EMBO reports

editorial

Fraud in our laboratories?

With depressing regularity, the media continue to uncover cases of scientific fraud. For journalists and their editors, such stories are news of the same calibre as a political scandal and they receive the same treatment: scientists, who commit fraud to advance their own careers or their companies, are rich material for a human aspect story. In addition, fraudulent research in the life sciences opens up another dimension because it might have a bearing on pubic health issues or touch controversial topics, such as cloning or genetically modified organisms. In the end, however, we rest assured that this was yet another case of a scientist gone wrong, and that the system of scientific research and publication remains intact. But an interesting article in this issue (Franzen *et al*, pp 3–7) suggests that sociologists arrive at a different conclusion.

In summary, the authors contend that—although the scientific community regards publicized cases of fraudulent behaviour as exceptional and deviant from accepted scientific standards—fraud is an inevitable component of today's research. They argue that the headlines focus on extreme cases of what they believe to be a gradient of fraud that occurs throughout the whole spectrum of research. We must accept that this learned paper is only a formal presentation of a growing public view that has led to an increased mistrust of scientific research in general.

Thus, we must face the question of whether most research carries with it a whiff of corruption. It is clear that only a low barrier needs to be crossed to end up on the wrong side of scientific ethical standards. How often do we ponder about raw data in which everything fits with a given hypothesis except for one part of a figure? The following discussions could go in different directions. Was the figure mislabelled? Were the samples mixed up? Maybe one sample in a triplicate was distorting the results? Should the experiment be repeated until it provides unambiguous and reproducible results or should this one outlier just be excluded from a paper?

Depending on the environment of the research group, such discussions can have different outcomes: the correct one—which I believe is the case for the vast majority of scientists—is to repeat the experiment until the data are robust. The very nature of the biological material we are working with can create inexplicable differences: the caretakers in the animal house might have used a different feed; the animals might react differently because of an infection; cells grown in culture can be at different degrees of confluence or be responding to unnoticed changes in the growth conditions. But no matter what the reason, the answer to the challenge of a result that does not fit is unambiguous: data that do not suit should be neither ignored nor wished away. Of course, there are factors that could drive the discussion in another direction: pressure to publish; the fact that the group member who did the experiment is leaving or that it would take months to repeat the work; an upcoming important meeting—all these could result in the presentation of 'cosmetically improved' data. Even if nobody notices, it is still fraud. Some group leaders might also have a reputation for intolerance and bullying, and their teams simply do not dare to present awkward data.

Franzen and colleagues present even more arguments of how structural changes, particularly in biomedical research, create an incentive for misconduct. All this raises the possibility that fraud might be more widespread than we like to think. However, apart from the possibility that I might simply be naive or in denial of reality, I do not believe that the majority of scientists are prospective swindlers because there are other elements at work. One reason to trust most data is the fact that any published paper has been examined by up to three independent researchers. The peer review system has its own flaws, but referees and editors can be very effective in raising telling questions. Knowing this and the fact that the paper can be examined very diligently, authors take extra care and include controls to ensure that their results hold up to critical scrutiny.

Another reason why fraud is the exception rather than the norm lies in the character of most scientists. Of course, scientists as a group are not morally superior to any other group in society. But, at least at the early stages of their careers, they pursue science because it is about understanding and they are likely to have a strong commitment to discovery and truth. In addition, group leaders who are charged with supervising and mentoring their students also take an active role in ensuring that the data are robust. To encourage students to fudge data is a visible, and therefore risky, strategy to advance one's career. Senior scientists who do so usually find themselves ousted rather quickly and, although this is not necessarily a noble reason, it clearly dissuades them from cutting corners.

Still, each story about a scientist gone astray increases the visibility of scientific fraud. Each story reinforces a negative view held by the public and destroys their trust in the scientific system. The potential implications are dire if the public—and therefore those who fund research—regard every scientist as a potential charlatan. Every scientist should therefore reinforce his or her commitment to avoid ignoring any data that do not fit the hypothesis. Honesty is the only weapon against fraud and against public mistrust, and it is available to everyone from technician to professor. We all need to make sure that it remains the dominant ethos in our laboratories.

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