Final Draft: Jan 9

Title: **Culture of Fraud: Science's Dirty Little Secret**
Catch phrase for twitter: ***Integrity in research ensures that its goal is to add to the existing body of knowledge, and not to a particular person's résumé.***
Authors: Biniam, Indra, May, Pariskevi, Roemel

To most of the world, scientists have an image of being rational creatures, driven (ideally) solely by the pursuit of truth and knowledge. They are thought to be honest, ethical and adherent to good scientific practice. However, fraud and misconduct in academia has been and is a serious problem – one that results from a complex culture that includes the ethos of "publish or perish"; current research culture doles out rewards in the form of grants and tenureship, and measures productivity by the measuring rod of publications. Medical research is a slow and rigorous process, and the cut-throat nature of life in research can incentivize not just outright fraud and misconduct, but grey areas conducive to taking a shortcut to scientific glory.

What defines a good scientific practice? Most of our research practices are learned through lab experience and from senior researchers with whom we worked closely. Certain questionable practices, such as p-hacking (1), have been normalized, and fraud and misconduct are a reality we cannot afford to shy away from in modern biomedical research.
Still, we need to distinguish between fraud and misconduct. Fraud is defined as plagiarism, falsification, fabrication or any other intentional manipulation. Misconduct on the other hand, is a broader umbrella, covering researchers' carelessness and inattentiveness to either essential scientific and/or statistical parameters, sloppiness of technician staff, or lack of good record-keeping. Yet other research activities are difficult to completely put into either category and the line between the two is quite blurred leaving several gray areas.

There are several driving forces that lead to scientists commiting fraud. There is a constant pressure to secure stable employment, and in a world where productivity and success is measured using the number of publications, especially those in journals with "high impact factors", leading to a culture of "publish or perish", it is no surprise that fraud is so prevalent in the scientific world. To succeed in such a cut-throat world, personality traits such as over-ambition, grandiosity, perfectionism seem "necessary", creating the perfect breeding ground for fraud.

Taken from: https://forbetterscience.com/2016/04/18/a-personal-tale-of-scientific-misconduct/

The research environment itself is not bulletproof, as tools used in science, by nature, are prone to manipulation. A common example is statistics, a crucial element in research. But actions like cherry-picking, messing around with data of higher or lower accuracy, playing around with the mean and the term of statistical power can lead to altered conclusions, and are often presented in a rather rational way. These errors can easily be missed by a review committee and subsequently be published, putting a manufactured result out in the world.

With all this being said, the scientific world has not been sitting with its arms folded. A lot of guidelines and systems have been established at the institutional and international levels in preventing fraud and misconduct such as cultivating and educating researchers by having quality mentorship and training programs and policies in recognizing the importance of complainants and whistleblowers in reporting fraud (2).

Potential solutions to control and improve this problem include pre-registration of all researches, a better control of all data from ongoing researches (for example through an online institutional database), required submissions of lab books in a timely manner, an organized method of paper submission for publication and a thorough review by the review board before approval. Also, scientists could have their work validated by an independent lab. Although costly, replication of results is an essential way of ensuring good and reliable results. Ideally, researchers should validate previous findings through replication before attempting to build on them. However, scientific journals themselves need to change their policies and give space for work that is not "ground-breaking"; this might include dedicated editions or space for research producing negative results, or research that attempts to replicate previous findings.

We are both the problem and the solution. All researchers should be accountable for the results they publish and they should give the utmost care and attention in generating them. Scientific journals are responsible for motivating scientists to produce *legitimate* results. Institutions should tighten their control over all researches under their wing to ensure that good scientific practices are adhered to. Rewards such as grants and recognition should not

only be focused on researchers and laboratories generating positive results and their number of publications. Together we can work towards upholding scientific integrity, as idealistic as the notion may seem right now.

References:

(1) https://www.vox.com/2016/3/14/11219446/psychology-replication-crisis
(2) http://retractionwatch.com/2012/07/16/how-can-institutions-prevent-scientific-misconduct/