Research, Ownership, Misconduct—Readers Respond

Robert B. Laughlin's gross extrapolation (PHYSICS TODAY, December 2002, page 10) from a single incident at Bell Labs—the first in its 77-year history—to an indictment of the whole of industry research is wrong on every plane.

The assertion that scientific misconduct in industry research is not only more frequent than in publicly funded research but indeed common is unsubstantiated by the essay. In fact, that comment is directly at odds with the results of investigations by those agencies that oversee federally funded research. The Office of Research Integrity, which oversees research sponsored by the National Institutes of Health, the Food and Drug Administration, the Centers for Disease Control and Prevention, and related agencies, has gathered some revealing statistics from annual reports on possible research misconduct during the six-year period 1991–96. Universities, both public and private, constitute 26.5% of those entities that answer to ORI, yet they account for 68% of the institutions at which misconduct was found. Small businesses, on the other hand, make up 43% of those institutions that answer to ORI but only 4.9% of the misconduct findings. The office of NSF's inspector general publishes a semiannual report of shenanigans by its grantees. According to the reports of the past few years, almost all misconduct findings were in universities—though it should be noted that most NSF grants go to university research.

I'd like to see the statistics for grant falsifications for all federally sponsored research. I strongly suspect they too would refute Laughlin's thesis. The "inherent truthfulness" of university research doesn't explain why the overwhelming majority of research misconduct findings occur at universities and not in industry labs. In light of the facts, is Laughlin willing to admit that some fraction of the university-style research portfolio that he is so proud of is "simply lies" as he callously characterized industry research?

I've worked in both environments, and the pressure to fudge both data and dollars is as easy to understand in an academic environment as in an industrial one. "Publish or perish," the law of the land in academia, translates to "patent or perish" in industry. But a private company faces a much more punishing feedback mechanism—namely, bankruptcy—to ensure accountability than any public enterprise. When a private company gets caught defrauding the taxpayers, there are unanimous calls for retribution. But such brutal accountability is hard to find in the public sphere. A tenured professor can be convicted and imprisoned for falsifying grants, get out of jail, and return to his or her old job. Does anyone expect Jan Hendrik Schön to ever work at Bell Labs again?

The notion that the products of industry research remain cloaked in secrecy is false. They are usually submitted for public scrutiny in the form of a patent application. Every such application includes a full disclosure of the technology involved and any discoveries that led to it. Anyone can read it, learn from it, and build upon that knowledge. Trade secrets are a rarity in industry because they are so hard to keep. Most industry leaders recognize the importance of open lines of inquiry and only clamp down when they are close to something patentable.

The idea that secrecy breeds impropriety is absurd. A secret that is untrue is a worthless secret. And a patent based on such information isn't worth the paper it's printed on. The "rottenness" of any fraudulent research in industry does not "take an extremely long time to reveal itself"—investors tend to be an impatient and shortsighted lot. Even if the work should somehow lead to production, products that don't work don't sell terribly well. And it is not at all clear how a company's shoddy research might "clog the pipeline of innovation," especially if that research is being done in secret. Did all semiconductor research grind to a halt when Bell Labs thought it had a transistor without avalanche breakdown? Schön and company published their phony results and others tried and failed to reproduce them. It remains for Laughlin to prove that the whole corrective process took longer at Bell Labs than it would have in a university lab. Remember, Stanley Pons and Martin Fleischmann "discovered" cold fusion in a university lab.

The "fiery independence" of university researchers receives praise from Laughlin, but few individuals possess the fiery independence of an entrepreneur. Revenues from patents offer universities some genuine independence by relieving them of at least some fundraising burden.

The claim that science is driven by selfless altruism is nonsense. We do it because it's fun—a distinctly selfish motivation. And never discount the value of simple greed. Greed is a terrific source of motivation, and far more reliable than altruism.

Bottom line: The decision to do something dishonest is a personal one and is more indicative of a character flaw than the avarice or altruism of one's employer. Honest, productive research can thrive in either industry or university environments. There are good arguments for supporting university research. Laughlin's isn't one of them.

Art Blair
(apblair@wisc.edu)
University of Wisconsin–Madison

The Reference Frame column by Robert Laughlin raises very interesting issues concerning the economic inducements to commit fraud in science and technology. It is always a pleasure to find physics writers sensitive to the industrial world, not just the university one.

It was striking, however, to observe how fixated Laughlin was on his peculiar idea of "property." I counted at least nine times he used the word, with uniformly negative connotations. For Laughlin, at least as far as the sciences are concerned, property is the root of all evil. It would appear that he has little or no industrial experience himself, or else learned little from what experience he had.

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Ironically, he has things exactly backward. In government and university occupations, researchers who commit fraud are putting just what at risk, personally? Perhaps their reputation, if they are caught. Perhaps their job, if the sin is egregious. Susceptible to fashions, the government and university sectors have a strong incentive to protect researchers and their work and to overlook little flaws that may tend to advance common interests. And with little or no need to produce a commercial product, university and government researchers are subject to no mechanism for independent test of value, other than the so-called peer review of other soldiers in the same army. If and when somebody is exposed doctoring data, still nobody really loses. The researcher is "promoted sideways" (found another job in another lab or agency), a polite retraction is issued by the sponsors or department head, and the money keeps flowing. In last year's most newsworthy revelations of physics fraud, not one of the coauthors of the perpetrator's papers admitted even secondary responsibility ("I just assumed he was providing good data," they whined), let alone suffered the slightest financial or career setback. Except for one man, the fraud was free.

In industry, by contrast and as Laughlin correctly noticed, the stakes are much higher. Industrial research, far from being insulated from self-correcting (market) forces, experiences the strongest possible discipline daily. Consider where the high stakes of investment costs and the potential value of intellectual property really lead: not to fraud but to truth. Senior people in high-tech companies who pursue fraud do not just lose their reputations, they lose their homes, their fortunes, their livelihoods, and sometimes even their families under the stress.

Just as a successful discovery or development can make you rich, a false one can ruin you. Entrepreneurs bet everything they own on the value of their ideas, discoveries, developments, products. They have little time to waste on data or ideas they know to be false or worthless, because they literally cannot afford failure or wasted effort. They are paying for the work themselves. Naturally, ideas, discoveries, and developments result in intellectual property, sometimes of the very highest value. But the property has value only to the extent it is valued by others. Once a private enterprise brings a new discovery or product to the market, consumers will test the work immediately and without pity. If it is without merit, or if its value is significantly less than the developers claimed, customers and competitors quickly crush the developers with rejection. That market scenario contains very little room for fraud and the greatest penalties when fraud is exposed. I would suggest that somebody enroll Laughlin in Economics 101.

Laurence N. Wesson
(AuroraSplr@aol.com)
Aurora Instruments Inc
Ambler, Pennsylvania

I could not disagree more with Robert Laughlin's analysis of recent fraud in experimental physics and the cure for what ails the profession. For science to be "relevant," it must produce something—which may be beauty or insight or patent royalties—that has real value to someone. Our best response to economic pressure is to create things with real value.

Laughlin claims that we scientists have an "obsession with fundamentals and truth" but that present economic "pressure can turn otherwise excellent and honest scientists into willing deceivers." Scientists as a group have moral frailties similar to other professional groups, but most of us understand two basic parameters. First, science is based on repeatable experiments and calculations, so it will not advance one's career to publish results that others will not repeat. And second, products and processes based on faulty parameters and theories do not work well. So truth is valuable in science because it enhances the value of intellectual property. A sane scientist would not assert a false answer to a question that has economic importance, but might be tempted to assert a self-serving falsehood that is "academic." Major hard-science frauds are generally committed by people who think that they know what the "right result" is and are frustrated in their attempts to get that result honestly.

To suppress fraud in physics, we can test our students for fraud in labs and assigned problems and punish where it is found. An instructor can set up a lab class to expect a fallacious result and then give a zero score to those who report it and praise those who report properly. Students often are given the correct answers before they begin to work assigned problems, especially those