

Keeping science honest

We are the whistle-blowers. Our ethical obligations as scientists made it impossible for us to accept a publication of fabricated results, even though it could have cost us our scientific careers. The process was slow and arduous, but worked nevertheless. Would we do it again? Yes. It was something we had to do to retain our trust in science.

The Research Article, published in *Science* in June 2016, made headlines around the world: Fish prefer microplastics to live prey. But we witnessed the experiments and knew that this paper was fraudulent. We reported the scientific misconduct and thereby set in motion an 18-month investigation that has had numerous repercussions for many. The paper was eventually retracted, and a final investigation concluded that the results were fabricated. The guilty scientists lost their research grants, and the university's decisions regarding potential reprimands are forthcoming.

The case severely influenced our personal and professional lives. The time and energy that we devoted to it can never be replaced. We naively thought that the “science police” would ride in, secure evidence, and make a swift declaration of misconduct. Despite a catalog of overwhelming evidence, the outcome was never certain, especially given the initial “not guilty” verdict by the preliminary investigation. That report almost caused us to lose trust in science and change careers altogether. We were attacked by the accused, who said that jealousy motivated our sole intention to discredit their work. We were told that our behavior was distasteful and unethical.

Yet, despite this, we have been encouraged by a process that ultimately worked. What lessons can we pass on to others who may find themselves in a similarly unfortunate situation? Gather a team of dedicated collaborators, because you're going to need help and support. Be prepared for a prolonged battle. Collect evidence, but don't contact the accused with questions if you are certain that they fabricated data, because they may then hide their tracks. Identify the appropriate authority where miscon-

duct should be reported; this could be at your own or the accused's institution. If no obvious channels exist, your own institution should be able to provide guidance. Be professional, stick to factual concerns, and ask trusted colleagues to critically assess the evidence and how you have presented your case. Put everything in writing, from correspondence with the university to contacts with any organization or government body that may be of assistance by, for example, providing documents.

What can be done by research institutions to help whistle-blowers? Universities could be associated with a central organization that handles reports of misconduct. This organization would convene an independent investigative committee, because universities might be more interested in protecting their reputation than protecting good science. This would reduce the potential for a conflict of interest and ensure that credible claims of misconduct are handled professionally. Once an investigation is initiated, it must be performed by independent, critical people with the appropriate expertise. A person with training in investigative journalism, police work, and/or law would also benefit the investigative team. The central organization, as well as the whistle-blower's home institution, should offer

her/him support and protection from personal attacks during the process. For example, a whistle-blower's identity could be kept anonymous. Whistle-blowers who were mistaken in their report should not be punished if they are deemed as acting in good faith. However, when they are correct in their claims, their institutions, as well as the institutions of the guilty scientists, should consider mechanisms to compensate the whistle-blowers for their service to the scientific community. This could include supporting contract extension and/or reducing teaching and administrative duties to make up for lost time.

Ideally, whistle-blowing should not be necessary. The scientific community must enforce a culture of honesty. Sometimes that takes courage.

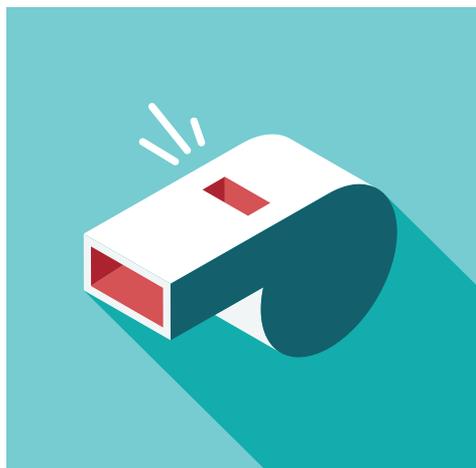
—**Josefin Sundin and Fredrik Jutfelt**



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