

Scientific misconduct

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Scientific misconduct is defined as “**fabrication, falsification or plagiarism in proposing, performing or reviewing research or in reporting research results,**” according to the U.S. Office of Research Integrity (ORI). A 2009 meta-analysis of misconduct studies found that about 14 percent of responding scientists reported having **witnessed** falsification by others—and **2 percent confessed** (anonymously) to having been involved in fabrication, falsification or modification of data themselves.

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By their calculations, however, the 217 U.S. cases of misconduct reported to the OIR in 2009 would add up to more than \$110 million each year. And the actual rate of misconduct remains uncertain, “owing largely to its clandestine nature as well as to the problem of underreporting,” the researchers noted.

....In his 1974 commencement speech at the California Institute of Technology, Nobel laureate physicist Richard P. Feynman articulated the foundation of scientific integrity: “The first principle is that you must not fool yourself—and you are the easiest person to fool.... After you’ve not fooled yourself, it’s easy not to fool other scientists. You just have to be honest in a conventional way after that.”

....Unfortunately, says Feynman’s Caltech colleague David Goodstein in his new book *On Fact and Fraud: Cautionary Tales from the Front Lines of Science* (Princeton University Press, 2010), some scientists do try to fool their colleagues, and believing that everyone is conventionally honest may make a person more likely to be duped by deliberate fraud. Nature may be subtle, but she does not intentionally lie. People do. Why some scientists lie is what Goodstein wants to understand. He begins by debunking myths about science such as: “A scientist should never be motivated to do science for personal gain, advancement or other rewards.” “Scientists should always be objective and impartial when gathering data.” “Scientists must never believe dogmatically in an idea or use rhetorical exaggeration in promoting it.” “Scientists should never permit their judgments to be affected by authority.” These and many other maxims just do not reflect how science works in practice. Knowing that scientists are highly motivated by status and rewards, that they are no more objective than professionals in other fields, that they can dogmatically defend an

idea no less vehemently than ideologues and that they can fall sway to the pull of authority allows us to understand that, in Goodstein's assessment, "injecting falsehoods into the body of science is rarely, if ever, the purpose of those who perpetrate fraud. They almost always believe that they are injecting a truth into the scientific record." Goodstein should know because his job as the vice provost of Caltech was to investigate allegations of scientific misconduct. From his investigations Goodstein found three risk factors present in nearly all cases of scientific fraud. The perpetrators, he writes, "1. Were under career pressure; 2. Knew, or thought they knew, what the answer to the problem they were considering would turn out to be if they went to all the trouble of doing the work properly; and 3. Were working in a field where individual experiments are not expected to be precisely reproducible."

To detect fraud, we must first define it, and Goodstein does: "Research misconduct is defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results." Next there must "be significant departure from accepted practices of the scientific community." Then, the misconduct must be "committed intentionally, or knowingly, or in reckless disregard of accepted practices," and finally, as in any court of law, the fraud charge must be proved by a preponderance of evidence.

...So some scientists sin, it's true. Given the fiercely competitive nature of research funding and the hardscrabble intensity of scientific status seeking, it is surprising that fraud isn't more rampant. The reason that it is so rare (compared with, say, corruption in politics) is that science is designed to detect deception (of one's self and others) through colleague collaboration, graduate student mentoring, peer review, experimental corroboration and results replication. The general environment of openness and honesty, though mythic in its idealized form, nonetheless exists and in the long run weeds out the cheats and exposes frauds and hoaxes, as history has demonstrated.