Editorial

Scientific Misconduct

Two cases of scientific misconduct have recently appeared in the media *(1, 2)*. One involved J. Hendrik Schön, a 32-year-old physicist at Bell Labs, whose “discoveries” in the area of superconductivity and molecular electronics, had they been true, might have merited a Nobel prize. The other was the withdrawal of the claim that element 118 had been discovered at Lawrence Berkeley National Laboratory. The original claim was based on Victor Ninov’s computer-aided processing of raw data from cyclotron experiments. Looking on the bright side, scientific misconduct continues to be newsworthy because it continues to be rare. During the past decade, fewer than 200 cases have been reported by the NSF and the NIH combined, out of hundreds of thousands of projects those agencies supported. Both the media and the public believe that most scientists are honest and trustworthy and that scientists themselves will root out cases of misconduct, insuring that the overall enterprise remains unsullied. The two recent highly visible cases ultimately reinforce that trust, but they also raise significant questions about how science detects and deals with misconduct.

Each case involved a collaborative research project with many scientists. One might think that collaboration would reduce the likelihood of misconduct, since collaborators could be expected to detect forged or misinterpreted data, but that did not happen. Prior to publication neither the collaborators nor the referees and editors of distinguished journals detected the problems that subsequently came to light. An advantage of collaboration is that everyone need not repeat every experiment, and different people bring different skills to a good collaboration, so it is impossible for everyone to check everything. Trusting colleagues to get things right is essential. Nevertheless, these cases of scientific misconduct illustrate that considerable vigilance is required among collaborators to make certain that spurious data or incorrect interpretations of data are not propagated.

What implications do these cases of scientific misconduct have for us as teachers of chemistry? We definitely need to address issues of scientific ethics. The NIH requires that ethics be taught to graduate students in departments that receive NIH grants, and this is a very good thing. In science we depend too often on things that go without saying. It is much better to bring ethical decisions and behavior out into the open and discuss situations in which ethics comes into play. Often those situations are less clear cut than we might expect.

In retrospect, some of the graphs published by Hendrik Schön and colleagues look far too good to be true. I would have expected my TAs in a first-year lab course to question baseline date with no discernible noise and a straight line from which none of the points deviated, but of course I would not fault a TA who accepted without question really good data from a really good student. We are prone to assume that an expert will get things right, and that appears to be what Schön’s collaborators did. Also, Schön’s results confirmed an idea initially proposed by a colleague. It is easy to be uncritical when one of our ideas is validated and we can tell others about it.

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In the Lawrence Berkeley case, only Ninov knew how to run the computer program that was used to analyze the data, so none of his colleagues dealt directly with the raw data until other labs were unable to replicate the results—long after the results were published. Following standard practice, the journal that published the results did not include the raw data either. It was more than a year before a colleague learned to use the software, analyzed the original data, and found that the results reported earlier were not there. Analysis of a computer log file gave evidence that data had been cut and pasted and numeric values had been changed. Ninov claims innocence and points out that many others had access to the computer containing the data. In any case several research groups spent considerable time trying to reproduce results that were not supported by the raw data.

These cases provide a good basis for discussions of scientific ethics, particularly with respect to the responsibilities of colleagues in collaborative projects. With increasing numbers of students working in cooperative or collaborative groups, there may be opportunities for more than just discussion—similar issues of responsibility apply to the members of such groups. Further, this is an area where, “no clear, widely accepted standards of behavior exist” *(1)*. Thus there is an opportunity to point out to students that scientific ethics, like science itself, is incomplete and needs constant attention to issues that result from new paradigms such as collaborative research. Finally, each of us can resolve to pay more attention to the contributions we and our colleagues make to collaborative projects, applying to our own work no less critical an eye than we would cast on the work of those we don’t know at all.

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Literature Cited

1. Chang, Kenneth. On Scientific Fakery and the Systems to Catch It. *New York Times,* Oct 15, 2002, p D1; see also *http://www.lucent.com/press/0902/020925.bla.html* and *http://www.lucent.com/news_events/researchreview.html* (both accessed Oct 2002).
2. Johnson, George. At Lawrence Berkeley, Physicists Say a Colleague Took Them for a Ride. *New York Times,* Oct 15, 2002, p D1.