

A Scientist's Oath

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Data on the perceptions of scientists suggest a moderate public distrust of scientist's motivations. Bettridge et al. suggest scientist's reluctance to engage the public on controversial ethical issues may be a contributing factor. The authors propose a Scientist's Oath to send a clear message to the public about our ideals.

The American public has mixed feelings when it comes to science. On the one hand, evidence suggests that the scientific field is well respected. On the other hand, data also indicate that the populace has potentially consequential trust issues in terms of ethical and honest reporting of scientific research (American Academy of Arts and Sciences). Additionally, public opinion and scientific consensus can drastically diverge (Pew Research Center). While there are many reasons for this, we feel that a large part is due to low engagement of scientists with the public. Consensus within science has historically been that ethical questions—use of animals, gene editing, and experimental design in general—are internal issues that should be handled only by specialists (Peters, 2013). Scientists are also reluctant to engage the public (Sintora and Hofer, 2016) and, as a result, are not well known in the public sphere (Research!America). However, physicians continue to be well-respected professionals with high ethical regard within the general community (Blendon et al., 2014), perhaps due to the frequent contact medical doctors have with patients and the public. Given that medical and biomedical science can and often do inform each other, we wondered why physicians are seen by the community to be morally superior to scientists. Medical doctors are well known to ponder the ethical implications of their practice through the Hippocratic Oath, which all medical students recite at some point in their training (Tyson, P.). Because of the pervasiveness of the Hippocratic Oath, and the general perception of medical doctors as ethical, we believe adoption

of a similar oath for scientists in training will promote public trust in science.

Despite potential trust issues with scientific reporting, a plethora of evidence exists that scientists are well respected. The biennial General Social Survey on public confidence in various institutions found that the scientific institution ranked second in terms of public trust, just below the military but well above Congress, the media, and financial institutions, a consistent 40-year trend (American Academy of Arts and Sciences). The National Science Foundation's annual Science and Engineering Indicators Report found that when it comes to public confidence, scientists rank second out of thirteen career categories, above religious leaders and elected officials (National Science Foundation). Yet, other studies indicate some level of distrust in scientists in particular areas. For instance, a recent Pew study found that 88% of scientists surveyed believe that genetically modified organisms are safe to eat, while only 37% of American adults concurred—a staggering 51-point gap. Other important issues engendered a similar opinion gap, including global warming (37-point gap), evolution (33-point gap), and use of nuclear power (20-point gap) (Pew Research Center). There is also concern about the ability of scientists to engage the public truthfully and behave ethically. Only a minority of Americans have more than just “some” trust that scientists conduct research that is in the best interests of humanity (73% with “some” or less trust, 27% with more than “some” trust) or that scientists are impartial on matters of public debate (76% with “some” or less trust, 23% with more than “some” trust)

(American Academy of Arts and Sciences). These studies demonstrate that the general community indicates trust in and respect for science as an institution, yet does not have high confidence in scientists' ethical conduct or humanitarian motivations.

In contrast, the public has a relatively high implicit level of trust in the ethics of physicians. More than two-thirds of Americans (69%) consider physicians to have “high” or “very high” ethical standards and practices. Many other countries have even higher rankings of trust in their physicians (Blendon et al., 2014). These divergent opinions are particularly curious since biomedical science gives rise to the advances in medicine that improve patient care. If biomedical and medical science are so tightly entwined, why does the public seem to have a more complex view of scientists? One possible reason lies in the semantics of the word “trust.” Fiske and Dupree defined trust as a combination of two general factors: warmth (or friendliness) and competence (or ability to carry out tasks well). They found that when American adults were asked to rate the public perception of a variety of common professions both on competence and warmth, physicians rated high on both axes, while scientists and researchers were high in competence, but relatively low on warmth (Fiske and Dupree, 2014). This implies that, in general, the public perceives the intentions of doctors to be good and that they are competent to carry out those intentions, leading to a high overall trust score. In contrast, scientists scored in the same category as lawyers: scientists are seen as competent, but lack perceived warmth, meaning



the public does not always trust the virtuosity of their intentions.

Access may underlie this perceived warmth gap between biomedical scientists and physicians. Physicians interact with the public daily, while scientists must actively seek out engagement with the community. This is particularly evident in a recent poll, in which 81% of Americans could not name a single living scientist (Research!America). Herein lies the first problem: according to a poll of Royal Academy scientists, scientists think that public engagement on science is only mildly useful (Sinatra and Hofer, 2016). Another poll found that scientists think of their “sphere of knowledge” as a distinct entity from the general public knowledge, and while willing to spend more time engaging the public, scientists are skeptical of the effectiveness of doing so (Peters, 2013). Without personal interactions, the public is forced to rely on second-hand interactions with scientists, which is an inherently cold relation. Perceived stereotypes from this lack of interaction are only reinforced in popular culture through television and movie portrayals of scientists. For example, an astounding 41% of horror films between 1931 and 1984 were found to have scientists or creations of scientists as the antihero, while being portrayed as the hero only 1% of the time (Moreno, C.S.). Rutjens and Heine also found that scientists are stereotyped as particularly robot-like and, while not inherently evil, capable of amoral actions (Rutjens and Heine, 2016). While there has been a popularization of science on TV (Sarner, L.) and a surge in STEM-related toys to engage the public at a younger age (Weinstock, M.), this is insufficient to offset current stereotypes. Increasing accessibility to science and actively engaging with the community may help remedy these perceptions.

In addition to becoming more actively engaged with the community, scientists can also publicly communicate the weight and respect that ethical concerns are given in science. Physicians are remarkably well known for this. It is commonly known that newly fledged physicians recite the Hippocratic Oath to imbue the weight of responsibility and detail the ethical implications they must consider

in their future medical practice and research. At the very least, it's well known that patients have rights and can expect the truth from the doctors they encounter. Scientists, however, tend to believe that ethical matters in science are best handled by the experts, and the experts alone (Peters, 2013). Perpetuating this belief that the public cannot comprehend complex ethical issues within scientific research opens the door to fear-mongering among the public about “big pharma” and “mad scientists.” Complicating this, controversies in scientific reporting may lead to a misunderstanding of scientific discoveries, or the meaning of reproducibility in science, leading to poor public understanding of the scientific process. Corroborating this, only 26% of the public self-reported a “good” to “very good” understanding of the scientific method (National Science Foundation). This may explain why the public does not always trust scientists to relay their research impartially. Scientists must regain the public trust by promoting ethical practices and working to ensure public understanding of research. Because medical doctors, with a high competence and warmth score, are all required to recite the Hippocratic Oath in some form, we feel that scientists' rapport with the public could benefit immensely from adopting a similar practice.

In 2014, the Johns Hopkins University School of Medicine Graduate Student Association (GSA) held its first Coating Ceremony to celebrate a significant milestone on the path to a Ph.D.: passing the qualifying examinations. We viewed this as an opportunity to impress upon new Ph.D. candidates—in a public forum—the responsibilities they accept upon becoming a scientist. While scientists are required to take ethics courses as part of their training, trainees were previously not required to recite any kind of oath upon entering or exiting graduate school. We felt this was problematic, as it reinforces that any concerns in science should be handled internally and not opened to the public. Additionally, there was no emphasis on the greater responsibilities that are required of scientists, all of which may lead to a perpetuation of the problems discussed above. To prevent this, the GSA created a Scientist's Oath for students to recite at the cere-

mony. In crafting the oath, we opened the conversation to students as to what values they should seek to uphold as scientists. A central theme that emerged was the importance of integrity and trust in scientists. In addition to public outreach and constant ethical conversations, we felt it was important to highlight the many other skills imperative to successful science that may get overlooked: the importance of collaboration and presenting work to the greater scientific community, crediting others' work and sharing successes, and promoting an inclusive atmosphere, to name a few. We also acknowledge that this type of oath should not be static but rather a living document, and we re-evaluate these principles biannually. These concepts served as the foundation for our Scientist's Oath:

“As I embark on my career as a scientist, I willingly pledge that:

- I will practice and support a scientific process that is based on logic, intellectual rigor, personal integrity, and an uncompromising respect for truth;
- I will perform my professional activities and interactions with scientific integrity and respect for the field and my peers;
- I will acknowledge my role as an ambassador of science to the public, and strive to be honest, respectful, and unbiased with engaging the public;
- I will value my work and its contribution to the scientific community;
- I will never let the potential for personal recognition or advancement cause me to act in a way that violates the public trust in science or in me as a scientist;
- I will foster a community that is inclusive of all and recognize that diversity cultivates innovation, creativity, and progress;
- I will acknowledge and honor the contributions of scientists who have preceded me and become a worthy role model deserving of respect by those who follow me;
- And I will always be cognizant that my work is for the advancement of knowledge and the benefit of all humanity.

By pronouncing this Oath, I declare my commitment to these professional standards and goals.”

Johns Hopkins University School of Medicine hosts an annual joint graduation ceremony for students receiving medical degrees and biomedical research doctoral degrees. At this ceremony, the medical students recite the Hippocratic Oath as a declaration of responsibility to their future patients and their being duty-bound to the public they serve. Because scientists have an equal moral responsibility and duty to the public, our Scientist's Oath is now recited by the biomedical graduate students. As biomedical and medical science rely heavily on each other, these parallel recitations remind both medical and biomedical science students of their shared responsibility as public servants. We believe making a Scientist's Oath as ubiquitous and well recognized as the Hippocratic Oath will catalyze conversations and create an environment that encourages public engagement, ethics awareness, and scientific integrity, leading to increased perception of public trust in scientists. We note that several others have called upon scientists to adopt such an oath (Rotblat, 1999; Benderly, 2007; Ravid and Wolozin, 2013); however, few schools ask their graduate students to recite an

oath at graduation. Given its important symbolism, we invite others to adopt and publicize a Scientist's Oath to send a clear message about the ideals their biomedical students should strive to achieve.

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WEB RESOURCES

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