SCIENCE AND SOCIETY

Do not trust science — verify it.

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Science is a resilient mechanism, standing strong throughout historical events just as it has in days that became history without mention. One might even say science thrives in the toughest of times. Despite its problems, it remains wondrous that such a large human endeavor functions more than it dysfunctions. Throughout my scientific career I have often felt strengthened by this organized chaos, especially at the moment my faith in science itself was tested.

In September 2011, I had just started my final undergraduate year at Tilburg University when I got word that my former boss had committed research fraud. He was the reason I wanted to become a researcher, but during that academic year I wondered whether I was convinced for the right reasons. Scientists are philosophers in their own right, convincing themselves of whether or not they can gain knowledge by studying natural phenomena. But during that time, it seemed like postmodernism had a place in it, where reality was constructed by research instead of manifested by research.

Throughout this struggle I started minimizing the value of research philosophically, which led me to nearly nullify my faith in science. How could we firmly know whether results were concocted to represent the beliefs of one or whether the results were based on true phenomena? Upon stupidly realizing that researchers are human and subject to unconscious biases, I minimized even more, which resulted in the re-evaluation of my entire reference library at that time (luckily I was still an undergraduate). I remained in dishevelment, because I was unable to determine whether I could believe in results --- simply trusting them was not an option anymore.

Considering that life is not idle, I did my courses, passed them, and life carried on while I gnawed on this problem further. I was not yet discouraged, because I knew there had to be something. Questionable research practices, such as publication bias due to statistical significance, discouraged some more, before I was exposed to the answer to my struggle. The answer had not presented itself earlier and I did not realize it was the way that science was supposed to be conducted; I had not been exposed to the idea in my initial scientific training nor had I thought about it this way. Science was supposed to be entirely transparent.

This realization came during my first full-fledged research project, where my supervisor said something along the lines of "Let's put all this online". He showed me where to put my files and since then, I have kept the uploading of all my research files in the back of my mind during the research process. There is a certain thrill of inviting other researchers into your files --- it is one of the most intimate things a researcher can do. What if I made a mistake? What if I made a decision prospectively that would be deemed irresponsible retrospectively? Researchers often fret about these things and I (still) do too. That is why, because of openness, I double- and triple-check everything, making me more confident of my results and, more importantly, willing to take responsibility for them and the potential mistakes. During the process of discovering openness, I realized that being able to see the process, see the human side of research, and its human interpretation allowed science to be subject to some biases without necessarily distorting it in its entirety.

If, despite the subjective human researcher, results remain consistent, they can be deemed more convincing of being true knowledge than when they do not. The current Zeitgeist of reproducibility and openness has helped me discover this tenet and I try to carry this forward. In my research, I have repeatedly strived to find out how human factors in science reflect themselves in research results, by aggregating individual results in a meta-analysis, replicating results, or ensuring that my own results are publicly verifiable. In talks, I have repeatedly extended on how the principles of openness relate to the very essence of science and try to show how easy it is to be open if one is willing to get past the initial hurdles. Being open has helped me better acknowledge good research, increased my exposure via preprints, and has gotten me invited to speak on matters of integrity several times. Having shared manuscripts even during the writing process has helped improve them before the preprint stage with uninvited comments. I will conclude by sharing what I have learned personally from being open.

The Universal Declaration of Human Rights (Article 27) acknowledges that all humans should be able to share in the advances of science, which resonates with me: science is inherently public. Being open has given me principles I am willing to actively take a stand for, even though I typically like the status-quo. I do not know whether being open will help me succeed in science (I certainly hope so), but openness has rekindled the scientific thrill I had and discovering it has given me a scientific topic I am driven to pursue. I could not imagine still being a researcher without being open, so I conclude that further openness, for me, is both necessary and sufficient.