

Career Insurance. Enabling intellectual risks.

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ABSTRACT

Professional science has become risk-averse. In terms of papers per dollar science is more productive than ever, but, in terms of pushing through new, applicable understanding of life, it has stagnated. This is because the career structure in professional science rewards cautious, me-too productivity over investment in long-term, high-risk programmes. Exploring new fields requires that the investigator forgo papers, grants, students, and other measurables on which their future promotion will be based. The potential reward is not sufficient to balance this downside. I suggest that funding bodies could help to remedy this by creating a 'Career Insurance' scheme for young, imaginative scientists who want to take career risks to protect them against the downside of those risks. Most plausibly this could be by providing back-up funding for the investigator so that, if the speculative path fails, they have resources to return to 'normal' science and rebuild their productivity.

Two roads diverged in a wood, and I --
I took the one less travelled by.
And got lost.

(anon, after Robert Frost)

TEXT

There is a paradox in the practice of science in the 21st Century. Most people agree that scientific innovation is important to culture and the economy, but encouraging scientists to pursue science as a career, rather than as a hobby for the gifted amateur, creates a career structure that drives the scientist away from innovation. Success means a flow of students to staff a laboratory, promotion to new posts, and institutional availability of space and equipment. All of these are dependent on stature among one's peers, measured (in the life sciences) largely by papers published in top tier journals, grants obtained, plenaries invited, clinical trials successfully concluded and so on.

But conventional top-rank journals want all the data clear and unambiguous before a paper is published. Grant-giving bodies are over-subscribed by excellent applicants with good projects, and tend to chose only those most likely to 'succeed' by these same criteria, which means those taking least risks and usually those with 'preliminary' data already in place. Ethical boards want reasonable evidence that a clinical trial will work. State funders of Universities measure scientific productivity on an electoral timescale of a few years, which means papers published, and patents filed and licensed.

All these drive the career scientist to pursue safe lines of enquiry that are guaranteed to produce papers, grants and patents. Regardless of the lip-service paid to the need for innovation, spending five years chasing a radical new technology or probing a new mechanism orthogonal to current trends is career death, because even if successful it will not result in a publication or a successful grant application for half a decade, their careers will slump, they will never be able to get back on the career ladder, and will end up in a minor university teaching future accountants the structure of DNA. So the rising stars generate new ideas in the bar, and then bury them beneath career aspirations in the sober light of morning. The result is decline in creativity and genuine innovation in academia (1) and industry (2).

Some new subjects suffer from this specifically. At a conference on ageing in 2007, several speakers talked to the lack of career structure in biogerontology. Scientists only have one career, and dare not risk it on high-risk, high-gain programmes. Clinical research in several areas has suffered from this for a decade (for example, see Weisberg et al (3)). Once the first post-doc is over, people consider their career too valuable an asset to gamble with, no matter what the odds and the potential upside.

In other walks of life we also take risks with unique, valuable assets. We buy houses and cars, we fly our families to exotic destinations. We balance the risk to the asset involved by insuring against it, so that if disaster strikes we have resources to put ourselves back on track. Travel insurance does not stop our luggage getting lost, but it pays for its replacement.

I suggest that the same logic should be applied to scientific careers in order to make high-risk, high-gain research areas more attractive to the career scientist. The issue with new areas of research is not that investigators are not willing to try them, but that if they 'lose' 5 years of their career through following a theme which turns out to be unpublishable, un-fundable, or just unfashionable, then they have lost their career opportunities, and that is a risk few are willing to take. This risk however can be insured against by providing an agreement (let us call it Career Insurance) that provides the investigator with resources to pursue a more conventional research path for long enough to return to the scientific mainstream if their radical path fails. Most plausibly, a grantor wanting a young researcher to pursue some high-risk, radical research agenda would provide not just funding for that agenda but also a guarantee that, if the ambitious research programme fails, the investigator gets another 5 years' money to allow them to claw their way back into the scientific mainstream.

How would this work in practice? Unlike insurance for travel or property, the initiative would have to come from the funder, who would identify a programme they wanted pursued. (This is for purely logistical reasons – the alternative is to put out a call for grant applications for very risky and speculative projects with a Career Insurance guarantee behind the funding, and any agency doing so would be buried in the resulting proposals.) Investigators would propose specific approaches, and investigator and grantor together would define criteria for success. This last is the hardest part of the proposal: what constitutes success in science if it is *not* a steady stream of papers in high impact journals, grants from conventional funding bodies etc.? Specific technical goals ('milestones') are often anathema to academic researchers, but an element of milestones would have to be included. If the project is successful, then the investigator can of course apply to the funding agency for more

funding to continue the work, or to another agency. If it fails, then the funding agency agrees to provide another term of funding to the investigator *regardless of the subject of the funded research*. The investigator may choose to use this to continue the speculative work anyway, or may choose to return to 'mainstream' science.

As stated, such a system is wide open to abuse, and (despite the relative honesty of scientists compared to, say, bankers(4)) I would expect it to be abused. Just as you are expected to prove that your car was stolen before being given cash for a new one, so there would have to be evidence that you had diligently pursued 'success'. The Career Insurance would not be as generous as continued funding of the research, to avoid motivating scientists to appear to fail. However these problems are minor to the principle one, which is that the scientific career structure drives scientists away from genuine innovation.

Career Insurance would be best suited to those funding bodies with a specific, practical goal in mind rather than those that fund basic research. For example charities supporting research into specific diseases have a strong motivation to get results, and usually an interest not in incremental change but in genuine breakthrough (as incremental improvement is well tackled with the existing academic and industrial research infrastructures). Some have enormous resources and a proven willingness to support individual researchers over the long term. Could they use these resources to stimulate innovation in this way?

I invite them to think about it.

My thanks to Aubrey de Grey for extensive discussions on this idea.

- 1) Bruce G. Charlton, Peter Andras "Down-shifting' among top UK scientists – The decline of 'revolutionary science' and the rise of 'normal science' in the UK compared with the USA" 2008: *Medical Hypotheses* 70(3) 465-472
- 2) William Bains. "The Timetable of innovation." *Drug Discovery World*, 2006. 2006(2): p. 3 - 12.
- 3) P. Weissberg, H. Watkins, D. Crossman, P. Poole-Wilson. "Training in academic cardiology: prospects for a better future". *Heart* 2002; 87:198-200.
- 4) William Bains. "Fraud and Scandal in Biotech." *Nature Biotechnology* 2006; 24: (7), 475-476