dr. Simpson as her adviser because his research background was closely related to the topic on which she wanted to focus her dissertation. Although he offered helpful suggestions on her research, she was never able to develop the sort of relationship that with him that enabled her to discuss her long-term career plans and life goals. Due to his busy travel schedule, Ms. Hogan found it very difficult to schedule any time with Dr. Simpson, and impromptu meetings were impossible. When formal meetings were scheduled, he consistently interrupted their conversation by taking phone calls. In addition, Dr. Simpson frequently arrived late to scheduled meetings. Most of the feedback she did receive from him was in the form of written notes.

At the first COGS meeting of the year, Ms. Hogan met Dr. Maria Rodriguez, a faculty member from Molecular Biology. Although she is not an expert in the field of History and Philosophy of Science, Dr. Rodriguez took an interest in Ms. Hogan's work. Over time, the two of them developed a rapport that made it possible for Ms. Hogan to begin to discuss the long-term issues that she could not discuss with Dr. Simpson. Dr. Rodriguez regularly scheduled appointments with Ms. Hogan and specifically arranged time to talk about Ms. Hogan's plans and goals for her future. Dr. Rodriguez also showed an interest in Ms. Hogan's work and suggested articles and books that are relevant to her dissertation topic. Dr. Rodriguez also contacted some of her colleagues who are interested in Ms. Hogan's research topic and arranged for them to meet.

Over time, Ms. Hogan and Dr. Rodriguez developed a mutually trusting relationship, and Dr. Rodriguez ultimately became her mentor. (For discussion of positive mentor characteristics, see Committee on Science, Engineering, and Public Policy 1997, 8.) Although busy with her own teaching, graduate students and research in Molecular Biology, Dr. Rodriguez agreed to be a member of Ms. Hogan's dissertation committee. She made a point to meet with Ms. Hogan and helps her identify ways to continue her research with another adviser, Dr. Patricia O'Halloran.

Dr. Simpson hired Ms. Hogan as a research assistant to help him with the literature review and proofreading necessary for a book he has contracted to write. As she is proofreading a draft of Dr. Simpson's work, Ms. Hogan finds approximately four pages of text that have been directly plagiarized from another author. She recognizes that a section of his chapter is taken verbatim from an article she reviewed earlier in her literature review for Dr. Simpson. She confirms the plagiarism by comparing Dr. Simpson's work to a copy of the original article.

Ms. Hogan realizes that this chapter is a draft that has not yet been sent to the publisher. At first, she does not know what to do. If she confronts Dr. Simpson with this information, what might be the repercussions? She wonders if she will lose her assistantship and, more importantly, what effect this situation might have on her future career. After contemplating her choices, Ms. Hogan decides to bring the plagiarism to Dr. Simpson's attention, so that he can correct the draft before publication. When she shows him the article from which he plagiarized, Dr. Simpson tells her to "grow up and understand that this goes on all the time. After all, no one ever gets hurt."

Ms. Hogan is in a dilemma. She cannot in good conscience continue to work with Dr. Simpson, but she does not want to throw away six years of graduate work.

Ms. Hogan contemplates taking formal action against Dr. Simpson with the Intellectual Integrity Officer, but fears that would jeopardize both her research assistantship and her ability to finish her degree. Frustrated and ready to quit, Ms. Hogan decides to talk with Dr. Rodriguez about her situation with Dr. Simpson. Dr. Rodriguez listens patiently to Ms. Hogan and gives her useful feedback as Ms. Hogan explores and evaluates possible options open to her. Dr. Rodriguez remains supportive throughout the ordeal as Ms. Hogan tries to figure out the best way to handle the situation. She leaves the final decision to Ms. Hogan, which fosters a sense of self-sufficiency. Ms. Hogan decides not to take any formal action against Dr. Simpson, at least until she has her degree in hand. (For further discussion see Pimple 1995.)

Ms. Hogan approaches her department chair for permission to change advisers. When asked why she wants to change advisers, Ms. Hogan gives a vague and untruthful answer. The department chair agrees, and Dr. O'Halloran becomes Ms. Hogan's new adviser. Although Dr. O'Halloran is not presently doing research in Hogan's area, her degree in History and Philosophy of Science and knowledge of Hogan's topic fully qualify her. This step enables Hogan to salvage most of her graduate work and research and maintain existing relationships with other committee members from her department. Through Dr. Rodriguez's contacts and help, Hogan is also able to obtain funding for her research and ultimately finish her degree. Dr. Simpson remains a tenured professor in the department of History and Philosophy of Science, continuing to advise a cadre of graduate students.

## Discussion Questions

1. What issues are associated with Ms. Hogan's wish decision not to blow the whistle against Dr. Simpson? She fears retribution, fears that all her work toward the dissertation will be jeopardized if she takes any action, fears future employability, fears that taking any action would have negative repercussions on her existing relationships within the department. Should these fears be the determining factors in her decision?
2. Does Ms. Hogan have other options (such as writing a letter to the dean of research) besides taking "formal action"? Why or why not?
3. What responsibilities must Dr. Rodriguez consider in deciding what to do with the information about Simpson's plagiarism, which Hogan shared with her in confidence? It would be important to check your own institutional policies on this matter.
4. Did Ms. Hogan have an ethical or moral responsibility to tell the department chair the truth about Dr. Simpson when she asked for permission to change advisers?
5. Is it possible to have a "successful" mentor outside your field or discipline? Why or why not?
6. How might Ms. Hogan's actions have changed if Dr. Simpson's shortcomings were not egregious (i.e., plagiarism), but instead consisted of: repeated unprofessional behavior, such as having little (and poor) communication with Ms. Hogan; missing appointments and committee meetings; drinking alcohol during office hours; assigning inappropriate research projects; making gender slurs; skipping office hours; and generally creating a

difficult research environment? Should this kind of unprofessional behavior be reported? If so, to whom?

7. How can Dr. Simpson be held accountable for unprofessional behavior? Does Ms. Hogan have a responsibility as a graduate student to report Dr. Simpson's unprofessional behavior? Would this action adversely affect her standing within the department? If so, how?
8. In light of the events presented in this case study, should Dr. Simpson advise graduate students? Why or why not?

## 2.3 Preliminary Data

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Penelope Brighton is a second year graduate student in Dr. David Gilligan's cell biology lab. Gilligan is a highly productive, well-published, respected investigator whose students receive prestigious post-docs. As part of Brighton's thesis, she has begun to characterize the localization of a newly discovered protein within cells. In her first, quick experiments, Brighton found some potentially interesting results. Gilligan is quite excited about Brighton's project and is in the process of writing a grant using Brighton's results as preliminary data.

Brighton followed up the initial experiments by performing in-depth, well-controlled experiments. She changed several experimental conditions. She used immunopurified antibodies instead of crude antisera and changed blocking conditions to eliminate staining by preimmune sera. As Brighton sat by the microscope collecting data, she was surprised to find that her protein was present in all of the cells, but that it was not localized where she or Gilligan expected it to be. As she scanned several slides, she could find only two cells out of hundreds where the protein appeared to localize where they had hypothesized it would. In all of the other cells, the staining was in a different, specific area. Brighton believed the new staining to be clean and consistent, but the staining does not look like the initial results with crude sera. Brighton realized that the characterization of the protein may not be as straightforward as originally expected. Brighton attempted to discuss her new results with Gilligan. However, Gilligan did not seem interested in all of the data. He said that they would deal with the staining details later, but that they need to get the grant application out now. Gilligan asked Brighton to create a figure for the grant using one of the cells where the localization fit with the proposed hypothesis. In the grant application, Gilligan did not mention that the figure is an example of an atypical result. Instead, he suggested that all of the data from these experiments completely support the hypothesis.

Brighton read a draft of the grant and was shocked by the spin Gilligan had put on the data. When discussing the draft with Gilligan, she stressed that most of the localization data did not agree with the hypothesis. Gilligan insisted that the figure in the grant certainly supports the hypothesis. He said that the standards for presenting data as preliminary results in a grant application are not as stringent as those for publishing data in a journal article. Gilligan stated that it is better to present the data his way. Mentioning the unexpected results would only create doubt among the grant reviewers and decrease the likelihood of funding for the project.

## Discussion questions

1. If the definition of scientific misconduct is fabrication, falsification, plagiarism, deception or other practices that seriously deviate from those that are commonly accepted within the scientific community for proposing, conducting or reporting research, did Gilligan represent his laboratory's work appropriately to the funding agency? Or is he guilty of scientific misconduct?
2. Would the situation be different if the research were being presented in another format?
3. How well-supported must a result be before it is presented at a seminar at another university? in a meeting abstract? in a progress report for the department? in a published paper?
4. What possible actions are available to Brighton and other graduate students who feel their work is being misrepresented?
5. Should Brighton take action? If so, what would be an appropriate form of action?
6. As a thesis adviser, what are Gilligan's obligations toward Brighton? In this case, is Gilligan fulfilling his obligations as a thesis adviser?

## 2.4 Student Publishes

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Stevens is a second year graduate student performing materials science research and hopes someday to have a faculty position. The material Stevens is working on is diamond. The cost of preparation and analysis of the samples is very high, and there are not many samples. Due to these high materials costs, few experiments can be conducted, and hence it is difficult for faculty and/or students to generate more than one or two publications from a given series of experiments. Students from Stevens's department generally have four or five publications by the time they finish the Ph.D.

Stevens's adviser is Professor and Department Chair Charlie Cordage. Cordage was recently elected to the position of chairman by the other seven faculty members in the department. Due to the obligations and time commitments dictated by the chairmanship position, Stevens is Cordage's only graduate student. Having a vague understanding of the importance of publications to get post-doc and faculty positions, Stevens based his decision to work with Cordage on the professor's outstanding publication record.

Stevens is making progress with his research and getting good data. He has analyzed his data well, and his relationship with Cordage is going very well. After one of their brief research meetings, Cordage believes that Stevens has enough data to publish a paper in an obscure journal. Cordage encourages Stevens to write a paper and tells him they can submit it for publication. After several revisions, Stevens and Cordage submit the paper, and it is accepted. Stevens is happy to start adding publications to his resume.

Because Cordage had been busy with administrative tasks, he hadn't taken the time to correct Stevens's paper beyond writing style and grammatical errors. Finishing up work a little early one afternoon, he decides to reread Stevens's paper. Reviewing the data carefully, he

concludes that the paper probably could have been published in a more highly regarded journal. After a couple of months of clever revisions, making himself first author, Cordage submits the research paper to the more prestigious journal.

Upon its acceptance, Cordage sends Stevens a short email with the title and citation and congratulates him on adding another publication to his resume. Stevens had no idea of Cordage's action until he received Cordage's email. Stevens is delighted but confused. He asks himself, "How can I publish the same paper twice?" Stevens does not want to make waves, and he is not sure to whom he should turn. He lets the matter pass and says nothing.

Months later, Stevens is doing the literature review for his dissertation. He notices that a large fraction of the papers previously published by Cordage on the same topic seem similar. He realizes that aside from details such as title changes, Cordage is publishing each paper twice, once in conference proceedings and once in a journal.

Normal practice has never been explained to Stevens, and he isn't really sure what to do.

## Discussion Questions

1. Is it ethical for authors to receive credit for two publications from the same data? If so, under what conditions is it ethical?
2. Should the authors be required to inform the second publication that data has been presented or published elsewhere?
3. Would it matter that the first publication was in conference proceedings? Assume for argument sake that the paper was reviewed but not with the same scrutiny as a peer-reviewed journal.
4. In an ongoing research project, it is common for data to overlap. How much new or additional data should be required for the paper to be a new publication?
5. To whom should Stevens turn with his concerns about Cordage?
6. When is information/data/research considered published?
7. Consider interdisciplinary research. Should the scientists from each discipline be allowed to publish the research in their disciplines' journals? If so, can all the scientists from each discipline be on each paper?
8. Is it acceptable to publish or present work or research without informing one's coauthors in advance?

## 2.5 Making the Grade

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Three professors team teach a 15-student graduate course (Dr. Whelan, a tenured senior faculty member, and Dr. Jihvraj and Dr. Brady, two junior faculty members). The only requirement for a grade in the course is a final paper on key course topics. Whelan arranged the course curriculum and does some of the instruction, but Jihvraj and Brady are responsible for reviewing and grading each paper. A student turns in his paper for a final grade. Jihvraj feels uncomfortable with the paper and does not assign a final grade.

In discussing the paper with Brady, Jihvraj points out that there are no references and a few of the paragraphs have different tenses. He does a web search with selected paragraphs of the student's paper and finds two online documents that match the student's paper. Apparently, the student has pasted sections of two different documents together. Jihvraj remembers reading articles in separate scientific journals and his suspicions are confirmed when he finds the articles and compares them to the student's work.

Jihvraj and Brady look at the school's penalties and policies handbook for some guidance. When a faculty member has information that a student has violated academic integrity in a course or program for which he or she is responsible and determines that a violation has occurred, the faculty member should inform the student and impose an appropriate sanction. A faculty member may make any one or a combination of the following responses to the infractions:

- warning without further penalty,
- requiring rewriting of a paper containing plagiarized material,
- lowering of a paper or project grade by one full grade or more,
- giving a failing grade on a paper containing plagiarized material,
- giving a failing grade on any examination in which cheating occurred,
- lowering a course grade by one full grade or more.

Faculty members can take an additional step of reporting the case to the university's judiciary board.

Further investigation by the two faculty members reveals that the student holds a medical degree from a different country and came to the department on a renowned international fellowship. The student's faculty adviser is Whelan.

Jihvraj and Brady discuss the option of having the student rewrite the paper but they are concerned about being fair to the 14 other graduate students. They decide to give the student a lower grade of "C" with the recommendation that he retake the course.

Whelan is very upset that his student is to receive a "C." He calls for a meeting with the dean. Jihvraj and Brady point out that plagiarism is punishable by expulsion if formal charges are brought to the judiciary board and that they have elected not to press formal charges in light of the total situation. The student refuses to admit that his paper is plagiarized, as it is a normal practice in his country to use material without referencing the sources. He also feels that he is being treated unfairly and unprofessionally.

The junior professors know that Whelan is a former department chair and that he has considerable political clout, but they feel that their decision is sound and just. Brady is even contemplating resigning publicly if their decision is undermined.

The dean listens and concludes that the junior professors' decision should stand.

## Discussion Questions

1. Does it matter that this international student is unfamiliar with typical U. S. university policies?
2. Where is the line drawn for adherence to the rules and regulations on references?

3. Was the student being treated unfairly and unprofessionally? If so, how? What about the other 14 students in the course?
4. Did Jihvraj and Brady exercise all options in arriving at their decision?
5. Should they have consulted Whelan before giving the student a "C?"
6. Who would be most affected by this outcome? the dean, funding agency, instructors, student, school?
7. How would a potential backlash change the final decision? Potential problems may arise with the funding agency that sponsored the student and their relationship with the university and the future of the junior faculty when they go up for tenure.

## 3.1 Informal Discussions/Formal Authority

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### Characters

- Dr. Bob Black Professor
- Dr. Lee Hong Postdoctoral Fellow in Black's Lab
- Sean Graduate student in Black's Lab
- Kabir Graduate student in Black's Lab

### Part 1

Lost in thought, Dr. Bob Black wanders out of his office into the small conference room between his office and the lab. He looks up and acknowledges Sean sitting at the conference table reading journals.

**Sean:** What's up?

**Black:** Just thinking. I was just revising the paper that Dr. Hong wrote. The experiments are great, but the paper still lacks a suitable interpretation for the results we got. Maybe it would make more sense to me if I could explain it to someone.

**Sean:** Sure, go ahead.

Black reviews Hong's observations with Sean. Sean listens intently, asking questions that lead to a review of the underlying theories and techniques. After an hour or so, Black feels that the discussion has given him a better understanding of what it was he was looking for.

**Sean:** Well, I hope that helps.

**Black:** It certainly does give me a few new thoughts to consider. Thanks, Sean.

A few days later, Sean, with papers in hand, returns to Black's office.

**Sean:** I've been thinking about our discussion the other day concerning Dr. Hong's experiments. I began to wonder whether these results could be explained by the flexible-hinge model that I'm proposing in my thesis. So, I did a literature search and went to the library and pulled up these articles. It appears that my hypothesis might explain the results Lee observed in addition to those from my own experiments.

Black glances over the papers.

**Black:** Hmmm. This is interesting. It could really give the paper the impact that we are looking for. Can you explain this model that you've developed to me?

## Discussion Questions

1. Generally, what would you consider to be a "significant" contribution to an experiment? If Sean's questions provide an insight that Black had overlooked or been unable to see previously, are they a "significant" contribution?
2. Should limits or restrictions be placed on what is said, and to whom, when informally discussing scientific results? How do these limits affect the development of scientific ideas? In other words, what types of informal discussions are appropriate and what types are not?
3. With respect to Sean, Hong and himself, how should Black proceed with the information that Sean has given him?
4. Are Sean's actions appropriate? If not, what should he have done differently?

## Part 2

A week after their initial conversation, Black walks into the student office and hands Sean a manuscript.

**Black:** Hi, Sean. I've revised Dr. Hong's paper. Would you mind reading it and giving me your input?

**Sean:** Sure, no problem. I'll get it back to you later today.

Later that day, Sean approaches another graduate student in the lab.

**Sean:** Hey, Kabir, got a minute? Do you remember when I told you that Bob and I were discussing the results of Dr. Hong's paper? Well I just read Bob's revised draft and -- as a conclusion -- they clearly state the premise of my thesis. Normally I don't think I'd care, but this is really a seminal element of my work.

**Kabir:** Have you talked to Bob?

**Sean:** Yes, I did. After I mentioned it to him he said that if I felt I deserved authorship then I could be a co-author. I don't know, I feel really uncomfortable arbitrating my own authorship decision, especially since it involves Dr. Hong. It's the idea that's important to me, not the paper.

**Kabir:** Did you tell this to Bob?

**Sean:** Yes. He said that since this situation was rather unusual, he would bring it up at group meeting and let the lab collectively decide what we should do.

## Discussion Questions

- At what point, and under what conditions, are intellectual contributions "significant" enough to warrant authorship? Does the inclusion of Sean's theory justify authorship? How else could his contributions be recognized?
- Who should decide authorship? Is the mechanism proposed by Black to resolve the authorship issue appropriate? What other ways might be appropriate?

- How does the issue of authorship affect your answers in Part 1? In other words, how do the issues surrounding authorship affect discussions of unpublished science with others? Is this practice good or bad for science? How could it be changed for the better?
- Assuming Black is a co-author on the original paper, were his actions with respect to Sean and Hong appropriate? Under what conditions could these actions be appropriate? What about Sean's actions?
- Assume that Black and Sean have an extremely good working relationship and that informal discussions such as the one above are often very productive for many projects within the lab. How does this information affect your answers to the above questions?

## 3.2 When in Rome: Conventions in Assignment of Authorship

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Charles, a Ph.D. student at Bucket University, needed to gain expertise in certain techniques of biomolecular synthesis in order to complete his dissertation. Since no one at his home institution could provide instruction in this area, Charles contacted a leading researcher at another school, Professor Williams, and arranged an internship conducting collaborative research at Williams' lab in Wonkaland. Wonkaland is a small but wealthy with cultural traditions that highly prize group harmony and mutual interdependence and de-emphasize individuality. Charles was eager not only to learn about the research methods and complexities of this area, but also to develop connections and establish a relationship with this noteworthy figure.

From the first day Charles arrived at Williams' lab, he had been impressed. He had been given a warm reception by the other members of the lab -- Augustus, Verruca, Mike, Violet and Umpa -- and they seemed genuinely interested in his work. During weekly lab meetings that lasted well into the night, the researchers would discuss their work and describe problems that had arisen, and then the various members of the lab would offer suggestions. Some of the suggestions were helpful, and some were not, but Charles felt he had learned a lot from these sessions.

Charles was quite pleased with the progress of the research. He and Williams had made some major breakthroughs and were on the verge of submitting their first paper on the subject to a medical journal for review. He had given a draft of the paper to Williams, who was to review it over the weekend and make changes and comments. When Charles arrived in the lab Monday morning, he found the paper on his desk with the names of Augustus, Verruca, Mike, Violet and Umpa added to the list of authors. Surprised, Charles approached Williams in his office: "Dr. Williams, I don't understand why these names were added to the paper," Charles began, "when it was you and I who did all the work."

Williams looked at him, puzzled, "How can you say that? During the weeks we have been conducting our research, we benefited greatly from the input of the other lab members. Naturally, I have circulated copies of the paper to each person for comment and approval. We will be discussing the paper at this week's group meeting."

Seeing Charles' astonishment, Williams continued, "Of course, Augustus is working on a draft of a paper about his research project. Since you have contributed to his project, you'll have an opportunity to review that paper, and it will include your name when it goes out."

The journal to which Williams and Charles intend to submit the paper requires contributors to conform to the "Uniform Requirements of the International Committee of Medical Journal Editors" (the Vancouver Convention). For authorship, the Convention requires "substantial contributions to 1) conception and design, or analysis and interpretation of data; and to 2) drafting the article or revising it critically for important intellectual content; and on 3) final approval of the version to be published."

Charles decides to argue that the level of participation of the other researchers is not enough to qualify for authorship under these criteria. Williams insists that the contributions made by the other researchers are enough to satisfy the criteria. Moreover, Williams replies, these standards are based upon distinctly Western notions of a scientist as an independent entity. He continues, "Our culture sees the scientist as interdependent within a larger group. Those around the scientist contribute in valuable ways and without them he or she could not function. We believe it is more appropriate to recognize this reality."

## Discussion Questions

1. What ethical issues are raised by the authorship arrangement? Should Charles consent?
2. How substantial must a contribution be to satisfy the uniform requirements? Do the contributions made by the others in Williams' lab entitle them to an authorship credit?
3. How might Western cultural norms and values have influenced the formulation of the uniform requirements?

## 3.3 Friendship vs. Authorship

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Dr. Jane McDonald is a psychology professor at a university in Texas. Her good friend and colleague, Dr. David Woodford, is a psychology professor at a university in Alabama. Both Jane and David are members of a professional psychology association that has requested the assistance of its members in conducting a large national survey. Although Jane and David are not teaching at the same university, they went to graduate school together and thought it would be fun to collaborate on this study. After some discussion and planning, they informed the professional association that they would be happy to conduct the study. During the planning stage, they agreed that since Jane would be doing more of the logistics of the study, she would be listed as first author and David would be listed as second when it came time to publish.

Jane approached one of her graduate students, Mark Dunn, and asked him if he would be interested in taking responsibility for the logistical aspects of the study, such as mailing the surveys and data entry. Mark was informed that he would not be responsible for the new data analysis or final report since David would be doing these tasks. However, Jane did not discuss the issue of authorship with Mark. Mark, new in the psychology program, was flattered to be asked and agreed to participate.

Eight months later Mark completed his portion of the study and sent the data to David for analysis. Several weeks later Jane approached Mark and told him that David had not completed the data analysis and it needed to be done. Furthermore, she needed to have the data in a final report format so that she could present it at a conference in two weeks. Mark spent most of the next two weeks conducting the data analysis and writing the final report. Jane expressed her gratitude to Mark for his commitment to the project and asked if he would be interested in collaborating on the final paper for publication. Mark agreed.

Two months after Jane and Mark had this discussion, Jane handed Mark a final draft of a manuscript that was to be submitted the next week for publication. Never in the previous two months had Jane asked Mark to help with writing the paper. Furthermore, although David had not contributed to writing the paper, he was listed as second author and Mark was listed as third. Mark approached Jane and expressed his confusion as to why he was not asked to participate, and why David was listed as second author. Jane stated that she was too busy to collaborate and that it saved her time to write the paper herself. Furthermore, she and David had an agreement about authorship from the beginning, and nothing could be done to change the arrangement.

## Discussion Questions

1. Since Mark was not included in the planning stages of the study, should he be included as an author?
2. Should participation in some parts of a study have greater weight in determining authorship than participation in other parts?
3. Although Jane and David reached an agreement at the outset of the study, should David be included as an author?
4. Did Jane let her friendship with David get in the way of doing what was right with regard to including Mark as second author?
5. How could Jane have handled this situation in a way that was fair to her?
6. How could Jane have handled this situation in a way that was fair to Mark?
7. Did Jane deceive Mark when she failed to collaborate with him in writing the paper?
8. What can Mark do to ensure that he receives proper credit for his work?

## 3.4 The Temporary Post-Doc

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### Phase 1

Dr. Smith, a post-doc, temporarily joined a research group while seeking employment. The group's mentor, Dr. Johnson, assigned him to investigate a very difficult organic chemical reaction. After two months, Smith claimed to have solved the problem by employing a certain reagent that he had independently discovered. Unfortunately, Smith did not have enough evidence to back up his claim. By that point, Smith had found employment and left the group. Jill Green, an experienced graduate student, continued the investigation of the reaction. Green had access to Smith's notebook and data. She found that Smith's experimental procedures were

poorly written, and it was not possible to duplicate his work. Furthermore, his data were inconsistent and no valid conclusions could be drawn from the work. Unfortunately, Smith's procedures were never evaluated since he had been with the group such a short time. Green experimented with the reagent used by Smith and found that the reaction did indeed work, but under different conditions than described by his results. Six months after this discovery, Johnson and Green submitted their results to a journal for publication without consulting Smith.

## Discussion Questions

1. Should Johnson and Green have informed Smith of their results? Why? Explain.
2. Should Johnson and Green have acknowledged Smith's contribution to the work? If yes, how much credit should he have been given?
3. Should Smith have claimed to solve the problem?

## Phase 2

A fourth party familiar with Smith's original work and the work submitted by the group happened to see him and described how the group had solved the problem. Upon learning that he was not acknowledged for his contribution, Smith became angry and returned to confront Johnson and Green. They pointed out to Smith that their procedure differed from that of his original work and that his work contained no data that could confirm a successful result. Smith could not deny their claim, but he argued that his idea led to a solution and that he should be acknowledged. Johnson and Green later privately discussed the best way to handle the situation. Green felt that acknowledging Smith's contribution in the publication would resolve the conflict and require only a minor adjustment. However, Johnson was concerned that listing Smith as a co-author was not justified based on his work. Johnson stated, "Even if Smith made some contribution, he deceived us into thinking that he was doing careful work, then took our salary, and we could not even use his results." In addition, Johnson thought an acknowledgment would complicate matters if a patent were to be filed on the experimental procedure.

## Discussion Questions

1. Even though Smith's idea led to a solution to the problem, does that justify his claim to acknowledgment?
2. Suppose a patent were filed on the experimental procedure published by the group and the procedure were used industrially and generated significant royalties. What ethical arguments could a patent lawyer use to include Smith on the patent?
3. Would requesting that Smith return to the lab and duplicate his own work be a fair way to resolve the question of his contribution?

## 3.5 Patent Authorship: Whose DNA Is It Anyway?

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### Part 1

Glen, a professor and principal investigator, performs a series of experiments to identify genes associated with heart disease. He clones several partial-length complementary DNAs (cDNAs) from a strain of mice and is immediately struck by the sequence similarity of one such cDNA with a class of known genes involved in cell proliferation. Glen asks Sarah, one of his graduate students, to perform additional experiments with this cDNA to fully characterize the importance of this discovery. This work is not initially part of Sarah's doctoral thesis, but it becomes the project on which she spends the majority of her research efforts for three years. Sarah's efforts result in substantial progress in characterizing this gene, and she and Glen prepare a manuscript for submission to *Nature*.

Glen and Sarah discuss the potential commercial applications of this gene, and how he intends to patent the gene sequence through the university's technology transfer office. In discussions with Sarah, he often refers to the patent submission as "our patent." Although Sarah has reservations about the appropriateness of patenting genes, she never expresses these concerns to Glen, and she excitedly tells her colleagues about her impending first patent. As far as Sarah knows, Glen's laboratory has no oral or written guidelines concerning patent applications.

### Discussion questions

1. As her adviser, what obligations does Glen have to review with Sarah the laboratory's policy regarding patent and manuscript authorship?
2. If Glen does not inform Sarah about this policy, what obligations does Sarah have to raise this issue with Glen or others within the university in order to ensure that she has a clear understanding of Glen's expectations regarding the patent process and manuscript generation?
3. Should the university have an institutional policy regarding these issues? Whose responsibility is it to see that students are adequately informed?

### Part 2

When she generates additional data from the project, Glen instructs Sarah to provide this material to the university-designated law office drafting the patent submission. As a result, she obtains a copy of the patent application, and she is dismayed to find that she is not included as an author, although the application is essentially a retyping of her manuscript. She confronts Glen, who defends his decision to be sole inventor and accuses Sarah of trying to claim credit for something she didn't do. Glen tells Sarah that the manuscript is as much his as hers, and that it

was he who made the initial discovery of the partial cDNA. Glen states that Sarah will be allowed to put her results into her dissertation and that she will be first author on the publication describing this gene.

Without Glen's knowledge, Sarah performs additional experiments to identify the human form of the gene. She is successful, and she also identifies an additional, closely related gene. Sarah presents these data to Glen and subsequently to her thesis committee members. Glen instructs Sarah to include the new data in a revised patent application. He states that this additional work merits her inclusion as an inventor on the revised patent.

## Discussion questions

1. Was Glen entitled to use Sarah's manuscript as a basis for his patent application? As a larger issue, when a student writes and an adviser revises a paper, who is/are the author(s)?
2. Is patent and manuscript authorship a matter of convention relative to each lab? Or should some global policy apply to laboratories everywhere?
3. Did an oral contract exist between Glen and Sarah concerning the gene patenting?
4. If after Sarah's additional contributions, Glen still refuses to grant her co-inventor status, what are her options and her responsibilities to the project?
5. What should Sarah have done about her objections to patenting gene sequences? When should she have done it?

# COMMENTARIES

## 1.1 Commentary on "Today's Specials"

*Karen Muskavitch*

*Indiana University*

### Case Overview

The issues in this case are not unique to science. For instance, it was not unusual to wonder what one could do with a Ph.D. in English 20 or 30 years ago. At the time, a Ph.D. in biology was considered a virtual guarantee of a job at a university, but that is no longer true today, if it ever was.

The employment prospects for those holding doctorates in the sciences is a difficult topic for scientists at any level to broach, but it is one that faculty, students and post-doctoral fellows need to discuss candidly. This case could serve as a catalyst to open that discussion. Certainly the topic is no longer taboo: For one thing, it is hard to ignore. Many are finding it difficult to find jobs appropriate to their training, and some science Ph.D.s are completing three or more post-doctoral appointments before finding something more permanent. Twenty years ago, graduate students who leaned toward college teaching careers (rather than the expected, research university professorship) knew they needed to be quiet about their interest in teaching. Now many science departments offer graduate courses on how to teach college-level science, and job ads require teaching experience. Even the NIH, as well as AAAS and other scientific societies, have recognized that the traditional tenure-track position at a research university is not what awaits most of our graduate students, and they are making efforts to explore and educate scientists about other career paths.

This case forces us to consider the responsibilities and expectations of many with regard to employment after graduate school (including the scientific community as a whole, university science departments, individual senior scientists who train students, and the students and post-docs themselves). Do we see graduate training in the sciences as primarily education and inculcation into a profession, or as preparation for future employment? The responsibilities one ascribes to each of the involved parties will tend to vary depending on one's perception of the primary role of graduate education in a scientific discipline.

In many ways, the issues in this case resemble the need for informed consent in research with human subjects, particularly the ethical mandate that we respect other people as persons like ourselves; that we respect their right to make their own decisions and direct the course of their lives. Along with giving people the freedom to choose, what is critical in this situation, just as in

research with human subjects, is the information on which the decision is based -- its validity, completeness and clear communication.

Prospective graduate students need honest information about the current status of the academic job market as well as the availability of so-called alternative career paths. During their graduate work, they should be kept informed, offered opportunities to inform themselves and to get the training and experience that may be necessary for nonacademic careers. Faculty members need to keep up with the status of the job market and the concerns of their students. They need to talk about these issues with their students and post-docs, and to support them in considering and preparing for careers other than the traditional research university professorship. I assert that the responsibility for the gathering and exchange of information lies with both the science faculty and our students, but each student must be free to make his/her own decisions.

## Discussion Questions

1. If one considers Bowman to be a mature individual capable of making his own decisions, one must conclude that Hill's approach was paternalistic and inappropriate. In fact, he lied to Bowman. In addition to considering alternative ways in which Hill could have handled the conversation with Bowman, it would be beneficial to look at what happened in the faculty meeting as well. (Discussion of this point may be delayed; see Question 4.) Hill proposed that the department limit the number of students accepted for graduate study, and his suggestion was rejected. What are some other strategies he might have suggested? How could he have improved on his introduction of this topic at the faculty meeting? What are some other things that he might do within his department? In your discussion, be sure to note that from what we can tell from the case, Hill is acting on limited information (his conversation with Jake at the restaurant).
2. Devorak has a lot of things she could discuss with Bowman. The question is what she should say in this phone conversation. She feels the tension of potentially conflicting obligations to herself, the university, Bowman and Hill. The possible topics range from the real reason for Hill's refusal to take Bowman on as a grad student, through the current job market, all the way to how she prefers to do her research and the pressures to get tenure. For each of these topics she could tell the complete truth, give Bowman an idea of what the situation is, lie or omit the topic from the conversation all together. In determining what she should say to Bowman, the most important consideration is what Bowman needs to know to make an informed decision at this time. Devorak need not disclose every detail about all of these topics, and some things may be better communicated later -- in a face-to-face meeting, perhaps, but at least after Bowman and Devorak get to know each other a little better. Recall that this is only their second phone conversation. We don't know how much time Bowman has before he must decide on other offers for graduate study, or if Hill and Devorak's department has set a deadline. However, it seems unlikely that Bowman and Devorak must decide on the best course of action today, in this phone call. Thus, Devorak should not lie to Bowman, but she should communicate to him the basic situation in her lab, and the possible problem with future employment, as far as she knows it. She should not discuss Hill (see Question 3). It

would probably be best for all concerned if she gave herself and Bowman some time before definite decisions were made.

3. Devorak should not tell Bowman that Hill lied about his reasons for refusing to accept Bowman as a graduate student. This issue is between Hill and Bowman, and Hill needs to be given the opportunity to explain his actions and his reasons. She can and should urge Hill to explain the situation to Bowman, and she should discuss concerns about future employment with Bowman, but she should not presume to speak for Hill. These conclusions are based in part on professional loyalty, the fact that one faculty member tries to avoid interfering in the interactions between other faculty members and their students. The idea of autonomy is also relevant here. Hill was free to decide to lie to Bowman, and he should be free to decide how he wants to handle the consequences, unless failure to be honest with Bowman about Hill's actions threatens to harm Bowman. If Devorak discusses the job market with Bowman, not mentioning Hill, potential harm to Bowman should be minimized, and Hill will be able to talk with Bowman later.
4. These questions are similar to the ones posed in the discussion of Question 1 regarding Hill's handling of the presentation of his concerns to the departmental faculty. An individual, faculty or student, can make a difference, but he/she needs to be savvy and well prepared, and then recruit others to the cause. A brain-storming session that includes the design and evaluation of action plans would be an excellent way to address these questions. Keep in mind possible involvement of other departments, the university as a whole and professional societies. Coming up with a plan of action for Hill and Devorak to follow in their department, or perhaps deciding on something that your discussion group will do to address the employment issue, would be a good way to conclude discussion of this case.

## 1.2 Commentary on "Whose Lab Is It?"

*Karen Muskavitch*

*Indiana University*

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This case raises two very important questions with regard to research conducted in the collaborative setting of an academic laboratory: "Whose lab is it?" and the corollary "Whose research is it?" These questions are most pertinent when they concern research conducted by a post-doctoral fellow or a graduate student, as is the situation here. In the biology laboratories with which I am most familiar, the research of a graduate student like Archibald is typically the basis of his dissertation and in that sense is "his," but the work is part of a larger project on which the entire laboratory is working, and will continue working after he completes his degree and moves on. In this sense, the research is not his but rather belongs to the lab and the director of the lab. Most people are now aware that the research notebooks belong to the lab, and in many cases the convention is that the research questions stay in the original lab as well.

Many people are typically involved in a research project in an academic laboratory including the faculty member who is the principal investigator (PI) on most of the grants supporting the laboratory, a few post-docs trying to get their CVs in shape for the job market, some graduate students working toward their degrees, perhaps some undergraduates, and a few technicians. The technicians may range from those with advanced training in the field, even doctorates, to those who came to the lab with no special training and may only be able to carry out relatively routine tasks. Linking all these people is a complex web of relationships that can sometimes become strained or frayed.

This scenario focuses on one of these relationships, that between a graduate student and the faculty member who directs the laboratory. You will note that I have avoided using the term "mentor" to describe the faculty member. Contrary to what is usually assumed in the sciences, a graduate student's research adviser might not be the student's mentor. As noted in *Adviser, Teacher, Role Model, Friend: On Being a Mentor to Students in Science and Engineering*, a recent book from the National Academy Press,

A fundamental difference between a mentor and an adviser is that mentoring is more than advising; mentoring is a personal as well as a professional relationship. An adviser might or might not be a mentor, depending on the quality of the relationship. . . Everyone benefits from having multiple mentors of diverse talents, ages, and personalities." (National Academy of Sciences et al., 1997, p.15)

Because we do not know what the quality of the relationship between Archibald and Baker has been, I will simply use the term "research adviser" to describe Baker's relationship to Archibald.

Serving as a research adviser to a graduate student includes a number of responsibilities. (I will discuss the student's responsibilities in the commentary on Discussion Question 6.) These include guiding the student's research project by communicating effectively with the student, reviewing and providing regular feedback on the student's progress, and helping the student to acquire and develop the skills needed by independent researchers in their scientific field. In this case, we see that Archibald is meeting with Baker on a regular basis and that she reviews his work over the past week, looks at the primary data (not just the summaries that Archibald presents to her), and gives him concrete ideas on what to try next. This pattern of behavior is very good, and it seems to fulfill the first of the responsibilities of advisers. However, the way in which the conflict between Archibald and Baker is presented in this case leads one to wonder how well Baker has communicated the overall goal of the laboratory's research to her lab, and to Archibald in particular. He seems to be focused on the short-term goal of purifying cambin as quickly as possible and by whatever means so that he can do his experiments, write his dissertation and finish his degree. Baker, on the other hand, seems to be focused on the long term, on working with proteins purified in a unique way without the use of detergents. It is not clear whether Archibald just doesn't care about the long-term goals of the lab, or whether Baker has failed to communicate them to her collaborators. If the latter, then she has also failed to help Archibald to develop one of the skills he will need in a future career in science: the ability to see the big picture as well as determine the details of the next protocol that should be tested. In fact, her practice of making detailed notes in Archibald's notebook for what he should try next makes

one wonder if she is doing too much directing of his work. What might be appropriate direction for a technician would not be appropriate for a senior graduate student who should be practicing experimental design skills. (See Discussion Question 3.)

As noted, we do not know what kind of relationship Archibald and Baker have had up to the exchanges recorded in this case study. What is likely to happen as this case is used with a group is that each person will project his/her own experiences and biases onto these two characters. That is good for the discussion if it engages the participants and helps them to reflect on their own relationships and what could be improved. However, it could be a problem if the participants start making assumptions about the personalities or motives of these two characters and then base their ethical analyses on these assumptions. We don't know if Baker is a long-suffering junior faculty member working with a graduate student who can't seem to see beyond his own dissertation, or if Archibald is a bright, motivated graduate student struggling under an adviser who doesn't tell lab members what the overall plan is and who wants to control every aspect of every experiment run in her lab. In facilitating discussion of this case, I suggest taking a neutral view of both characters. Assume that they are acting in good faith, and beware of assumptions that discussion participants may be making. However, the discussion also should explore the possible differences if we assume that Baker is a micro-manager or Archibald a short-sighted student. The possible consequences of a proposed course of action might change, but usually the affected parties' rights and interests, and the ethical principles and obligations, do not.

Some people might question whether the conflicts presented in this case aren't more issues of etiquette than of ethics. Because they deal with how people ought to treat each other, they are ethical issues. Many scientific societies and writers in the field of research ethics have argued that the treatment of graduate students is an issue in research ethics. In their report *Responsible Science: Ensuring the Integrity of the Research Process*, an NAS committee includes "[i]nadequately supervising research subordinates or exploiting them" among questionable research practices, "actions which violate traditional values of the research enterprise and that may be detrimental to the research process." In describing best practices, they note that "[s]cientists in universities accept the obligation to pass along knowledge and skills to the next generation of scientists," and that "[t]he mentor has the responsibility to supervise the trainee's progress closely and to interact personally with the trainee on a regular basis in such as way as to make the training experience a meaningful one." (National Academy of Sciences, 1992, Vol. 1, pp. 28, 141-42) Weil and Arzbaecher assert that with regard to relationships within research groups going sour "[w]e can collect these ways of going astray under broader ethical questions about how to wield power responsibly and how to behave responsibly as one dependent on the power of others. As we proceed to point out the kinds of standards and practices that are needed, we thereby delineate role responsibilities in research groups. To fail to fulfill these role responsibilities would be to behave irresponsibly, that is, unethically." (Weil and Arzbaecher, 1997, p. 78)

## Discussion Questions

### Questions 1 and 2

Baker's reaction to Archibald's announcement that he had gone ahead and tried the CTAB indicates that there may have been a better way either to go about the experiment, or to tell Baker about it. That does not mean that doing the experiment was "wrong." Archibald was not squandering significant laboratory resources or endangering other members of the lab, and he did try Baker's suggestion first. He was trying something that others had used with success but which Baker had told him not to do. It is not clear why she told him not to try CTAB. Was it because she wanted to control every detail of work in the lab, or because protein purified in the presence of a detergent like CTAB was worthless for their research? It is unreasonable to expect that an adviser should okay the details of everything a graduate student does. However, Archibald could have done things a little differently and possibly avoided Baker's angry response. For instance, he could have asked Baker earlier for a clarification as to why she opposed his testing CTAB. The ensuing discussion might have led to some sort of understanding. Or he could have presented the results differently. Instead of announcing the wonderful purification as he did, he could have started by describing how he carefully tried all Baker's suggestions and then decided to try CTAB while he was at it. He could have told Baker, "I know that protein purified with detergent is not useful for our studies, but I was starting to wonder if active cambin could be purified at all. At least I now know that it is possible, and we just have to figure out how to keep it active in the absence of detergent." He needs to respect his adviser-student relationship with Baker, but he must also remember that he is part of a research team and not just a pair of hands.

Archibald's chosen course of action, although not "wrong," probably was not the best choice. The tone of Baker's response, however, was clearly inappropriate and arguably "wrong." She responded as if she were scolding a child, not talking with a junior colleague in the presence of other members of the lab. (Recall that the setting is a lab meeting; we can assume others are present even if we do not hear from them.) In addition, it would take a very special set of circumstances to justify the command to a graduate student that he "never conduct experiments without my explicit approval!" It might be justified if he were a first year student just starting in research, or if he had a history of endangering others or wasting time and materials on poorly designed, inconclusive experiments. However, the essence of science is exploration and discovery: To deny a student the opportunity to try some of his own ideas is to deny him the opportunity to develop into a mature scientific investigator.

### Question 3

This question asks whether Baker has the authority to control all experiments in her laboratory. For a number of reasons, the ultimate answer is "yes." I would add several qualifiers, however: that she should include others in her decision making, and that she should be sure to provide opportunities for graduate students and post-docs to participate in the decision-making process as a part of their training. However, she is the one held responsible for the funds granted to the lab, for the safety of all in the lab, for the validity of work published by the lab, and for the lab's progress in its research. Therefore, she does and must have final authority for what is done in her name in her laboratory.

Although she has the authority, that does not give her the right to act in a dictatorial or arbitrary manner. In addition, the different types of researchers in her laboratory need to have different amounts of freedom in their design of experimental approaches. A post-doc is like an apprentice scientist, just one step away from independent research and often the recipient of a

stipendiary grant and funds for research materials. However, the post-doc usually has received the grant to do a certain project in a certain lab and is still considered a trainee. Thus, some guidance and supervision is appropriate. At the other end of the spectrum is the relatively unskilled technician who follows protocols prepared by others and may not even participate in the interpretation of the data collected. Between the post-doc apprentice and the hired hands of the technician is the graduate student. As part of their training, graduate students must be part of the experimental design process so that they can learn and develop their skills. The level of their participation should increase over time as they complete their graduate work. Thus, the level of faculty guidance given to a first-year student would not be appropriate for a fourth-year student. However, a completely hands-off style is never appropriate for reasons of student training and faculty responsibility.

Deciding whether Archibald's committee needs to be informed about this incident requires that we know if it was an isolated occurrence on a particularly bad Monday morning, or if it represents a pattern of micro-management and dictatorial behavior by Baker toward Archibald. Archibald could experience negative consequences if he takes this conflict outside the lab, even if it is to his dissertation committee. Thus, he must weigh his options carefully, and, if possible, unemotionally. If this incident does represent a pattern, then Archibald should go to the dissertation committee to seek redress of a situation in which he, and possibly other students in the lab, is not being trained as a predoctoral student should be.

## Questions 4 and 5

No level of pressure of any type on Baker would justify a disrespectful and dictatorial response to a graduate student. However, because of the fact that she is responsible for the use of grant funds and for the reasons mentioned in the comments above, Baker does have the authority and responsibility to oversee the experiments carried out in her laboratory. She needs to change the way in which she exerts this authority.

We often hear people say that the pressures of contemporary science justify inappropriate actions, even fraud. "Pressure" is not a valid ethical factor. True, we do need to be cognizant of the pressures confronting us and try to reduce them if possible, but we can't use them to excuse inappropriate actions. The pressure on a junior faculty member to secure continued funding is not only related to getting tenure. It also involves concerns about having enough money to keep members of the lab employed, maintain student support, and be able to pay the bills for expensive reagents so that all can do their experiments. Baker may see the use of a unique, detergent-free purification for the proteins studied in the lab as the hook that will secure the continued funding, but she needs to explain her reasoning to others in her lab so that they will understand and learn from her.

## Question 6

In discussions of cases like this one, we frequently spend a lot of time talking about the rights of graduate students, probably because these rights are often disregarded. However, it is also important to explore the other side - the responsibilities of students. After all, education is not a passive endeavor. In this case, we learn that Archibald has been reading papers describing

purification protocols similar to his own, and that is exactly what he should be doing. But I am puzzled as to why he does not understand the significance of the detergent-free protocol used in the Baker lab. From the information given in the case, it is not clear if the fault for this lapse lies primarily with Archibald or Baker. Has Baker failed to be clear or forthcoming with her reasons? Has Archibald failed to ask, or has he failed to pay attention to Baker's answers? We don't know, but both must bear some of the blame for the situation.

It has been noted that "The term 'mentoring' refers to an interactive process; The role of the mentored person is not a passive one. That person has a responsibility to seek information and guidance and to be ready to make use of it."(Weil and Arzbaecher, 1997, p. 77) A student should be open to, and even seek out, additional information and the perspectives of others, particularly those who are more experienced. Then the student should develop a reasoned position of his/her own to contribute to the discussion. In the end, it is hoped that student and adviser will arrive at a consensus as to how to proceed; failing that, however, the authority of the adviser who is head of the lab must be respected. This situation differs from that in History, for instance, where students typically work independently of all others in libraries or archives, and the dissertation adviser may not be a coauthor on any work that is published. But all graduate students should acknowledge the greater experience of their adviser and the fact that they asked this faculty member to guide their work, and so act on their adviser's suggestions or at the very least give them serious consideration.

## Question 7

Consideration of the two principal questions raised here will probably be the most valuable part of the discussion of this case. How could this situation have been avoided? And what should Archibald and Baker do in the future? As noted above, it is not clear who bears the greatest share of blame for the current situation, nor do we know what Archibald and Baker's previous relationship has been like. Therefore, there are no definitive answers to these questions. Rather, they serve to help all of us to consider how to improve communication and thus relationships within our own research groups. Brainstorming and sharing ideas and experiences will be very helpful if coupled with an evaluation of what is likely to be most successful in a given situation.

I offer two suggestions. It would be helpful if there were an opportunity for members of a research group to discuss their expectations of each other before a crisis occurs. Perhaps this case or the vignette entitled "The Lab of Last Resorts" (Weil and Arzbaecher 1997, p. 79) could be used to trigger the discussion. Baker's lab and others also could benefit from more discussion of the "big picture" by the lab director so that all would know how their work fits together into a whole. This orientation could be provided through regular presentations by the director at lab meetings, or by cooperative preparation of grant applications.

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## 1.3 Commentary on "The Slave Driver vs. the Lazy Student"

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### 1. Are Santiago's standards unreasonable? Is Patton's work ethic lacking?

It is difficult to answer these questions without further probing. Apparently, Santiago and Patton would answer each of these questions differently. Santiago: "My standards are reasonable; Patton needs to work harder." Patton: "Santiago's standards are unreasonable. It shouldn't take me another couple of years to have a publishable paper; my work ethic is fine."

Two strategies might help resolve these differences. First, a conversation between Santiago and Patton, in which they actually discuss their differences, might be helpful. The case presents no evidence of their having such a conversation. However, for this conversation to be helpful, it cannot simply be a confrontational meeting. Santiago questions Patton's dedication (too many vacations and extracurricular activities). Patton questions Santiago's motivation (she wants Patton around longer as an assistant because she does not seem able to recruit new assistants). If Santiago is right, Patton has little basis for complaint. If Patton is right, Santiago is exploiting Patton. A meeting in which they confront each other with their suspicions is unlikely to help them move ahead constructively (at least not together). However, a meeting in which they seek a meeting of minds on how Patton might best complete her degree program could have good results and might even dissolve their mutual suspicions.

Second, at this point Patton's thesis committee is involved; perhaps committee members can play a mediating role. The committee is convinced that Patton is a strong candidate. Perhaps a meeting involving Patton, Santiago and at least one other member of the committee could help put a more constructive spin on the situation. Given their mutual suspicions, Patton and Santiago may not be able to move ahead without the mediation of others.

## 2. How could an institution prevent such situations? How can a department or institution encourage good adviser/student relationships?

As long as the basic communication about expectations and requirements is only one-to-one (adviser to advisee), such situations can easily occur. Meetings and workshops on program aims and requirements can help promote understanding among faculty and students alike. When students and faculty are left on their own to work out these matters one-on-one, it should be no surprise to find misunderstandings and suspicions. Does the department have any say about what reasonable standards are? Is there any discussion about how best to help students meet these standards? Are there candid discussions with students about how much work it takes to complete a program in a timely fashion? Are students fully informed about the publication restraints that accompany industrial collaboration?

## 3. What are Santiago's obligations to her students' careers?

I prefer to phrase this question somewhat differently: What are Santiago's obligations to help her students in the course of their degree programs? I would tie these obligations to the institution in which she is working, the quality of program her department is seeking to maintain, and the institution's and department's obligations to its students generally. Within that framework, Santiago has an obligation to provide opportunities and encouragement for Patton to do the best work she can. If Santiago does not want to publish Patton's work because she feels it will not benefit her own career, she seems to have things the wrong way around.

Santiago's basic question should be whether her standards are reasonable (and not just in her own eyes, but from the standpoint of her department), and whether Patton is satisfying them. If the bar is too high for Patton, what should be done? Perhaps the bar should be lowered. But departmental standards are for all students, not just for Patton. The question of reasonable standards should not be settled by Santiago alone, Patton alone or even Santiago and Patton together. Again, it is important that others be involved in the issue between Santiago and Patton.

## 4. What about the relevance of industrial collaboration to Santiago and Patton's work?

It is difficult to answer this question in the abstract. Certainly it is possible for researchers to become involved in industrial collaboration in ways that compromise their commitments to the university and/or their students. However, that problem does not require outright refusal to become involved in such collaborations. At the same time, students need to be fully informed about the limitations that will be placed on their own research should they join in such collaborations - and they should be informed about the implications of collaborative research before they agree to participate.

## 1.4 Commentary on "How Much Help Is Too Much?"

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There is no argument here that Professor Brown is guilty of moral misconduct. Society, which indirectly pays his salary and supports his cushy life-style, must hold him accountable for doing the right thing. Part of his job is to certify that graduate students have certain expected skills, and in this regard he is clearly violating the public trust. The rest of the faculty, by knuckling under to Professor Brown, are equally guilty accomplices.

But should the focus of this unfortunate situation exclude James, the student who was unfairly helped through the program? Did he not, by accepting unfair assistance in passing the cumulative exams, essentially steal his degree? Is this behavior any different from that of students who cheat on exams or plagiarizes papers in order to graduate from college? In such cases, while the students receive the degrees, they must, at some stage in their lives, reflect on what underhanded means they had to use, and that reflection must be personally painful.

Just recently the local newspaper carried a story about how term papers can be purchased; the author of the news article estimated that at least 10 percent of college students use one of these paper mills during their time in college. The author had interviewed a writer of such term papers, who understood the sleazy nature of her craft, but then rationalized it by saying; "It's a natural thing [to purchase term papers and use them as your own]. If someone tells you a joke, you tell it as your own."

Her statement is wrong on two accounts. First, it is not a natural thing to steal, or to use deception in obtaining a college degree. Most students who cheat in college do so with full knowledge that it is wrong and often agonize about it. Second, telling a joke does not imply that the joke has been created by the person telling it. Everyone knows that jokes are shared without attribution. Only when the jokes are claimed to be original when they are not is the re-telling immoral. But the purchase and use of term papers without proper attribution is an immoral act, and the writer of such papers is guilty of immoral behavior by openly and notoriously acting as a source of such papers.

It is interesting, however, that while some 20 states have made the sale of such papers illegal (punishable by a civil penalty), not one state has outlawed the purchase of the papers, although the entire industry would collapse if there were no buyers. The students who purchase the papers are also guilty parties in this sorry business.

Similarly, James is the truly guilty person in this case. It is his responsibility to conduct himself in an honorable way, and if he perceives that he is being unfairly helped (by having Professor Brown tell him what is on the comprehensive exams, e.g.), then he should stand up and refuse such help. This requirement differs little from that of a student who is offered a term paper for sale. We all recognize that the moral thing to do is to refuse to purchase the paper. Similarly, James should refuse to accept Brown's assistance. By cheating his way through graduate school, not only does James paint himself as a scientifically incompetent person, but also as an immoral

one. It might be, that, as in the scenario, James could not hold a job; the problem with the job was not that he could not perform in the laboratory, but that his co-workers soon discovered that James could not be trusted. That second conclusion is far more damning than the first. If James were simply incompetent, he could always find a job cooking French fries. If he was a cheat and liar, then no one would hire him.

## 1.5 Commentary on "The Graduate Student Laborer"

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This case focuses in an illuminating way on the power disparity between a graduate student and the student's research adviser. A carefully nuanced account of a single incident - a visit by the adviser to the student's office on a Friday afternoon to ask a favor - allows the psychological and ethical subtleties of the situation and of the student/adviser relationship to come fully into view.

Because the second year master's student, Joe McGrath, is extremely hard working and productive, he has accomplished enough to have landed a desirable job, with the starting date set. Joe's expertise is needed for a new initiative at the small company that has hired him. This job commitment has resulted in a tight time schedule because Joe must finish his research and complete his thesis before starting the new job. Nevertheless, his research adviser, Dr. Smith, has put him to work providing figures and graphs for a presentation Smith is to make. Although the figures and graphs are based on data Joe and two predecessors collected in the lab, Joe has to set aside his own thesis work to prepare the requested items. In requesting the figures and graphs, has Smith adequately respected the student's needs and interests? Smith appears to have given priority to his own need to have his presentation prepared on time.

When Smith shows up to ask Joe to come in on Saturday, he seems unaware that Joe routinely comes in on Saturday and that taking more time away from his thesis project may interfere with Joe's completing it on time. Smith may be unheeding enough to believe that Joe feels pleased to have been chosen to flesh out Smith's presentation and to ensure that it is ready on time. He may think that Joe appreciates his thanks for time spent on Smith's presentation and his offer to list Joe as fourth author after himself and the other two graduate students who did not finish their degrees. Smith seems to have no idea that Joe is anxious about the time he has lost working on the graphs and is disappointed to be listed as fourth and last author. Nor does he realize that under the pressure of his thesis deadline, Joe is not prepared to question the rationale for this assignment of authorship. In a situation that the student reads as a request he cannot refuse, the adviser seems clueless about the student's discomfort and dissatisfaction. Finally, the student's chagrin at his adviser taking a day off work while the student loses time from his thesis work escapes Smith's notice.

While all these failures of attention and respect for the student's interests show some lack of sensitivity on Smith's part, Joe appears somewhat diffident. We are very comfortable when others read our feelings correctly and are sensitive to our needs and interests. On some

occasions, when others fail to pick up clues, it may be necessary, although not easy, to speak up politely. Joe has done well in his studies and in the job market, and he ought to feel some confidence in calling attention to his own interests. He could use this occasion to make Smith aware of his tight schedule. Perhaps they could discuss how best to plan the time ahead after Smith's presentation to ensure that Joe completes his thesis work on time. Joe could mention that he would be interested in further explanation of the criteria for authorship when there is more time for a conversation. There is no harm in Joe's informing Smith that he normally comes in on Saturday to do his own work and that he has found that routine has helped him to progress well.

Not all of Smith's failings are failings of sensitivity. He should be generally aware of the power disparity between student and adviser and should be careful not to take advantage of students, for example, by asking favors students cannot refuse. He should be conscious of where students are in their course of study. Most importantly, he should not mention authorship in a way that allows it to be read as a return for a favor. Authorship criteria should be a matter of research group policy, with rationale provided, and not treated as a personal matter. It is precisely because awarding recognition and credit produces awkwardness and discomfort, raising issues about the value of a person's work, that policies are necessary. Joe should already have encountered discussion in his research group about credit for collecting data as against credit for such contributions as providing figures and graphs. When pressed to take time away from his thesis, he should have known what the recognition for his contribution was likely to be.

The situation in this case indicates the importance of open communication between graduate students and research advisers and the necessity for research group policies that are clearly articulated and explained. This case highlights the need for policies regarding the roles and responsibilities of graduate students in preparing presentations for advisers and preparing presentations that represent team efforts. Explicit ground rules concerning expectations for graduate students in these and other common situations should reduce the likelihood of research advisers' taking advantage of students and increase the likelihood of graduate students' speaking up as their interests require.

Lacking information about why Smith does not plan to work on Saturday, we cannot say whether it is appropriate for him to ask Joe to work on his presentation when he himself does not. If Smith had earlier committed himself to, say, representing the university at an all-day consortium or performing in a community musical production, he might be justified in asking Joe to help out. The last-minute character of Smith's request is harder to justify. In any case, he owes Joe an explanation.

In order to flourish, graduate students need an environment in which they feel safe enough to ask necessary questions and to look out for their own interests appropriately. Policies regarding authorship, the roles and responsibilities of graduate students, and other matters must be decided and articulated within research groups and customized to their particular circumstances. In some areas of research, data compilation may have more importance; in others, analysis may have greater significance and earn greater recognition. By creating an atmosphere in which research group members, including students, feel comfortable discussing the ground rules covering their activities, research advisers can prevent conflicts and disappointments that might pass unnoticed but nevertheless hamper the progress of students.

## 2.1 Commentary on "Truth or Consequences"

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As one can quickly see from scanning this case, the central issues are trust and honesty. However, the case also raises several more peripheral yet important issues, including proper data management and the responsibilities of authors, collaborating researchers and faculty research advisers.

Trust is essential for science, particularly in collaborative research settings. In fact, in 1995 an entire issue of *Science and Engineering Ethics* was devoted to consideration of "Trustworthy Research." (Vol.1, No. 4, 1995) Trust, in turn, depends on honesty, the value listed first among the core values of science. (National Academy of Sciences et al., 1995, p. 21) If someone is seen as dishonest, we do not trust him and avoid him as a collaborator. In Part 1 of this case, we are asked to consider what can happen within a research group when trust is weakened; in Part 2 we look outward to consider the possible effects within the larger scientific community.

There is no glaring instance of misconduct in this case. At most, Peter can point to a lack of primary data in Sally's notebook for the second set of mice and report that she didn't save any of the cells for reanalysis. The failure to preserve relevant data has been termed a questionable research practice, something that may be detrimental to the research process, but is not misconduct. (National Academy of Sciences et al., 1992, Vol. 1, p. 28) However, when he considers the sum of Sally's actions, Peter comes to wonder if she might have falsified or even fabricated her results from the second group of mice so that they would be consistent with those of the first. If so, her action would be misconduct. Peter must decide whether and how to act on his misgivings. Exploring his options and identifying the factors he must weigh in making his decisions are the most obvious foci for discussion of this case.

The case also could be used to trigger a discussion of best practices for the conduct of collaborative laboratory research. The discussion group could identify what types of standard operating procedures for the laboratory could have been put into place before this incident so that the problem Peter faces would never have arisen. What if the lab agreed on norms for the number of subjects tested and/or replications to be done before publication of the results? What if there were a clearly articulated expectation that primary data will always be kept and preserved in a bound notebook? What if it were a standard part of preparing a manuscript to have all the authors sit down together to review the primary data, not just the graphs and tables generated from the data? That is exactly what some laboratories have done, but often only after a crisis. After two independent but concurrent incidents of misconduct in his laboratory, Lee Hood is reported to have "formalized the review process, so that each paper is now reviewed by three people inside the lab." In addition, "[t]here is considerably more emphasis on dealing with raw data, not merely a synopsis of the findings. And Hood now also requires everyone to keep a bound lab notebook." (Roberts, 1991, 1347)

## Discussion Questions

### Question 1

This question challenges us to consider what options are open to Peter, and how he might decide among them. Some possible options are 1) going ahead with the writing as if he had no misgivings, 2) confronting Sally, or 3) telling Larson that he will not prepare the manuscript until the data can be verified. Surely discussion will generate other possibilities, such as Peter loudly and without warning declaring at a laboratory group meeting that he's certain Sally has fudged her data, that he's never going to work with her again, and that others had better watch out for her. Such a course of action is clearly inappropriate because it fails to show respect for the people involved, and it could have some very serious negative consequences for a number of people, including Peter. However, brainstorming that includes such inappropriate options can help us exercise our imaginations and improve our creativity in devising innovative appropriate solutions.

Next, one must evaluate the many possible courses of action and select among them. This process involves looking at the possibilities from a number of perspectives, considering ethical principles and obligations, predicting possible consequences and making reasoned judgments that take account of conflicting interests, principles and obligations. During this part of the discussion, it is important for participants to justify their positions, rather than falling back on "I think" or "I feel" statements. Discussants must be able to explain their reasoning so that the group can work toward a consensus on which possible courses of action are ethically acceptable, which are not, and why. Then the relative merits of the acceptable options can be evaluated to determine the best course of action. In the end, participants may differ on the best option because they will give different weights to conflicting obligations or principles.

In this scenario, Peter would need to consider the interests of such people as Sally, Larson, the rest of the lab members, and other scientists working in this field, in addition to his own. He needs to examine his obligations to these and other people, as well as the ethical principles on which these obligations are based. For instance, he has a basic obligation as a member of the human community to treat other people respectfully, as he would like to be treated. But he also has a responsibility to the scientific community in particular to honestly report the results of his research because of his respect for them, their time and their ability to draw their own conclusions from the data. These and other obligations may appear to be in conflict. Then Peter needs to examine the possible courses of action open to him to determine the possible consequences of each alternative, and evaluate how well each option fulfills his obligations and takes into account others' reasonable interests

### Questions 2 and 3

These questions focus the discussion on the responsibilities of the authors of scientific papers. For instance, how sure of your results do you need to be before you publish? In discussions of research ethics, we often focus on appropriate authorship and investigate criteria for determining who has the right to be listed as an author. The responsibilities of authorship, the

flip side of this coin, often are not considered as thoroughly, probably because of the large variation in expectations.

Generally, an author is expected to take responsibility for the validity of the data presented in a paper, but there is some question as to whether one is responsible for all of the data presented, or only for the data one actually collected. In "Responsible Science," the NAS committee seems to argue for collective responsibility, saying that "the privilege of authorship should be based on a significant contribution . . . as well as a willingness to take responsibility for the defense of the study should the need arise." (National Academy of Sciences et al., 1992, Vol. 1, p.140). The American Society for Microbiology also comes down on the side of collective responsibility, stating that when publishing in its journals, "All authors of a manuscript must have agreed to its submission and are responsible for its content . . . ASM considers all authors responsible for the entire paper." (Journal of Bacteriology, 1998, Vol. , p. I-ii) In contrast, the Journal of the American Medical Association indicates that "[a]uthors may include explanation of each author's contribution and add a publishable footnote explaining specific contributions," presumably to indicate who is taking responsibility for what parts of the study (JAMA, Jan. 7, 1998, Vol. 279, p. 67). As the International Committee of Medical Journal Editors has asserted, "[a]ny part of an article critical to its main conclusions must be the responsibility of at least one author" (JAMA, 1997, p. 928), but, one infers, not necessarily all. Nature, where the characters in this scenario plan to publish, has not published its expectations concerning the criteria for and responsibilities of authors in its "Notes to Contributors" (Nature, 1997, p. 702), and we do not know the conventions in the characters' field, professional organization(s) or laboratory. Similarly, the conventions for the meaning of and responsibilities of first vs. last vs. internal authors vary considerably from discipline to discipline, and even from laboratory to laboratory.

Thus, even though he is the first author, Peter may be able to indicate via a footnote in the manuscript that he accepts responsibility only for the data he collected and not for the data from the cell function assays that Sally ran. Is that course of action ethically tenable? One's answer will vary depending on one's view of the responsibilities of authorship.

This case may trigger a discussion exploring the range of variation in the criteria for and responsibilities of authors that would inform students of the very real variation and point out the benefits of discovering the local conventions before they become authors.

#### Question 4

Now we pause to look at the actions of Larson, the faculty member who directs the laboratory in which Peter and Sally work, and who is the principal investigator on the grants that support the lab. In these roles, he is the person ultimately held responsible for the validity of the work done within the laboratory, and therefore is responsible for quality control. However, he is more than just the lab director: He is also the faculty adviser for Peter and Sally, two fourth-year graduate students working toward the Ph.D. As such, he is responsible for training them and helping them to develop the skills they will need to become independent investigators. Two of the ways in which he should do this are to model best practices in laboratory management, and to be explicit about how and why things are done.

One can argue that Larson acted properly when he told Sally that she would appear as the second author on Peter's manuscript if her data were informative, because he was providing

explicit information as to what Sally might expect from the work she is being asked to do for Peter's project. He is also being consistent with the expectation that one is an author only if one has significantly contributed to the information presented in a paper. However, one could also argue that he is putting Sally in a difficult position, tempting her to fudge results so that her data will be seen as "informative."

That is particularly true when one notices indications that best practices are not the rule in this lab, so that tainted data may not be caught. This lab seems to have no standard procedures for recording and preserving primary data, or for storing samples for possible confirmatory analyses. Similarly, there are no routine mechanisms by which other members of the lab discuss primary data or review manuscripts. For instance, note that Larson never asks to see the raw data from Sally's analyses; he only looks at her graphical interpretations of the data. Peter didn't feel he could ask directly about the data, but instead went to look at Sally's notebook on the sly. He now seems to feel that publicly asking about the data will depart from routine lab practice sufficiently to stigmatize Sally. If a set of laboratory procedures had been in place and were routinely followed, Peter would not be in the quandary in which he now finds himself, and Larson would be publishing papers of higher quality.

Of course, this discussion does not address the very real problem of survival in the competitive atmosphere of contemporary scientific research. Many people use the time pressure as a justification for sloppy record keeping, lax laboratory oversight and over-interpretation of marginal data. However, consider all the time that the Hood lab spent sorting through the mess left after misconduct was discovered in their lab, and how much time and energy Peter is spending worrying about Sally's data rather than writing the manuscript and doing further experiments. Best practices include not falling prey to short-term expediency.

## Questions 5 and 6

Now that the paper has been published and presumably discussed at scientific meetings, any actions Peter might take will occur in a far more public context. The basic ethical considerations are the same as they were when he wrote the paper, but now some of the possible consequences are different, and an additional course of action is now possible: retracting the paper.

If this were the only paper on the function of this gene and if understanding the gene had become important for human health between Part 1 and Part 2, then one might argue that Peter's obligation to investigate Sally's analyses had increased. However, other groups have already cast doubt on the Larson lab results so that Peter's failure to act will not endanger human lives or health. This is an example of the self-correcting nature of science to which many have referred. However, it is not without cost.

Note that it is possible that Sally really did get the sample labels correct, and the first two sets of analyses were a fluke. Alternatively, the assay conditions, mice or knockout alleles studied by the Larson lab may differ from those used by other labs in some way that affects the cell function analyses. Discrepancies between labs do not always indicate fraud, and Peter needs to be careful. Until the situation is clarified, however, the Larson lab will be perceived as either sloppy or dishonest.

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## 2.2 Commentary on "O, What a Tangled Web We Weave!"

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The main issue raised by this case is the relationship between a graduate student and the student's faculty adviser. What should this relationship be like, and what can and should one do if the relationship goes sour? A secondary issue concerns how and when one should report misconduct by a faculty member.

Most will readily accept that misconduct is relevant to research ethics, but some will question whether the student-adviser relationship fits in this category. Because it concerns people's treatment of each other, many scientific societies and writers in the field of research ethics agree that treatment of graduate students is an issue in research ethics. A committee of the National Academy of Sciences included "Inadequately supervising research subordinates or exploiting them" among questionable research practices - that is, "actions which violate traditional values of the research enterprise and that may be detrimental to the research process." (*Responsible Science: Ensuring the Integrity of the Research Process*, Vol. 1, p. 28, National Academy Press, 1992) With regard to relationships in research groups going sour, as is the situation in this case, Weil and Arzbaeher assert, "We can collect these ways of going astray

under broader ethical questions about how to wield power responsibly and how to behave responsibly as one dependent on the power of others. As we proceed to point out the kinds of standards and practices that are needed, we thereby delineate role responsibilities in research groups. To fail to fulfill these role responsibilities would be to behave irresponsibly, that is, unethically."(Weil and Arzbaeher, p. 78)

In the past, it was often assumed that the student's research adviser would serve as the student's mentor as well. This assumption is still common in the natural sciences, but more and more people are using the term "mentor" as an honorific rather than as a description of an assigned role. For instance, *Adviser, Teacher, Role Model, Friend: On Being a Mentor to Students in Science and Engineering*, states:

In a broad sense, a mentor is someone who takes a special interest in helping another develop into a successful professional. . . .A fundamental difference between a mentor and an adviser is that mentoring is more than advising; mentoring is a personal as well as a professional relationship. An adviser might or might not be a mentor, depending on the quality of the relationship. (National Academy of Sciences et al., 1997, 15)

While the best situation may be to have one person fulfill both roles, that is not always possible for a number of reasons. Concerning the choice of an adviser, the National Academies' Student Planning Guide says, "The ideal person can not only guide your career, support your research, and help to find you a job, but can also serve as a close and caring mentor - a 'research uncle,' as one author puts it. Obviously, this is a rare combination, but one worth searching for." (National Academy of Science, 1996, 69) Often the personalities of the student and the adviser do not facilitate such a close relationship, and even when personalities are compatible another person may be a better mentor in a specialized area such as teaching or preparation of presentations. In fact, it has been asserted that "[n]o mentor can know everything a given student might need to learn in order to succeed. Everyone benefits from multiple mentors of diverse talents, ages, and personalities." (National Academy of Science et al., 1997, 5) That can be especially true when the student is a woman and the faculty adviser is a man, as is the situation with Hogan and Simpson. It has been observed that "[w]hile academic advisors are supposed to serve as formal mentors for women, they do not always do an adequate job. . . . Women often react by reaching beyond their official advisors to find other mentors among faculty from other disciplines, peers, or classmates," just as Hogan reaches out to Rodriguez in this scenario. (Bird et al. 1993, 8) And the National Academy of Sciences et al. suggest, "You might decide to seek several advisers to broaden the range of counsel available to you . That is particularly important for women and minority-group students, who might wish to have a woman or member of their minority group as a mentor." (National Academy of Sciences, 1996, 75). For these reasons, having a mentor who is not one's research adviser, having more than one mentor, or developing group mentoring opportunities are now being encouraged.

When a student's relationship with a mentor who is not the research adviser goes sour, the termination of the relationship can be difficult, but it will not usually have long-term negative consequences for the student. However, termination of a relationship with a research adviser can lead to a number of negative consequences including slowed progress toward one's degree, a change in the direction of one's research project, damaged reputations, and perhaps the need for a

change to a different department or school. The *Student Planning Guide* offers the following advice:

What can you do if the relationship with your adviser is a poor one? If the two of you cannot work it out, you should try to find another professor who is qualified and willing to take you on. In general, it is best to make a change as soon as you see that the situation is unworkable. . . Only if it is late in your student career should you endure a difficult situation rather than try for a better one. The head of the graduate program or the departmental chair might be able to help you to decide what to do and who might help you." (National Academy of Sciences, 1996, 75)

The *Guide* also notes, "It is very important to remember that the education of a graduate student is the responsibility of an entire department, not just of a single adviser." (National Academy of Sciences, 1996, 70) However, not all departments acknowledge this responsibility, and the effects of changing advisers will depend on many factors including the department's attitude toward such changes, the details of the specific situation, and how the student and the advisers, old and new, negotiate their way through the change. If it is possible to be civil and rational throughout, the change may be beneficial to all concerned, but rumors, accusations, and recriminations can easily poison the atmosphere.

The secondary issue, the misconduct charge against Simpson, will be addressed in the discussion questions.

## Discussion Questions

### Question 1

This question explores the reasons why Hogan might not want to publicly accuse Simpson of plagiarism. Naturally she fears direct retribution and damage to her relationships within the department and the discipline. While I agree with the NAS panel that "every case of misconduct in science is serious and requires action," ( *Responsible Science: Ensuring the Integrity of the Research Process*, p. 31), I do not believe that the action must be either direct or immediate in this case. That is because the risk of potential harm to Hogan is so great while the risk of harm to others if she delays is minimal. Although Simpson goes too far when he asserts that plagiarism is a harmless little transgression, it is true that it is not on the same level as publishing falsified data from a human clinical trial. Therefore, Hogan has some time to stop and carefully consider her actions.

First, she must be absolutely certain of what she saw, and she should have documentation; photocopies would be best. How much was plagiarized and where? Was it direct copying or a paraphrase without citation? Second, she needs to know her institution's regulations and the various routes by which she might make an accusation. Third, she needs to talk to a trusted faculty member like Rodriguez in confidence to check her reasoning and actions. Fourth, she needs to come up with as many creative possible courses of action as she can and then decide

which is best. And fifth, she needs to design and carry out a plan of action. Steps four and five will probably involve consultations with the trusted faculty member.

These are steps that the discussion group can follow. The brainstorming to develop possible courses of action, and the investigation of institutional misconduct regulations and procedures might be the most valuable elements of the discussion. For instance, some may realize that it is not clear that Hogan needs to be directly involved in the accusation of misconduct at all. If Simpson publishes the book with the plagiarized material, then the author who was plagiarized could make the accusation, rather than Hogan. She need only make him/her aware of it, and that could even be done indirectly.

## Question 2

Here we are asked to consider the conflict between Rodriguez's obligation to honor Hogan's request for confidentiality, and Rodriguez's obligation to her institution and the scientific community to report Simpson's plagiarism. As a faculty member and a member of the scientific community, Rodriguez has a responsibility to see that probable misconduct is reported to the proper authorities, but that does not have to be done immediately. It does not seem likely that the plagiarism will result in immediate, serious harm to anyone if it continues to go unreported for a while longer, and Rodriguez, like Hogan, needs to take time to learn about the facts of the situation and the local regulations, and to consider her options. She might even want to talk to a faculty friend in Simpson's department to sound out the situation there. Barring the risk of immediate harm to others, it is important that Rodriguez give Hogan time to develop her own plan for reporting the plagiarism, both because of her promise to Hogan to keep it confidential and because knowledge of the breached confidence would deter other students from seeking necessary advice in delicate matters. Thus, Rodriguez needs to respect Hogan's wish to develop her own plan for making the accusation, but Rodriguez does have an obligation to be sure that an accusation is made in a reasonable amount of time if the evidence for plagiarism is sound. A way needs to be found to make Simpson accountable while minimizing the possible harm to Hogan and herself, perhaps by having the accusation come from someone outside their institution.

## Question 3

Some might argue that untruthful answers are never morally justified, but in this situation Hogan's untruthful response to the chair's question may be her best course of action, considering the possible consequences. However, that does not mean that Hogan has no responsibilities toward other graduate students, the academic community, or Simpson. Rather, it means that she may be able to fulfill those obligations through actions that pose less risk to herself.

## Question 4

Many scientists believe that it is possible to have a successful mentoring relationship with a faculty member outside one's department or discipline. In discussions of mentoring with

graduate students, I am learning of an increasing number of such successful pairings, particularly among students who have more than one mentor.

### Questions 5 and 6

As written, the case indicates that Simpson's plagiarism leads Hogan to decide that she cannot continue to be advised by a person who knowingly engages in such unprofessional conduct. However, an adviser could engage in other types of unprofessional behavior that might make the continued relationship impossible for the student. These questions ask what a student could and should do in such a situation.

There are many reasons why the relationship between a student and his/her research adviser might go sour, short of unprofessional behavior. However, the basic advice is the same for almost all situations: Try to resolve the situation through improved communication and/or changes in procedures; if not, change advisers as soon as possible. What varies from situation to situation is whether the student should report the unprofessional conduct by the adviser, and to whom the report should be made. If the behavior is likely to be repeated with other graduate students and to have a deleterious effect on them as well, then the student has some obligation to report the behavior and so attempt to protect others. The report might be made to the graduate studies director of the department, the departmental chair, or some other senior faculty member who would have the standing to do something to change the adviser's behavior. Alternatively, a student might go to the university's graduate school administration, an advocacy office, or an ombudsperson, if one exists.

As discussed in the comments on Question 1, it is important to consider the person to be approached, the timing and the form of the complaint when projecting possible consequences and determining the best course of action. There is always the danger that the student, especially if she is a woman, will be viewed as a whiner and/or not tough enough for the academic world. The manner in which the complaint is made needs to be carefully considered to ensure that it is a factual report of observed incidents and not a formless recitation of grievances. In some cases it may be best to switch advisers first and report the unprofessional behavior later.

### Question 7

I think that most will agree that Simpson is not qualified to train graduate students to become professionals in the field if he knowingly engages in plagiarism and thinks of it as typical behavior. The more interesting discussion would concern whether his behavior toward Hogan while her adviser would make him unsuitable to advise any graduate student. What are the minimal qualifications for an adviser? How can we help adequate advisers become great advisers?

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## 2.3 Commentary on “Preliminary Data”

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This brief case includes more issues for discussion than might appear at first sight. First, it usefully draws attention to issues about the status of data that are seldom discussed. From past work on sharing data, we have learned how conventions affect what counts as data.<sup>1</sup> By bringing preliminary data to the foreground, this case raises questions about conventions for ranking data as preliminary and for presenting data in a range of contexts. Second, the case shows some of the complexity associated with identifying and dealing with misconduct in science. With its ambiguities relating to the appropriateness of the conduct of the lab director, the case presents some of the subtleties associated with identifying misconduct. Accordingly, it underlines the importance of providing explicit education in research ethics to graduate students. Third, the case highlights an important problem in the relationship between a lab director and his student when the student is progressing well and shows initiative.

What criteria should determine whether data are counted as "preliminary"? How should preliminary data be presented, and in what contexts are the data appropriate? These are questions raised by this case. It is not obvious that they can be answered globally for application to all research environments, but they must be answered locally and, specifically, for the research environment in this case. Centering on the lab director's handling of the graduate student's data in a proposal, the case is designed to address issues about misconduct in science. Because of ambiguities in the situation, it is not clear whether the lab director's treatment of the student's data is unethical. However, there are obviously serious enough problems in communication of ethical standards, laboratory policies and accepted investigative practices to have led the graduate student to suspect misconduct.

As a second year graduate student, Penelope Brighton is a relative newcomer to the world of scientific research. As far as we know, she has not had experience in other labs, unless perhaps in rotating through labs in her first year of graduate study. It does not appear that Brighton has had the advantage of an orientation to issues of scientific research ethics. So she is unprepared for considering her lab director's use of her data in the light of well and justifiably accepted practices. Dr. David Gilligan, the lab director and apparently director of Brighton's thesis research, is a "highly productive, well-published, respected investigator whose students receive prestigious post-docs." With these qualifications, he seems ideal for heading a lab and directing thesis research. Indeed, Brighton seems to be making swift progress in her graduate studies, for in her first, quick experiments as part of her thesis work she has come up with potentially interesting results that excite Gilligan.

He thinks enough of her work to use her results as preliminary data in a grant proposal he is writing. Lacking information about any conversations between Gilligan and Brighton regarding Brighton's following up the initial experiments, we do not know whether she has proceeded to follow up with in-depth, well-controlled experiments on her own initiative. Nor do we know whether Gilligan is even aware that Brighton is moving ahead and making changes in several experimental conditions. If she has proceeded on her own unbeknownst to Gilligan, he has justification for including only her earlier, cruder data and for referring to it as preliminary. Timing is a key consideration, for Gilligan must submit the proposal within a short time and may justifiably judge that there is not enough time to carry out and validate further experiments. Funding agencies depend on well proven investigators to judge in the light of accepted standards when data should be considered preliminary and yet worth presenting.

Brighton manages to complete additional, more refined experiments before Gilligan actually submits the proposal. With changes in experimental conditions to eliminate certain staining, Brighton gets results that do not look like the results from her earlier, cruder experiments. The new results tend not to fit the hypothesis that she and Gilligan had formulated from the earlier experiments. Confident that her new data are reliable, Brighton concludes that the characterization of the protein, which is the aim of her experiments, "may not be as straightforward as originally expected." Apparently Gilligan does not have time to examine Brighton's new results carefully. He may judge that he can nevertheless trust his earlier excitement over Brighton's initial data, believing that she is on her way to interesting results.

To Brighton's dismay, she cannot interest Gilligan in putting her new results in the proposal. He says he must get the grant application out the door and "will deal with the staining details later." For the proposal, he asks Brighton to supply a figure using one of the cells that fits their hypothesis. The figure appears in the proposal, apparently with no mention of the additional data that would make it appear to be an atypical result. According to the author of the case, Gilligan suggests that all of the data completely support the hypothesis. Whether he makes this suggestion merely by omitting the additional data or by explicit statement, we do not know. If he states in the proposal that all the data support their hypothesis, his action is more open to objection than if he simply omits the later data. Given the time constraint, Gilligan could justifiably decide on a cut-off point after which he excludes data that he has not examined in detail.

When Brighton reads the grant she is shocked by the "spin" Gilligan has given the data. In discussing the draft with Gilligan, she stresses that most of the data do not agree with their hypothesis. It is noteworthy that Gilligan has given the draft to Brighton to read and that he

discusses it with her. Perhaps he does not allow enough discussion, but he does not use his power to shut her out and deprive her of an opportunity to speak her mind about the use of her data in the proposal. Gilligan's defense of including only Brighton's earlier data is worth examining.

His remark that standards for presenting data as preliminary results in a grant application are less stringent than those for publishing data in a journal article may be read in two different ways. If his point is that preliminary data in a grant application are not required to meet the same standards of reliability as data not identified as preliminary in a journal article, his comment is defensible. It points to complexities in the legitimate use of data in different contexts. If the remark refers to data identified as preliminary in both contexts, then Gilligan owes Brighton an explanation to account for the difference. It is more likely that he intends the first reading.

Gilligan argues that it is better, presumably prudentially better, to present the data his way. This response is not necessarily ethically objectionable. The crude data, labeled "preliminary," had excited him, a highly competent investigator. He might reasonably expect reviewers to be similarly excited. There is no evidence in the case that Gilligan has asked Brighton for the follow-up experiments intending to include them in the "preliminary" data. So we do not have a basis for judging that he excludes her data because the results do not support their hypothesis. As noted earlier, follow-up and checking of new results would take time when time is short. Rushing the process might leave them with results no longer reasonably described as preliminary, but without enough data and time to suitably revise the hypothesis. Better not to complicate the proposal with new data Brighton has managed to produce, when, as it appears, the new data have not been scrutinized for reliability and time is too short for that effort. Gilligan judges that it is a better strategy for winning funding not to mention the later findings; they might create doubt among the grant reviewers.

If Gilligan has convincing evidence that their hypothesis lacks support, his action is ethically objectionable. That Brighton is confident of her results does not show that Gilligan has convincing evidence of that kind. Brighton's view of Gilligan's conduct appears to be colored by her confidence in her new results. Yet even she concludes only that the characterization of the protein may not be as straightforward as originally expected. Unless Gilligan has clearly implied or explicitly indicated in the proposal that characterization of the protein will be straightforward, he is not misleading the reviewers. The path from preliminary, exciting data to ultimate findings is often not straightforward. Experienced investigators expect surprises that may complicate matters. Unexpected findings can add to the interest and illumination of experimental work.

This interpretation of the situation is reasonable on the basis of information in the case. Access to the proposal might put a different light on the situation, and it may be that Gilligan uses the time constraint as an excuse to simplify the proposal submission. Perhaps he avoids examining data that he suspects to be strong, but complicating. To the extent that he has reason to be skeptical of the hypothesis in the proposal and presents it without qualification, his conduct is ethically objectionable. He also takes a chance of being wrong and having to deal with the consequences.

In any event, Brighton should try to find others more experienced in this or other labs with whom to discuss her concerns. She needs to test her reactions against the responses of others. An especially good resource would be an individual or office in the university involved with research ethics, because Brighton needs a sound basis for assessing other scientists' reactions. It might be a good move for Brighton to initiate a conversation with Gilligan about dealing with the staining details, for Gilligan has committed himself to addressing those details

after sending off the proposal. She will have an opportunity to ask more questions about the proposal submission and his use of her data. From that conversation Brighton should get a better sense of Gilligan's reasons for his handling of her data in the proposal. She should learn how he will deal with her unexpected, complicating findings. As an outcome, she should have a better sense of whether Gilligan is to be trusted.

If in the end, she is convinced that he has handled her data unethically in the proposal, she must take some kind of action because she cannot continue to work under someone she believes to be unworthy of her trust. To extricate herself, she must begin by seeking advice from a person or an office she can trust to take a balanced view of her situation. On the information in this case, Brighton does not have enough evidence to raise an issue of serious wrongdoing. She has reason to try to stimulate discussion of the use of preliminary data in grant proposals and what should count as preliminary data. Also worth discussing is the question of how well supported a result must be before it is presented in various settings, a seminar in the lab, in another university, in a meeting abstract, in a progress report for the department or in a published paper. Appropriate settings for such discussions would be lab meetings, graduate student gatherings, research ethics seminars or the like.

For responsible reporting of results, it is essential to explain fully and honestly the experimental basis and to make no claim to have reported all the data when withholding data. It is not clear that Gilligan has violated these strictures. If he has, he has acted unethically. And he has also failed to model ethical standards in a kind of situation that is critical for educating graduate students in research ethics.

## Footnotes

- [1](#) Weil, V., and Hollander, R. "Sharing Data. Scientific Data II: Normative Issues," IRB: A Review of Human Subjects Research 12 (No. 2, March/April 1990): 7-8, reprinted as "Normative Issues in Data Sharing" in Joan E. Sieber, ed., *Sharing Social Science Data*. Newberry Park: Sage Publications, 1991, pp. 151-56.

## 2.4 Commentary on "Student Publishes"

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Stevens's experience suggests that this graduate department puts a premium on graduate students' publishing work before finishing their PhDs. The department does not ensure that students are familiar with conventions and procedures governing publishing in this field, however. It is careless, if not unfair, to encourage students to publish while failing to give them an appreciation of publication practices and standards.

Cordage's supervision of Steven's first paper is irresponsible. Limiting himself to one student (Stevens) because of his responsibilities as department chair, Cordage owes him the same careful attention owed any student. Evidently, Cordage does not look carefully at Stevens's first paper before encouraging him to submit it to an obscure journal. When Cordage belatedly gets around to studying the paper, he realizes that it merits publication in a more prestigious journal. Omitting to inform Stevens of his discovery, Cordage revises the paper on his own and submits it for publication in a well-regarded journal, without the student's knowledge. His actions in excluding the student from the revision process and taking over the student's work are indefensible. This action is not only an abuse of power. Cordage also denies Stevens an excellent opportunity to learn how to prepare a paper for publication in a highly ranked journal and to learn conventions of publishing in the materials science field. In a gesture that reflects an image of his student as a mere subordinate rather than a budding colleague, Cordage informs the student only when the paper is accepted - not in person, but by email.

Understandably, Cordage's action leaves Stevens confused and disturbed. Do Cordage's actions amount to publishing the same paper twice? Is it legitimate to do that? Having been excluded from the revision process, Stevens is reluctant to raise such questions with Cordage, fearful of "making waves." Seeing nowhere to turn for answers to his questions, Stevens does nothing. His puzzlement and timidity about asking questions show the damage from Cordage's high-handed treatment of him with respect to the second submission.

Stevens does not forget the incident. Months later, he is dismayed to discover that Cordage's publishing record contains a large fraction of papers published once in conference proceedings and once in a journal. Now Stevens must confront the issue, in all likelihood, even more stymied about what to think and where to turn. Unless he has relationships with other senior members of the department or someone trustworthy and knowledgeable outside the department, he has no choice but to raise his questions with Cordage. He could prepare by seeking advice from someone knowledgeable in a research office or ethics center, for example, about how to raise his questions in a tactful way, seeking information and guidance without judging prematurely.

Because the questions that disturb Stevens concern issues of importance for the responsible conduct of science and require careful consideration, it is unfortunate that Stevens feels blocked from raising them with his adviser. Discussion might have brought out justification for publishing the second version of Stevens's own paper. If the work merits greater visibility, publishing the second version can be ethically justifiable so long as the prior publication is acknowledged. That is so despite the fact that the second version is a result of Cordage's scanty attention to the first version. Investigators can have good reasons for republishing work (for example, when they make changes in interpretation). These are matters to be aired in graduate departments and research groups. Questions about what makes papers the same or different and how different they must be to count as distinct should also generate worthwhile and interesting discussions in departments and research groups. Lacking information about Cordage's "duplicate" publications, we cannot say whether they were justified or not. Assuredly, the later publication should acknowledge the earlier one.

Interdisciplinary research raises additional issues because the findings may be of interest to quite distinct audiences, each associated with a different journal or set of journals. Members of interdisciplinary collaborations should anticipate this issue and should agree - before problems come to the fore - on publication arrangements that can be publicly defended if they are not

already compatible with journals' policies. Again, prior publication or publication in other venues should be acknowledged. That is required not only to prevent underhanded dealing but also to guide other investigators and readers to other versions of or perspectives on the findings.

Cordage's supervision of his graduate student cannot be defended, ethically speaking. It appears that a case can be made to justify publishing Stevens's work a second time in a well-regarded journal. As to Cordage's publication record, we do not have enough information to pass judgment. However, the practices it reflects should be a matter of open discussion in the department.

## 2.5 Commentary on "Making the Grade"

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This interesting and rich scenario raises two primary issues:

1. Did Jihvraj and Brady use an appropriate procedure to punish the graduate student?
2. Did the graduate student deserve to be punished?

Any university that allows its faculty to impose sanctions on students for academic dishonesty without going through a judicial process is morally corrupt and legally on very dangerous ground. One of the hallmarks of our legal system and Western morality is that all people are to be treated equally unless there are justifiable reasons for doing otherwise. Ideally, a transgression by one is treated exactly like that of any other, regardless of wealth, race, status or any other irrelevant characteristic. When a university allows its faculty to decide on their own what penalties are to be imposed, it is saying in effect that it does not care that all students be treated equally and with justice.

Second, the university is in shaky legal territory when it allows individuals to impose sanctions. Any student who receives sanctions should be able to seek redress in a court of law. The student's legal argument would be that the sanctions imposed by professors are arbitrary. To show that they are not, the university would have to prove that similar transgressions resulted in similar sanctions, which they could not do because they would have no record of the results of academic irregularities. Legally speaking, the university would be placing itself and its professors in harm's way.

So the answer to the first question is that the procedure used by Jihvraj and Brady was not appropriate - not because the two professors did not want to do the right thing, but rather because their university failed them.

The second question is an interesting one. Should the graduate student deserve to be punished at all if he honestly did not know that his behavior was inappropriate in the context of an American university?

Once again we must look to common law, that wonderful living legacy from England that still guides our jurisprudence. In common law, not only are all penalties to be just, but penalties are to be imposed for wrongs even if the perpetrator did not know that he or she was committing an unlawful act. If I drive along a highway at 60 m.p.h. and get pulled over for speeding in a 35 m.p.h. zone, I cannot plead that I did not know the speed limit. If the police can show me a speed limit sign that I should have seen, then my ignorance does not mitigate my wrongful act.

Plagiarism, and writing research papers based on others' work, are clearly a fuzzy area. What do we consider acceptable behavior, and what do we consider inappropriate? In this country, we agree that we can take a word, phrase, or even a paragraph from another publication and use it in our own work as long as we clearly indicate its source and original author. But suppose we change the rule to read that we could take whatever we wanted from another publication as long as we gave general credit in the bibliography at the conclusion of the paper. Would this strategy not be just as workable? Yes, it might lead to students copying entire papers or large chunks of papers and pasting them together, but the students' papers would then be judged on the basis of their ability to assimilate the works of several authors and to produce a seamless document that makes sense and presses a point of view. Students would want to do a lot of editing in tense, voice and vocabulary to produce such a paper, which are skills many professional editors value. Why, then, do American universities consider this behavior wrong? We must conclude that taking large sections of other works and synthesizing them into a cohesive document is not by itself an immoral activity. We are not breaking any moral rules by using such sections.

So the graduate student in our scenario might have been perfectly justified in arguing that he did not do anything immoral. The problem is, of course, that he was still going 60 m.p.h. in a 35 m.p.h. speed zone. He is enrolled in an American university, and he has had ample opportunity to learn the rules. If, as in this scenario, he has an M.D. and is a well-read and intelligent person, there should be no excuse for ignorance.

There is, of course, the question of the university's role in helping its graduate students (particularly graduate students from overseas) to understand the rules of academic conduct. Given the first part of this scenario, it might seem that this particular university has failed to prevent such problems. If I were Jihvraj and Brady, I would definitely start looking for a new job.

### **3.1 Commentary on "Informal Discussions/Formal Authority"**

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This case demonstrates very well how the vagueness and uncertainty of conventions on credit and ownership create subtle but complex problems in the practice of science. Part 2 illustrates the subtleties of the authority relationship between student and professor and how this relationship exacerbates issues of credit and ownership.

Questions about the behavior of Professor Black and Sean can be raised at each stage in the case description. For Professor Black, there seem to be two important questions: 1) Was he wrong to talk to Sean initially? That is, was it inappropriate for him to use Sean as a sounding board? and 2) Was it wrong for him to use Sean's ideas in the article he was co-writing with Dr. Hong?

In principle, neither type of behavior seems problematic. A professor talking out the interpretation of data with a student seems an ideal situation for student learning and training. The student sees how a professor thinks through a problem and gains practice by participating in the activity. Moreover, if the ideas that Sean had suggested to Professor Black had been published by someone else (ideas that Professor Black had unaware of), then there would be no problem here. Sean simply would have assisted Professor Black by pointing him to ideas and literature already published. We would assume that Professor Black could then read up on the ideas and make use of them in writing the paper.

A problem arises because the case description indicates that Sean's interpretation has not been published, and that Sean plans to present it in his thesis and, presumably, eventually publish it. Publication will establish his role in the development of an important idea. The case contains a degree of ambiguity about the status of Sean's contribution. He has both given Professor Black articles that point in a certain direction and shown him a model he has developed, which, we gather, goes beyond the literature. However, it is unclear whether Professor Black is using one or both of these contributions. Simply using (and citing) the articles provided by Sean would not justify co-authorship, while using a model developed by Sean would seem to justify including him as a co-author. Nevertheless, it may be quite realistic to pose a case in which this issue is unclear, for it is often difficult to distinguish the original part of a new idea from what has been suggested in the literature but not yet pulled together into an articulated theory or model.

Sean's behavior does not appear to be morally questionable. On the contrary, he has been open with his ideas, willing to assist and to share what he knows. This type of behavior has traditionally been highly valued in science. The most important goal is generally thought to be furthering knowledge; giving and getting credit is a means to this end, not an end in itself. Given what happens in the case, we might say that strategically Sean should have held back some of his ideas, but that is to say what might have been better for Sean and his career; it is not to say that his behavior was immoral.

Another major question about Professor Black's behavior is whether he was wrong to leave the decision on co-authorship up to Sean. Here I think Professor Black is wrong. In leaving the matter up to Sean, he is saying, in effect, that he has no concerns about or responsibility for standards of authorship and credit in science. He is refusing to deal with these issues in his own work. That is a double wrong: It is a refusal to accept responsibility for his own behavior, and it is wrong because Dr. Black's behavior serves as a model for Sean. In effect, he is telling Sean that scientists can treat authorship and credit in a cavalier (almost reckless) manner.

Professor Black and Sean have at least three options in dealing with this situation. 1) The specific claim of Sean's thesis can be removed from the paper. The case does not give us enough detail to know whether that is possible without ruining the paper. Could it be written in a way that points in the direction of Sean's thesis but doesn't scoop it? in a way that draws on the literature, but not Sean's model? 2) Sean's work could be cited in the paper and described as a forthcoming and extremely promising thesis. 3) Sean could be made a co-author of the paper.

It is difficult to decide which of these three options should be chosen without more details. For example, would co-authorship of the paper hurt or help Sean in defending his thesis and publishing it in the future? To what extent are the ideas Professor Black has used already in the literature?

In any case, Sean should be asked for permission to use anything that might have implications for his thesis or future publications. Whether or not he should be made co-author depends on what he agrees to and what is actually published. Professor Black should take responsibility for the final decision. Moreover, if the situation continues to be gray, Professor Black ought to err on the side of giving credit and/or authorship.

## 3.2 Commentary on "When in Rome: Conventions in Assignment of Authorship"

*Vivian Weil*

*Illinois Institute of Technology*

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This case is distinctive in raising questions about how to interpret international standards in a local setting. Observers from outside science often assume that there are transnational norms that bind scientists into a single international community. It may be reasonable to claim that there is an international system of scientific research, but standards or norms that are recognized across research communities -- even in this country -- are notoriously difficult to identify. The Vancouver Convention offers a nice example of internationally agreed-upon standards that cover more than 500 medical journals. For considering how general standards should guide conduct in particular situations, the Convention, therefore, is a good choice.

But, of course, in the complexity of circumstances, other issues arise as well. One is the responsibility of Charles's adviser, who is absent from the account. Another is the obligation of the host adviser, Dr. Williams, to orient his intern, Charles, to his lab and explain their local practices, which he himself contrasts to "Western" practices. A third issue is the responsibility of graduate students to seek information about the practices and norms that prevail in the research groups where they work.

Charles seems to have shown initiative in arranging the internship on his own. His adviser, however, must have recommended him to Williams or approved the arrangement, if only passively. It appears that she did not have a conversation with Charles to prepare him for another research setting, or at least alert him to the need to find out at the start the ground rules in Williams's lab. Charles seems caught up in the prospect of proximity to the "great scientist"; he would have benefited from preparation for the concrete realities of another lab. Apparently, his prior experience as a graduate student had not prepared Charles to be alert to local procedures and social relationships in the lab. Charles bears some responsibility for his naivete. Students should not move passively through graduate study, taking little notice of the social environment and failing to ask questions. When so much depends on personal relationships, students cannot

afford to exclude them from their purview. In their later careers as scientists, they will need to help manage relationships in research groups.

Williams is at fault for leaving Charles to learn the ground rules in his lab by unsettling experience. The disagreement was avoidable. At a minimum, Williams should have explained local expectations with regard to recognition, authorship and publishing. When Williams says, "Naturally, I have circulated copies of the paper to each person for their comment and approval," he seems to be describing his usual practice, a convention in the lab. Why does he use the word "natural"? Perhaps he regards his practice as so clearly justified or so obvious that he does not realize it needs to be pointed out and explained. Such lack of awareness cannot be defended.

It is only at the juncture of their disagreement that Williams offers an explanation of his practices. Whether those practices meet the criteria of the Vancouver Convention is difficult for the reader to determine. Williams has an obligation to explain in detail how, in his view, the practices in his lab are in compliance. He is entitled to criticize the standards on the basis of local notions about the scientist as a group member, but when he submits articles to the journals governed by the Convention, he is ethically bound either to comply or to explain his deviation to the journal and seek approval. It is undermining to standards when a clear deviation on the part of a "noteworthy figure" is recognized and tolerated. That Williams believes his practice is superior to the standards does not justify deviation from standards that capture a reasonable understanding of authorship.

However, the notion of "substantial contribution" is an open concept that can generate honest disagreement. An explicit local policy about what ranks as a "substantial contribution," formulated with examples, should help to produce reasonable consistency and reduce disagreement in the research group. The frequency of disputes about ideas being stolen or given away attests to the interdependence Williams mentions. That interdependence makes it necessary to formulate and justify ground rules, wherever the lab is located.

### 3.3 Commentary on "Friendship vs. Authorship"

*Vivian Weil*

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The lab or research group is the setting for many, if not most, of the cases in research ethics. To avoid problems highlighted in the cases and to promote predictability and fairness, leaders of research groups need to make policies explicit and discuss their rationales. Among the specific arrangements that policies must address are collaborations, in all the variations that can occur within research groups. However, as this case illustrates, collaborations can encompass other contexts that are beyond the scope of the research group's policies, indeed are not covered by any explicit policies. Nevertheless, certain principles -openness, explicitness, honesty, fairness and consistency - that underlie appropriate policies within research groups should carry over to other contexts.

In this case, Dr. Jane McDonald and Dr. David Woodford, professors at two different universities, have agreed to collaborate on a research survey for a professional association of

which both are members. Previously together as graduate students, they are now good friends. Since there is no mention of funding, it seems reasonable to assume that the professional association does not provide significant funding for the survey. The two professors have agreed to respond to their professional association's request for help, thinking it would be fun. Evidently Jane offers to handle the logistics, with the idea she can get help from a graduate student if necessary.

In due course, Jane enlists the help of a new graduate student, Mark, but apparently without initiating a conversation about authorship. If she has not already oriented this student to her policies regarding authorship, it is time to begin when she approaches him for help on a project that will lead to a paper. She should also inform the student about the authorship arrangement she has made with David, even though he is not a member of their research group. Explanation of her authorship policies would fit very naturally with information about how she and David plan to divide the work.

Jane should realize that Mark may be too diffident, or may not know enough, to ask about authorship. Flattered to be chosen to participate, he probably does not think about how one gets appropriate credit or even consider whether he will find the work itself interesting. This situation is a template of a not uncommon experience for graduate students. Advisers and research group leaders should be alert to the possibility of causing reactions like Mark's, which make it all too easy for senior investigators to take advantage of graduate students.

As far as we can tell, Mark completes his tasks in timely fashion. Apparently, Jane cannot count on David to come through with his analysis and final report in time for her to present them at an upcoming conference. She, therefore, enlists Mark to perform the data analysis and produce the final report. To be accurate, honest and fair in her conference presentation, Jane should acknowledge Mark's work. She would deceive her audience if she led or allowed them to believe that she performed the data analysis and produced the final report herself.

It appears that Mark has completed most, if not all, of the work to which Jane had committed herself and has completed David's share as well. Before proceeding with the paper, Jane has a duty to review the authorship agreement with David and with Mark. The division of labor has not turned out as planned, which is not unusual. The changes require modification of the original agreement between Jane and David regarding authorship. If David does not contribute to producing the paper, there is no basis for including him as an author. David should be fully informed about Mark's handling the logistical aspects and stepping in to perform the data analysis and prepare the final report as well. If David is available for advice and consultation while Jane prepares the paper, she can add an acknowledgment regarding his support.

Jane and David should have learned such practices for dealing with authorship and giving credit when they were graduate students together. Moreover, Jane should be aware that by her conduct she conveys to her students standards for research and authorship in her field, not least in undertaking research for her professional association.

Jane's treatment of Mark in connection with writing the final paper, as described in the case, is inexcusable. She invites him to collaborate in writing the final paper, he agrees, and then she writes it alone in a two-month period, without informing him about what she is doing. If she is under an unanticipated time constraint and concludes that collaboration will take too long, she is obligated to let Mark know. Surely there is time for that. Perhaps Jane has made the invitation out of a momentary sense of indebtedness. Ethically speaking, she cannot use the invitation as a way of thanking Mark. Because Jane has led Mark to expect that he will be involved in writing

the paper, she must follow through with collaboration or inform Mark why she cannot. She has a moral duty to respect his interests and must not use him merely as a means to her own ends.

Is Jane merely careless and not well organized? Does she have a problem with being forthright when she has to deal with developments that may disappoint colleagues or students? We do not know the answers to these questions. In any case, these are personal traits that interfere with responsible dealings with colleagues and students, causing avoidable harm, especially to students not in a position to defend their interests.

Can Mark be faulted for not raising questions and looking out for his interests along the way? After completing work on the logistics, Mark is entitled to ask whether he will receive some kind of credit - an acknowledgement, perhaps. After another two weeks or so devoted to data analysis and preparation of the final report, Mark should have questions about criteria for authorship, and he should feel justified in raising them. By this point, he should have a sense of the importance of credit and authorship, and he should not be diffident. Graduate students should not remain passive, expecting others to look out for their interests. We should note, however, that first year students often need prompting or support to ask the questions they need to have answered.

The title of this case, "Friendship vs. Authorship," suggests that the author views Jane's failure to revise the authorship assignment as attributable to Jane's relationship with David. As noted above, Jane has no justification for listing David as an author. Even if David is unaware of Mark's contributions, he should not accept listing as an author. David knows how little he contributed to producing the paper. When colleagues who are friends list each other as co-authors on papers without actually collaborating, both are culpable. Such behavior corrupts the process and does damage to any who are unjustifiably denied authorship. When the behavior comes to light, it provokes resentment and fosters cynicism.

This case shows how damaging unethical handling of authorship can be. The graduate student does not get appropriate credit for his contribution. Finding himself listed as third author though playing no part in the writing process, he is likely to be confused about what authorship signifies. Moreover, he undoubtedly realizes that he has come up with publishable findings that he cannot now publish. As the author of the case and commentary suggests, the best way for students to extract something positive from such predicaments is "to take responsibility for becoming informed about how best to handle issues of authorship in the future."

### 3.4 Commentary on "The Temporary Post-Doc"

*Karen Muskavitch*

*Indiana University*

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#### Case Overview

An initial reading of this case might lead one see it as "simply" a case dealing with the issue of authorship. However, further reflection reveals that it hinges on the larger issue of the system of responsibility and reward in the laboratory, and how this system is communicated to and understood by all the laboratory members, including the PI. At an even more basic level, the essence of the problem here is a lack of communication.

In discussing the case, it would be very instructive to spend some time exploring the relevant obligations of all the major characters, and if, and how, the fulfillment of these obligations should be linked to rewards such as authorship. For instance, Smith had an obligation to carry out and document careful research that others could build on, and Johnson had a responsibility to supervise Smith's work and to review his results. Both failed in their responsibilities. Now we are asked to determine what happens to the reward, authorship. In Part 2, Johnson asserts that by failing to fulfill his obligation to the lab, Smith has given up his right to a co-authorship.

The responsibility-reward system will vary from lab to lab, yet is central to the scientific enterprise. In the discussion of this case, it will be thought-provoking to have participants share the systems in their labs, if they even know them, and then discuss what the linkage should be.

Another interesting aspect of this case is that a graduate student, Jill Green, has been put in the middle of a dispute over appropriate attribution for another's work. My experience indicates that this occurrence is not infrequent, but it is one that we do not usually discuss. A brain-storming session on what Jill might do, followed by an evaluation of the probable consequences of each suggestion, would be very valuable to graduate students who may find themselves in such a situation in the future. Green has an obligation to communicate honestly with all involved, but she must be savvy enough to do so without harming herself.

The case presents some ambiguous aspects that are interesting to play with. I list a few below.

How novel was the reagent the Smith said he used? What was the probability that any similarly trained chemist would have tried the same reagent? Was it likely that Green would have come up with the idea on her own, and Smith's only contribution was to save her time?

What type of information should Smith have had to "back up his claim?" How much is enough? What are the criteria? Who makes the determination? Where is Smith now employed? Did he get the job based on a recommendation from Johnson? Is Smith doing research similar to that done in Johnson's lab? Is he in an academic position, possibly training graduate students?

Green noted that "Smith's experimental procedures were poorly written" and that "it was not possible to duplicate his work." Was this problem just sloppiness, or was it sloppiness that crossed the line into negligence by a man who claimed to be a professional scientist? Was there any indication of fraud? How would and should the determination of sloppiness vs. negligence vs. fraud affect the evaluation of other aspects of this case?

In this research group, would a temporary post-doc have been considered an employee or a colleague? It could have been a research group associated with a chemical company at which Green was doing her research and at which Smith was employed. If it was an academic research group, did Smith sign a release form concerning patents?

## Discussion Questions

### Phase 1

Question 1. Johnson and Green should have informed Smith of Green's results and their submission of the manuscript not because it is mandated by some professional code, but just as a matter of common courtesy to a colleague, even if he could have been considered an employee. Science depends on communication in all modes, not just the formal, published paper. Avoiding communicating with Smith may have seemed the easiest thing to do in the short run, but it can lead to more unpleasant consequences in the long run and is disrespectful of Smith as a person. If Smith had been listed as a co-author on the paper, he must be contacted. Authorship involves acceptance of responsibility for the contents of the paper, and Smith must be able to choose whether he will take on this responsibility.

Question 2. Smith's contribution could have been acknowledged in a variety of ways other than a co-authorship. Generally today, authorship represents recognition for a significant intellectual contribution to the published work. Some other possible modes of attribution are an acknowledgment, a footnote or a citation as an unpublished result. The criteria for these other forms of attribution are no more clearly formulated than is the definition of a significant contribution, and to make matters worse they vary from lab to lab, and from discipline to discipline. It may be useful to check the instructions to authors for a number of prominent journals in your field to see whether they provide guidelines. A comparative discussion of criteria and standard practice among the discussion participants will help everyone to look more critically at what they have accepted as the norm, and to consider what the criteria should be, and why.

Question 3. Without further information, it is not possible to determine whether Smith should have claimed to have solved the problem. One would need to know what items of documentation were in his notebooks and what the criteria for a solution were. However, among a focused group such as a research lab group or a class of beginning grad students, it would be very beneficial to discuss what sorts of documentation one should have, and how the monitoring of research progress should be carried out. In short, how could this problem have been avoided?

## Phase 2

Question 1. Answering this question takes us back to the issues addressed under Question 2 in Phase 1 and in the overview above: What did Smith contribute? What was its the significance of his contribution? What would be the appropriate attribution for what Smith did? Once some of the uncertainties have been clarified by arbitrarily defining a few of the variables in the case, one could begin to discuss the appropriate way to acknowledge his contributions.

For example, let us assume that: 1) The reagent was not one that just any chemist would have thought to try in this situation, but it was not completely unknown. 2) Smith's notes were almost illegible, and included only one NMR analysis run on the products of the critical reaction, but it didn't look as if he had falsified or fabricated anything in his notes. In this situation, I would conclude that Smith's contribution, while not significant enough to warrant an authorship, does require some form of acknowledgment, probably in the form of an acknowledgment at the end of the paper.

Question 2. One might not expect a patent lawyer to raise ethical arguments. However, it would be a good idea to raise the issue of patents, particularly in the field of chemistry. What arguments could be made for including Dr. Smith on the patent?

Notice that in the text of the case, Johnson seems reluctant to acknowledge Smith in any way partly because he feels it would obligate him to include Smith on a patent application. I doubt that that would be the case, but many people worry unnecessarily about the ramifications of their actions on the distribution of royalties from possible patents. Practice concerning patents has varied with time and institution; it is best to consult with those concerned with patents to determine the relevant policy is. Researchers should have some basic information about this issue. In fact, this case provides an excellent opportunity to ask an official who deals with patents to join the discussion.

In either a commercial company or an academic university, the institution is the entity that makes the patent application. Scientists may share in the royalties, depending on the practice of the institution. It is my experience that university scientists sign patent waivers along with other employment papers when they start work; I have observed quite a bit of variation among heads of laboratories in the royalties distribution concerning inclusion of graduate students and post-docs who worked on the project. It is not unusual for the royalties to be split between the PI and the university. Many PIs feel that they have fulfilled their obligation to others in their labs if they use the royalties to fund further work in the lab.

With regard to the case involving Smith, Johnson and Green, it should be noted that patents are awarded for practical applications, not ideas. Thus, it is the tested machine or the process that is patented, not an unproven idea. Smith's contribution was, at best, an idea of a reagent to use; Green worked out the details of the reaction conditions. Smith does not have a good case for being included on the patent, but Green does.

Question 3. It is difficult for me to see how having Smith leave his place of employment and return to the lab would solve any of the problems in this case, unless he were being invited back to try to replicate results in his notebook and so prove that they were not fabricated. I suppose that one possible compromise that the parties in this case could have reached was to have Smith try to get the other reaction conditions written in his notes to work, document his results and then

have them included with Green's in a revised manuscript on which Smith would be a co-author. This strategy seems awkward, but possible.

It might be useful to change this question into a opportunity to brainstorm possible solutions to the problem as it now exists for Smith , Johnson and Green, and then to investigate the probable consequences of each.

### **3.5 Commentary on "Patent Authorship: Whose DNA Is It Anyway?"**

*Vivian Weil*

*Illinois Institute of Technology*

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This case highlights the issue of fairness in listing inventors on a patent application from an academic laboratory. However, concern about a professor's fairness in wielding power over a graduate student appears to shape the presentation of the situation, with the focus on the professor, his student and their relationship. Omitting any introduction to the laboratory setting, the narrative reflects the isolation of the professor/student relationship, as if no one else is present and there are no practices or policies to guide decisions about patenting.

Only one detail refers to the world outside the laboratory and this professor/student relationship: the fact that the experimental work is to identify genes associated with heart disease. The potential for contributing to understanding and treatment of heart disease provides a basis for considering - within the research group - broad policy questions about openness and accessibility of research results. Apparently, no such discussion has taken place before Glen, the professor, asks Sarah, one of his graduate students, to carry out additional experiments on a cDNA he has cloned. Sarah is to characterize fully the importance of Glen's discovery.

Initially, this work is not part of Sarah's doctoral thesis. We do not know whether Sarah had already started another project for her thesis that might be put at risk by the new assignment. There is no indication that Glen discussed with Sarah the relation of the new assignment to her doctoral thesis. Even if he believes, on the basis of her prior work, that she is likely to succeed with the new assignment and will not be delayed in finishing her doctoral work, Glen has a responsibility to discuss this matter with Sarah.

Fortunately, Sarah's commitment to a major three-year effort on this project proves to be productive. Her progress in characterizing the gene is substantial enough for Sarah and Glen to prepare a manuscript for submission to Nature. Neither the circumstances of submission nor the fate of the manuscript are mentioned again in Section 1. We do not know whether this omission indicates that the preparation of the manuscript is unproblematic or whether the writing of the paper is simply obscured by the patenting issues. It may be that procedures for manuscript preparation are better understood in this lab than policies and practices surrounding patenting, a relatively new option. That is not to say that there are no questions about Glen's management of authorship when in Section 2 he awards Sarah the position of first author on the paper.

Glen discusses with Sarah the commercial potential of the gene sequence she has helped to characterize, explains how he intends to patent the gene sequence through the university's technology transfer office, and speaks of the submission of "our patent." In this way, he leads her to expect to be included in the patent on the gene sequence. He seems to have offered no opening for a discussion of ethical issues associated with patenting. Although Sarah has "reservations" about the appropriateness of patenting her results, she is excited by the prospect of her first patent and keeps her reservations to herself. Her response is natural and unsurprising in view of her hard work over a long period and Glen's apparent comfort with patenting. Because reactions such as Sarah's are predictable, professors engaged in research with a potential for patenting have a responsibility to open discussion with graduate students about guidelines for patenting well before students become involved in the procedures. The occasion of transmitting oral or written guidelines concerning patent applications offers an opportunity to initiate discussion of ethical issues associated with patenting. It seems that Glen has not made a point of supplying guidelines, for Sarah has no knowledge of guidelines concerning patenting.

Professors engaged in research with potential for patenting have an ethical responsibility to give attention to patenting practices and policies: to formulate policies, to make sure that the policies are fair, that students are aware of the policies, and that students have an opportunity to consider the justification for patenting before they are drawn into the patenting process. Patenting should not be taken for granted as merely a component of scientific work like publishing. Since patenting confers proprietary control, it needs special justification. The patenting of discoveries related to human health has been an ethically controversial issue from the beginning of academics' efforts to patent their discoveries (early in the last century). Senior investigators should expect and entertain probing ethical questions from thoughtful students. They should themselves have considered the pros and cons and be able to explain them in discussion with students. To fail to discuss ethically debatable procedures is to fall short in the transmission of ethical standards in science.

The failure to discuss such ethically debatable matters has significance beyond the impact on graduate students like Sarah who find themselves going along with procedures despite qualms about the ethical defensibility of what they are doing. Such failures contribute to an environment in science of treating unresolved issues of consequence to the welfare of society as if consensus already exists. Acting in this way, scientists help to settle important, controversial questions in advance of or in the absence of public discussion. By the time members of the public learn of and react to such developments as the patenting of genes, the developments have acquired momentum not easy to halt or slow down.

Failure to discuss relevant questions within research groups issue from and contribute to a climate that distances scientists from the social impact of their work. When public debate does occur, often scientists are not inclined to enter in with thoughtful contributions. They frequently fall back on the claim that they have no special expertise about the public's concerns. Such responses can be disingenuous when scientists have overlooked their own responsibilities to discuss issues (such as gene patenting in this case) within their research groups. Prior discussion within research groups might allow scientists to develop insights useful to the public debate.

These considerations notwithstanding, the question remains of whether Sarah has an obligation to raise questions about the patent process and manuscript generation. Intimidating as the graduate student environment can sometimes be, students have some responsibility for their own education. They have to learn how to ask questions, of whom and when. Timidity with

respect to matters of appropriate behavior, particularly in the face of ethical doubts, has neither ethical nor prudential justification. Institutional policies may help to ensure that research groups in the institution have explicit policies and that students are informed about the policies. However, students, their professors and their institutions all have responsibility to see that students are adequately informed about patent policies and practices.

It is only after Sarah becomes more deeply involved in the patenting process by generating additional data and providing this material to the university's designated law office engaged in drafting the patent submission that she learns she is not included on the patent. Because the application represents her manuscript, she at last confronts Glen. He defends his decision to make himself sole inventor, but not by referring to a policy or a practice. Instead, he points out that he made the initial discovery, that Sarah will be allowed to put the results in her dissertation, and that she can be first author on the publication describing the gene. Should these points convince Sarah that Glen's decision is fair?

If Glen has spoken plainly to Sarah in referring to "our patent," he has misled her to expect to be included in the patent. He owes her an explanation, if not an apology. His use of Sarah's manuscript as the basis of the patent application no doubt heightens her expectations. It is remarkable that Sarah could become so essential to the patenting process without getting clear information about whether she is to be included as an inventor and without asking direct questions on that point. Glen should not have used her manuscript for the patent application without making clear the terms. Misleading Sarah and taking advantage of her subordinate position are ethically objectionable. As a matter of prudence, Sarah should not have proceeded on a tacit understanding, counting on certain "signs" that she would be included as an inventor. If there was an oral agreement between Glen and Sarah that she would be included, Glen is ethically in the wrong for breaking his promise.

Because Glen has not previously made Sarah aware of any policies concerning patenting, his justification for making himself sole inventor appears to be ad hoc. He has not given her a basis for thinking he would decide another case similarly. Since her work is essential to the patent application, she might think he would have come to a different decision if she had raised the issue earlier. Though Glen may not have made a convincing case for his decision, Sarah apparently drops the matter and places her reliance on carrying out additional successful research. Without informing Glen, she performs more experiments to identify the human form of the gene. After identifying another closely related gene, she presents the data to Glen and then to her thesis committee. Now Glen instructs her to include the new material and agrees to include her as an inventor in a revised patent.

The outcome for Sarah is not damaging insofar as she is included in the patent, she can include the findings in her dissertation, and she can be first author on a joint paper with Glen. Nevertheless, she has had a damaging experience in other respects. She has experienced ethically objectionable treatment from her professor, and she has been exposed to neglect of standards in science, including ethical standards, that could undermine high ethical aspirations and trust. The experience could leave her cynical or discouraged about a career in science.

There are significant efforts in a number of scientific disciplines associated with codes of ethics, and there is perhaps a growing interest in an international oath of ethical commitment by scientists. Nevertheless, in view of differences in local circumstances of research, conventions for awarding credit, authorship and inclusion in patents, among other matters, must remain relatively local. Principles such as those regarding authorship that have been promulgated by

consortia of journal editors should inform local policies and practices. Research groups, however, must devise and announce their own conventions, policies and practices.

This case shows the damage that can result from negligence with regard to establishing local policies governing patenting: The student is left unprotected from the power of a professor. If Glen had in the end refused Sarah co-inventor status, Sarah would have been without recourse unless she was lucky enough to be in a position to appeal to university policies, a university office for dealing with conflicts over authorship and patents, a sophisticated, diplomatic department chair or another senior person with local influence. In her own research group, policies that might protect graduate students' interests are lacking.

## References

1. For an account of earlier controversies about patenting in the domain of medicine and health, see Charles Weiner, "Patenting and Academic Research: Historical Case Studies," in V. Weil and J. Snapper, eds., *Owning Scientific and Technical Information: Value and Ethical Issues* (New Brunswick, N.J.: Rutgers University Press, 1989).
2. The Standing Committee on Responsibility and Ethics in Science (SCRES) of the International Council of Scientific Unions is conducting a project in 2000-2001 to gather and analyze scientists' codes of ethics from all over the world. The committee aims to determine empirically whether there is a common core of standards. The American Association for the Advancement of Science (AAAS) is sponsoring a session on an international ethical oath for scientists at its February 2001 meeting in San Francisco.

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## A Note:

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