

A Question of Replication

A graduate student in biochemistry has been working on his dissertation project for 3 years. The research is based on furthering the results of a postdoctoral fellow who has been working in the laboratory for 5 years. The graduate student has been working on an enzyme in DNA repair, and the laboratory has funding for cancer research. The enzyme is well characterized, and kinetics and genetics results on it have been published (in a total of 10 papers). However, the student has been unable to replicate the enzyme purification so far, and his contradictory results have always been discarded in favor of the postdoctoral fellow's data. The postdoctoral fellow leaves for a different institution with the "highest recommendation" of the principal investigator (PI) of the laboratory. When the student then analyzes the source material (the highly pure and highly active enzyme that the fellow has left in the freezer), it does not have the published activity, and the student surmises with the PI that the fellow may have falsified data. When asked to return and to purify an enzyme for independent analysis, the fellow is unable to produce a sample that could be verified by another source. The graduate student leaves the original laboratory and is assigned to another research project; but the original laboratory has never published a retraction of the work and has told the student that "everyone that needs to know [about the retraction] has been notified"; the student has been asked, "What if the newspapers get hold of this?" How should this graduate student proceed?

Solutions

Doing nothing is not a viable option—inaction would be ethically wrong and would undermine the integrity of the scientific process. Besides, if the crime doesn't get you, the cover-up will. The graduate student should return to the PI and argue that eventually someone else will try to replicate the data and the truth will be known. The PI would do best to face the problem head on rather than be found later to have covered up the fraud, at which point the PI might risk losing his

or her position, not to mention reputation. The graduate student's reputation could also be tarnished in the process. In contrast, full and early disclosure is unlikely to result in a dire outcome for anyone but the postdoctoral fellow, although the short term might be a bit uncomfortable.

The student should make it clear to the PI that if the PI does not retract the falsified work, the student will have no choice but to go over his or her head. If that does not sway the PI, the student should document the falsifications as thoroughly as possible and act on the threat, going first to the department chair and then, if necessary, to the dean of research. For protection, the student should keep a record of the conversations with each official. As a last resort, the student could contact the journals in which the fraudulent data have been published.

If the student trusts his or her new adviser, it might be helpful to inform the adviser (in confidence) what is about to occur before going to the department chair. At the same time, the student could ask for advice and support while heading off any attempts by the original PI to undermine the student's credibility.

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Because the graduate student has not published anything on this enzyme, there is nothing for the student to correct in the literature. The student has already decided to leave the laboratory and begin a new dissertation project that does not involve continued work on the enzyme, so his or her new project ought not be affected by any further action taken regarding the enzyme. Unless the student chooses to be drawn back into the situation, whether a retraction occurs need have little, if any, further impact on his or her career. Of course, the student might be reassured to see a retraction published because it would help justify why he or she was unsuccessful in purifying the enzyme (if one concludes that it was never purified in the first place), and a retraction might help the student

come to grips with any feeling of failure or of having wasted so much time. But in fact, neither the student nor the principal investigator has proved that the postdoctoral fellow falsified data. Unless the fellow admits to doing so, all that can be concluded is that he or she was not able to purify the enzyme the second time—and, although I am no expert in protein purification, I suspect that a number of technical reasons could explain why this might occur.

I would not advise the graduate student to try to sort out this issue or demand a retraction of (possibly sound) data. The best course would be to discuss the matter with other faculty members in the graduate program, including the graduate adviser, and follow their advice. Other factors may support the notion that the data were falsified; for example, the postdoctoral fellow could have produced a great many papers at an extraordinary rate. But the validity of the fellow's work is for the PI or other faculty members to investigate.

The graduate student can decide whether to accept any invitation by a newspaper for an interview on the subject. If he or she agreed to an interview, it would be important to stick to the facts. The student should simply indicate that he or she was unable to replicate the purification and that the postdoctoral fellow also had failed to purify the enzyme a second time. The student should not indicate a suspicion that the data were falsified. A simple "I don't know why we couldn't reproduce the data" will suffice.

So I think it is in the graduate student's best interests to get on with his or her own project and spend no more time on this issue. The student has brought the matter to the attention of the PI and perhaps other faculty members as well. That is all that is required here.

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Scientific fraud is a hot issue, and I believe that further discussion on the topic is

beneficial. At this point, we do not know whether this is a case of fraud. It would be only fair to give the former postdoctoral fellow another opportunity to replicate the initial results and perhaps to invite an outside researcher to do the same. Who has published the 10 papers on the enzyme? If all the papers are by the fellow, there may be a problem; but if other researchers are involved, perhaps they could contribute. If the enzyme cannot be purified to the extent originally reported, letters to the editors of the journals and to the grant-funding agency are appropriate.

From my point of view, the PI is initiating or perpetuating fraud if he or she does not go public with the information. The inability to replicate the results may be due to poor technique rather than anything premeditated. Poor research may not be fraud, but covering it up is. I feel that the graduate student should be passive unless there is a lack of progress; then he or she should contact his or her new PI, the head of the department, and the dean of the school.

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New Question: A Question of Dialect

As a physical scientist who for many years has been editor of an interdisciplinary journal contributed to and read by biologists, medical people, engineers, and others, I have had to accommodate the various disciplines' dialects of scientific writing and to distinguish between differences in style and poor English. One such unsolved puzzle, which I hope my colleagues can help me solve, is to identify the differences in meaning, if any, between the verb *quantitate*, as used by many biologists, and the older verbs *quantify* and *measure*. What are your thoughts regarding possible distinctions? [Contributed by an editor in bioelectromagnetics.]