Data Handling Cases

1. You are present during a conversation in the departmental conference room. Jim, a new assistant professor, is getting ready to submit his first paper since joining the faculty. He reviews one of the figures, which is a photo of an ethidium bromide-stained agarose gel. The gel contains the products of polymerasc chain reaction-amplified whole cell DNA. The photo displays the predicted 3-kb DNA fragment. Jim comments that a second minor signal was also evident on the original gel. Based on its size, Jim believes that this second fragment represents a very exciting discovery, but it needs considerable additional work. This second fragment cannot be seen in the photograph. Jim discloses that this is because he has deliberately prepared an overexposed print in order to obscure the second fragment. He says he did (his because he is worried that competing groups in larger, more established labs will interpret the potential of the second fragment and will "scoop" him. He has prepared a figure legend that says, "a second minor signal of unexplained origin was present in this experiment but is not visible in the photo", but the figure legend does not include the size of the unexplained fragment. Thus, he argues he'll be telling the truth while at the same time protecting himself from his competition. Are Jim's actions appropriate? Is he (1) simply playing fairly in the hotly competitive arena of biomedical research, or (2) falling victim to self-deception, or (3) perpetrating scientific fraud?

2. A predoctoral trainee under your supervision has had several difficult years finishing up his dissertation research. He has needed continual guidance, and his attitude has not been positive about the work. He does not seem motivated, but you press him almost OD a daily basis until the work is completed and the dissertation is finally written. The student turns in an average defense and informs you that he is leaving science to take a job in biomedical sales. Several areas of the student's dissertation need additional work before the research can be written up for publication. You turn several portions of the dissertation work over to a competent postdoctoral trainee in your laboratory. Over the course of the next several weeks, the postdoc pursues these new lines of experimentation. In the process, however, she uncovers several problems with the data in the dissertation. In fact, a number of experiments cannot be repeated. Moreover, some of the results obtained are opposite those reported in the student's dissertation. These results have serious implications regarding interpretations and conclusions reached by the student in his dissertation. You review the student's databooks and are unable to find entries that could have been used to construct some of the tables seen m the dissertation. Moreover, other data sets written into the databook have been used selectively to construct some tables in the dissertation (i.e., critical points that would have confused analysis were omitted). After considerable analysis and discussion with the postdoc, you decide that the student has at least falsified data and possibly fabricated data presented in his dissertation. You have not yet published any of the work of the student's dissertation in manuscript form. However, one published abstract contains accurate information which has been authenticated by your postdoctoral trainee. All of the student's work was supported by your NTH grant. What actions(s), if any, do you take in this situation?

Cases are from:
Macrina, Francis L., Scientific Integrity: An Introductory Text with Cases. ASM Press: Washington. D.C., 1995.

3. Marty Brown, a plant biologist at a major research university, is investigating the potential utility of transgenic tobacco plants as "factories" for the production of foreign proteins.

The potential benefit of this research to human medicine is clear. For instance, the non-plant gene that Brown is working with right now is human Factor VIII, a protein essential (or blood clotting and the protein that most people with hemophilia lack.

In his current experiment, Brown has introduced a construct of the Factor VIII gene into tobacco and has 100 transgenic plants that he is studying in a developmental time course. He is following both Factor VIII production and plants* growth to assess the effect of the foreign gene on the plants' development, and vice versa.

Brown is excited about the success of his experiment thus far, and he feels (hat the potential uses for his findings make it imperative that he publish as soon as possible. A disease-free, inexpensive source of Human Factor VIII would be of great benefit to hemophiliacs, who run the risk of contracting disease from plasma-derived sources and who must find a way to pay about $100,000 per year for their treatment. The urgency is all the more real to Brown, whose infant son is a hemophiliac. The sooner Brown's promising results are published, the sooner other scientists will be able to follow his line of work, and the sooner his discovery can have a practical, clinical impact.

One Friday, late in January, Brown checks on the 100 transgenic tobacco plants that have now been in the greenhouse for about a month. He discovers that twelve of them arc beginning to look sickly. Their leaves arc drooping a bit and turning yellow on the edges. He records this in his notebook, and also notes That all of these plants are close to the door. Later, in the lab, when he checks his previous results, he finds that these twelve plants have been producing Factor VIII at a consistently higher level than the other plants. Only one other plant had Factor VIIT in this range, although quite a few came close.

Feeling pressed for time. Brown decides not to investigate the cause of the poorer growth of the twelve plants any further. He concludes that because they happen to be near the greenhouse door, they have been repeatedly exposed to lower temperatures than the other plants, and that this is the problem. He records this conclusion in, his notebook along with the other entries.

Early the following week, Brown is working on integrating his most recent transgenic plant data into the first draft of the manuscript on which he is working. He has entitled it "Human Factor VIII Production in Transgenic Tobacco Has No Deleterious Effect on Plant Growth." When Brown comes to the data on the twelve sickly plants, he considers whether he should exclude these plants from his analysis. He thinks that doing so would be justified because of the plants* proximity to the greenhouse door. In addition, the paper would be more impressive without the uncertainty associated with the data from these plants. He weighs the relevance of the data from those twelve plants against the principle that there is nothing wrong with excluding outliers and irrelevant data- Besides, he thinks these results are too important to risk letting them get held up in the review process.

Should Brown leave out the data from those twelve plants? Why or why not?

Case is from:
Bebeau, Muriel J., et a1. Moral Reasoning in Scientific Research: Cases for Teaching and Assessment. Indiana University Press: Bloomington, 1995.