Ownership of Knowledge and Graduate Education

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Part 1

Susan Moss is a third-year graduate student in the laboratory of Dr. Jocelyn Abrams, a successful and energetic researcher in a competitive field. Abrams has three post-doctoral fellows working in her laboratory, whom she relies on to train and assist her four graduate students. The laboratory holds weekly research meetings where people report their finished data and work in progress. Abrams stresses that the reports must be concise and focused primarily on finished work. Two days before Moss must deliver a research report, she tries to develop a model that describes a set of data, but she has difficulty synthesizing the information on her own. Because Abrams is often too busy to meet with Moss, she makes an appointment with one of the post-doctoral fellows, Jim Reynolds. Reynolds is very eager and helpful. Within an hour, Moss and Reynolds have worked out a reasonable model, and Moss presents a successful report.

Two weeks after meeting with Reynolds, Moss is asked to review a portion of a grant proposal written by Reynolds and Abrams. As she is reading, she realizes that several of the proposed experiments are ones she had mentioned to Reynolds as the next steps in completing her thesis research. Moss tells Reynolds that the proposed experiments are directly related to her thesis, but he maintains that the ideas were his and that they will not interfere with Moss's project. Moss believes that the ideas were hers and that they are vital to her project, so she makes an appointment with Abrams. Abrams listens to Moss's side of the story, but she says that she does not want to get involved in personal conflicts between people in the lab and that Moss will have to work things out with Reynolds on her own.

Discussion Questions

1. Does Abrams have a professional obligation to involve herself in the conflict between Reynolds and Moss?
2. Should either Reynolds or Moss have sole rights to the ideas generated from their conversation, or do the ideas belong to the laboratory as a whole?
3. What should Moss do to gain credit for her ideas? to determine whether she deserves credit for her ideas? to understand the perspectives of Abrams and Reynolds? Could or should she talk with someone else? If so, whom?

4. When do research ideas become part of the experimental process? at the conceptualization of individual experiments? at the design of specific protocols? at the execution of experiments?

Part 2

After Moss confronts Reynolds about the proposal, Reynolds responds by saying, "Yes, I agree that you helped generate the ideas in the proposal and we would love for you to work on some of the experiments. If you complete them and include them in your thesis, then you have contributed to the research goals of the lab. It doesn't really matter who thinks of the experiments or who does the experiments, as long as they get done." Moss still feels that her ideas have been taken from her, and she reports this response to Abrams. Abrams replies, "I could have thought of those same ideas a year ago. Ideas are a dime a dozen; it's the execution of the experiments that receives credit, and this you can certainly do."

Discussion Questions

1. How do Reynolds', Moss's and Abrams' perceptions of "ideas in the lab" differ? How do these different attitudes affect the dynamics of communication in the laboratory?
2. What responsibilities do Moss, Reynolds and Abrams have to each other and to themselves to resolve this issue?
3. How could each person have responded differently to avoid conflict?

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

- Should Peter ignore his misgivings and write up the manuscript incorporating Sally's graph? Why? What are his other options?
- What are Peter's responsibilities as the first author of the manuscript?
- What are Sally's responsibilities as a contributing author?
- 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

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

The Chance Meeting

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Lisa Jones is a graduate student in the lab of Dr. John Smith at State University, where she studies the pathology of SMEL virus, a highly pathogenic virus that has experienced a recent resurgence due to the appearance of drug-resistant strains. Lisa has set out to examine a hypothesis posed by a competing lab headed by Dr. Shirley Frank. In vitro experiments by members of Dr. Frank's lab have suggested that SMEL protease is able to cleave SMEL protein X. It has been suggested that this reaction occurs in vivo and is essential for activating SMEL protein X, which promotes viral DNA replication. Lisa plans to isolate SMEL protein X early in the viral life cycle with the hope of capturing the uncleaved SMEL protein X. Unfortunately, utilizing SMEL strain A, Lisa has been unable to purify SMEL protein X. Upon switching to strain B, Lisa has generated preliminary data that suggest that she has succeeded in isolating a larger, perhaps uncleaved, form of SMEL protein X.

Soon after Lisa conducted these preliminary experiments, a viral conference was held at a nearby university. Prior to the conference, Dr. Smith told the lab that many competitors would be attending and instructed them to say nothing about results generated by the lab. At the poster session, Lisa ran into Steve Jones, an old friend she hasn't seen since high school. Steve is a graduate student in Dr. Frank's group and was a participant in the lab's in vitro experiments with SMEL protease and protein X. Lisa became nervous when she discovered Steve's objectives were similar to her own. But she realized that he was implementing a slightly different technique and utilizing strain A. So far, all Steve's attempts have failed.

Lisa apprehensively approached Dr. Smith and informed him that Steve's plans were not identical to hers and asked whether she should mention her experience with strain A to her old friend. Dr. Smith emphatically answered, "No!" Lisa, feeling that any action contradictory to Dr. Smith's instruction would jeopardize her relationship with her mentor, decided not to mention her results to Steve.

Discussion Questions

- What should Lisa tell Steve?
- Should Dr. Smith instruct his lab not to share information? Why or why not?
- Should Lisa fear retribution from Dr. Smith if she tells Steve? Is retribution a common occurrence in today's research environment? What alternatives exist for students who experience retribution?
- Is the practice of withholding information in today's highly competitive research environment necessary or is it self-destructive and contradictory to the advancement of knowledge? What are the consequences of withholding information?

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

- What ethical issues are raised by the authorship arrangement? Should Charles consent?
- 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?
- How might Western cultural norms and values have influenced the formulation of the uniform requirements?