

Fraud, the *h*-index, and Pasternak

While I was in Hong Kong at the IEEE International NanoElectronics Conference (INEC) 2010 meeting, an article appeared in the South China Morning Post, an English-language newspaper.¹ The article described how two professors from Jingtangshan University in Jiangxi Province in China published fake data in the journal *Acta Crystallographica Section E* in 2007. The two professors were fired from their university and stripped of Communist Party membership, indicating a grim future for them (but short of jail time). The article also covered the strong division in Chinese academic circles about the case. The source of the division is the debate on the underlying cause of the fraud. The opinion of many scientists is that the Chinese system of evaluation of the work of researchers is bureaucratic and links the number of papers in international journals, not their quality, to the performance of a professor. Pay raises and promotions are directly dependent on the number of publications. The system is based on numbers that are simple to evaluate. This upsets a lot of scientists who see the two exposed professors as victims of a bad system.

From my conversations with colleagues from China and from my experience as an Associate Editor of *ACS Nano*, I can attest that many sentiments expressed in the article ring true; while world-leading research is done in many laboratories, there is a certain level of unhealthy nervousness about publication numbers in China. One may take a high road about these facts, but if we look deeper, we can also see that this evaluation system established by officials of science and education ministries (China is only one of them) has simply formalized many aspects of the evaluation process of academic researchers in the U.S. and elsewhere. Indeed, the primary component of the degree, tenure, and promotion processes of scientists and engineers at research universities in the U.S. are the number of published articles and the ranking of the journals in which they were published. Now the question becomes, who is promoting evaluation based on simple numbers?

In this respect, as scientists, we ought to look in the mirror and ask ourselves what we have done. It is not any academic bureaucracy that forced us to evaluate our peers based on specific numerical metrics of ranking creativity and intellect, but rather the scientific community itself that generated and is perpetrating the "simple number approach". Neither the National Science Foundation nor any other federal funding agency that steers the development of science and engineering imposes overwhelming importance on the simple number of papers in their funding decisions. It is a factor among many other considerations, but no more than that.

There is a tremendous frenzy about the simple publication metrics among scientists of all calibers. Take, for instance, the *h*-index, which is a great reflection on how our community behaves. Discussion of new faculty candidates necessarily involves someone bringing up the *h*-index of the person in question. I have known academic researchers who track the *h*-indices of their friends, making diagrams similar to those of the stock market. Another colleague of mine takes every opportunity to mention that the *h*-index depends strongly on the field. There are also examples of scientists who advertise their *h*-index on the front page of their web site. These tendencies have been noted and satirized in a recent Editorial in our sister journal, *ACS Chemical Biology*, pointing out multiple ways to increase one's *h*-index artificially.² Such manipulations are nothing more than another form of scientific misconduct and fraud and are caused by overwhelming attention to this index.

Overall, the more simplified and metric-driven the evaluation of scientific work becomes, the more susceptible science will be to deceit and petty tricks. No one needs a numerical score to establish that Van Gogh painted or that Pasternak wrote at a highly

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creative level. Reduction of talent to a number, such as the cost of a painting or manuscript at auction, leads to new methods of manipulations. While the *h*-index does have some utility and convenience, the dangers of simple numbers and unhealthy consequences of their frequent consumption, just like simple sugars, need to be remembered very well. **The race for a high *h*-index and its dark side must not replace the joys of creative work and adventures of unraveling a challenging scientific problem** about which one feels strongly regardless of what may be its “off-Broadway” status. Who knows what may lead to the next breakthrough in science or technology, as has happened many times in the past?³



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REFERENCES AND NOTES

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