

Faked data, fudged numbers, filched ideas: how common in science are these grave sins? There may only be a handful of cases where scientists managed to fool the whole world—a Jon Hendrik Schön here, a Woo-Suk Hwang there—but survey after survey reveals that your garden-variety fraud is more prevalent than anyone cares to admit. Whose responsibility is it to police misconduct in science? And what motivates it in the first place? In the following pages, we take a look at what prompts those ethical missteps and what governments, universities, journals—and you—can do about it.

## Your cheatin' heart



Every scientist feels the pressure to succeed. But why do a few let that desire take them into unethical waters?

That question aired repeatedly after the spectacular fall from grace of South Korean Woo-Suk Hwang. Why, everyone wondered, did he do it?

As the number of reported fraud cases continues to rise, a psychological profile of the scientific cheat is beginning to emerge.

Three things repeatedly pop up in misconduct cases, says David Goodstein, vice provost of the California Institute of Technology: career pressure, a belief in one's conclusions even when the experimental evidence does not support them, and a field where reproducibility is not always possible.

"The presence of such factors doesn't necessarily lead to misconduct, but when misconduct occurs, these factors are present," Goodstein says.

For those who cheat, success rather than money is often the draw, Goodstein says. Biological sciences, inherently more irreproducible than physical sciences, are also more prone to misconduct, he says.

All three factors apply in Hwang's case. As a star of Korean science entrusted with large grants, Hwang probably felt pressure to make the most of his results. Like most stem cell researchers, he presumably also believed in the end result: that therapeutic cloning is possible. And cloning is a famously finicky process—

Hwang claimed a 1-in-242 success rate in his first human cloning paper—so reproducibility could not be readily demanded.

Scientists might also misbehave if they feel slighted or at a disadvantage (*Nature* **435**, 737–738; 2006). Although Hwang was adored in Korea, being from a country that has yet to win a Nobel Prize in science may have led him to believe he needed a leg up.

The Hwang case also shed uncomfortable light on a common phenomenon: the pressure among younger scientists to please their seniors. "Graduate students especially feel lack of power," says Darrel Smith, a psychologist who counsels junior laboratory members at Vanderbilt University. "They'd do anything to please their principal investigator."

This may be even stronger in countries that follow a more hierarchical structure in the labs. Cultural factors may also play a role, especially in plagiarism.

In a study of graduate students in the Houston area, for example, Asian students were specifically told not to memorize for a test. But they still wrote back answers word for word from the textbook. "We saw it as plagiarism. They saw it as the most accurate representation of the facts," says medical ethicist Elizabeth Heitman, now at Vanderbilt University.

So can educating people about fraud help prevent it?

The US National Institutes of Health now requires training in research integrity, but some of this training is of dubious value. One online tutorial, the Collaborative IRB Training Initiative, lets people amend their answers, allowing even those who haven't studied the material to pass, says Heitman. Aiming to teach research ethics, the tutorial was forced to put up a warning against "inappropriate use" that could in itself "be viewed as research/academic misconduct by your institution." As Heitman says, "the irony is incredible."

*David Cyranoski, Tokyo*

### WHAT IS MISCONDUCT?

Defining that is trickier than it would seem. To qualify as misconduct, someone must be shown to have *intentionally* made up or omitted data or results, or to have manipulated research materials or processes (*Fed. Regist.* **70**, section 42 CFR Part 93.103; 2005). More recently, the definition has been expanded to include plagiarism—appropriating another person's ideas, processes, results or words, without giving proper credit—such as during the review of grants or manuscripts (see "Plagiarize or perish?").

Misconduct does not include honest mistakes, however, nor does it cover differences in scientific interpretation or authorship disputes.

*Kendall Powell, Denver*



**33% of scientists surveyed admitted to at least one instance of misconduct**

*(Nature* **435**, 737–738; 2005)

"If you ask why are the rules being bent, it is, in some cases, because too many rules have been implemented."

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