Title
Openness in science is key to keeping public trust

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The Ebola crisis demonstrates once again that, despite all the posturing of politicians, it is scientists that the public looks to in times of crisis and concern. The public still trusts scientists. In fact, a UK survey this year found that they trust scientists even if they don't always trust scientific information itself. Given how much scientists depend upon the public's goodwill and the funding that flows from it, I am always surprised by how much scientists take the public's trust for granted. Trust is fragile and science can do more to protect and nurture it.

Trust in science is often discussed only in response to some scandal or controversy, such as misconduct. This is unfortunate because the threat to public trust goes far beyond the consequences of misconduct alone. Such focus on bad behavior, equating concerns about trust with misconduct, can make scientists unwilling to discuss the issue because they feel personally criticized. As a result, they ignore or even resist calls (such as this one) to promote and improve the overall trustworthiness of research.

Yet, mishaps that cast science and scientists in a bad light and could undermine trust are inevitable, particularly as many fields of science are poorly understood by the wider public. It is down to scientists to identify and try to prevent them.

Things can and do go wrong in science in countless ways due to its methods, technical procedures, and complexity, which can make the most innocent of mistakes exceptionally difficult to detect. Yet, too often, scientists do not consider the need for improvements because they are content with their faith that science self-corrects. This is a bad idea. Science's ability to weed out incorrect findings is overstated.

There may have once been a time in science when there were multiple chances to get it right, but that is much less true today. Modern science is more fast-moving and connected and the financial and reputational stakes are now so much higher. The priority must be to try to get research right the first time, especially in biomedical research. That means we cannot afford to leave the detection of problems to chance.

Simply following the rules that others set won't help scientists much either. Regulations often fail to solve the problems that give rise to them. The US has strengthened conflict of interest regulations for biomedical researchers, for example, but this does nothing to address the potential that financial relationships between research sponsors and institutions have to cause bias, a particularly significant shortcoming considering the extent to which large universities treat their science divisions as money makers. Also, complying with rules tend to fatigue the research community on the one hand and contribute to a false sense of security that things are being taken care of on the other.

Scientists need to articulate better what makes our work deserving of the public's trust in the first place. I hope we can agree that research should satisfy three basic expectations: publications can consistently be relied

upon to inform subsequent enquiry, research is of sufficient social value to justify the expenditures that support it, and research is conducted in accordance with widely shared ethical norms. Making science more trustworthy then comes down to steps to make sure those expectations are met. We need a culture that prevents and fixes mistakes not by chance but by design. How can we create such a culture?

One of the most important steps is to recognize and identify where standards break down. We need to routinely conduct confidential surveys at the individual lab, institution and professional society levels, to assess the openness of communication and the extent to which people feel safe identifying problems in the research setting. Some research institutions, to their great credit, are already conducting these kinds of assessments, but most don't. It is critical that we start to make them the norm.

We can't expect people to call attention to problems when it is not safe for them to do so and at present it is unsafe in too many of our research settings. Those who question the status quo can be ostracized and labeled as troublemakers. To make them safer, leaders have to be prepared to hear unwelcome news and hold their nerve over bad publicity. And they have to convince staff their desire to improve is sincere. This is easier said than done, but the alternative is silence and stifled progress.

Building on the results of these surveys, institutions should be open and declare errors and near-misses. They should make public what actions they take to correct the situation, and whether they work.

As science becomes less bound by both individual disciplines and geography, opportunities for errors and mistakes increase. One feature we need to better investigate is how distributing work among teams generates errors in data gathering and analysis. Unstable reagents can perform differently at different sites, for example, and a stronger emphasis on quality assurance could help us discover and reduce such errors. Unlike the call for surveys, which demands institutional buy-in, research teams could direct such efforts themselves, whether or not funders or universities push them to do it.

While science frets over misconduct and the bad apples in our midst, it fails to confront the bigger problems. We must make sure that we reward the public trust in scientists with trustworthy science.

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