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Editorial

Zombie science: A sinister consequence of evaluating scientific theories purely on the basis of enlightened self-interest

Summary Although the classical ideal is that scientific theories are evaluated by a careful teasing-out of their internal logic and external implications, and checking whether these deductions and predictions are in-line-with old and new observations; the fact that so many vague, dumb or incoherent scientific theories are apparently believed by so many scientists for so many years is suggestive that this ideal does not necessarily reflect real world practice. In the real world it looks more like most scientists are quite willing to pursue wrong ideas for so long as they are rewarded with a better chance of achieving more grants, publications and status. The classic account has it that bogus theories should readily be demolished by sceptical (or jealous) competitor scientists. However, in practice even the most conclusive 'hatchet jobs' may fail to kill, or even weaken, phoney hypotheses when they are backed-up with sufficient economic muscle in the form of lavish and sustained funding. And when a branch of science based on phoney theories serves a useful but non-scientific purpose, it may be kept-going indefinitely by continuous transfusions of cash from those whose interests it serves. If this happens, real science expires and a 'zombie science' evolves. Zombie science is science that is dead but will not lie down. It keeps twitching and lumbering around so that (from a distance, and with your eyes half-closed) zombie science looks much like the real thing. But in fact the zombie has no life of its own; it is animated and moved only by the incessant pumping of funds. If zombie science is not scientifically-useable — what is its function? In a nutshell, zombie science is supported because it is useful *propaganda* to be deployed in arenas such as political rhetoric, public administration, management, public relations, marketing and the mass media generally. It persuades, it constructs taboos, it buttresses some kind of rhetorical attempt to shape mass opinion. Indeed, zombie science often comes across in the mass media as being *more plausible* than real science; and it is precisely the superficial face-plausibility which is the sole and sufficient purpose of zombie science.

How do scientists decide whether a theory is 'valid'?

In contrast to the ideal of impartial and objective analysis, in the real world it looks more like most scientists are quite willing to pursue wrong ideas — so long as they are rewarded for doing so with a better chance of achieving more grants, publications and status.

Thus is 'enlightened self-interest' a powerful factor in scientific evaluation. 'Self-interest' because the primary criterion of the 'validity' of a theory is whether or not acting-upon-it will benefit the career of the individual scientist; 'enlightened' because the canny career scientist will be looking ahead a few years in order to prefer that theory which offers the best prospect of netting the next grant, tenure, promotion or prestigious job opportunity.

When a new theory is launched upon the population of scientists, it is unlikely to win converts unless the early-adopters are rewarded in a fairly obvious fashion — usually with a greater chance of generous research funding, the opportunity to publish in prestigious journals (plus a raft of new second-string specialist journals — to provide a home for the more modest and less-important papers), and the hope of increased status exemplified

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by interest, admiration and respect from other scientists.

How do bogus theories survive?

While it is simply human nature to respond to immediate incentives, this phenomenon does imply that theories may become popular or even dominant purely because of their association with immediate incentives — and despite their scientific weaknesses.

In terms of the classical theory of science; bogus theories should be readily demolished by sceptical (or jealous) competitor scientists, who will denounce the weaknesses of merely-fashionable theories in conferences and in print. However, in practice it seems that even the most conclusive 'hatchet jobs' done on phoney theories will fail to kill, or even weaken, them when the phoney theories are backed-up with sufficient economic muscle in the form of funding. Scientists will — at the margin — gravitate to where the money is; and the paraphernalia of specialist conferences (to present results at) journals (to publish in) and academic jobs (to work in) will follow as day follows night; so long as the funding stream is sufficiently deep and sustained.

Classical theory has it that a bogus hypothesis will be rejected when it fails to predict 'reality' as determined by controlled observations and experiments. But such a catastrophe can be deferred almost indefinitely by the elaboration of secondary hypotheses to explain why not fitting the facts is not — after all — fatal to the theory; but instead merely implies the need for a more complex theory — which then requires further testing (and generates more work for the bogus believers).

Furthermore, since the new version of the bogus theory, with its many auxiliary secondary hypotheses, is so complex — this complexity makes it that much harder to test: further putting-off the time when the bogus theory needs to be abandoned.

(Meanwhile, a much simpler rival theory — i.e. that the first theory is phoney, and always was phoney, and this is why it so singularly fails to predict reality — is regarded as simplistic, crass, merely a sign of lack of sophistication ...)

And anyway, there are massive 'sunk costs' associated with the phoney theory including the reputations of numerous scientists who are now successful and powerful on the back of the phoney theory, and who by-now control the peer review process (including allocation of grants, publications and jobs) so there is a powerful disincentive against upsetting the apple cart.

False theories, theories which never did have anything in their favour except careerism, can therefore prove very long-lived. However, they are probably not immortal. Eventually, the branch of science which is underpinned by a bogus hypotheses will be evaluated *as a whole*.

People will ask: what is the good of all this activity, effort and expense? And the answer will be — no good at all. An area of science underpinned by a bogus theory is really only a species of job-creation or make-work. Perhaps there will be some by-products — for example the development of new methods and technologies. But since these are an accidental spin-off, they do not serve to justify the field as a whole. And the plug may be pulled — so a whole branch of science goes down the drain.

The zombification of science

On the other hand, when a branch of science based on phoney theories is serving a useful but non-scientific purpose it may be kept-going by continuous transfusions of cash from those whose interests it serves.

For example, if a branch of pseudo-science based on a phoney theory is nonetheless valuable for political purposes (e.g. to justify government policies) or for marketing purposes (to provide a rationale for sales) then real science expires and a 'zombie science' evolves.

Zombie science is science that is dead but will not lie down. It keeps twitching and lumbering around so that (from a distance, and with your eyes half-closed) zombie science looks much like real science. But in fact the zombie has no life of its own; it is animated and moved only by the incessant pumping of funds.

Proper science finds its use, and gets its validation, from being deployed in technology. So proper medical science is underpinned by the effectiveness of medical treatments based upon its theories and results; proper physics is underpinned by successful engineering — and so on. But the findings of zombie science do not have value for technology because any technology built using bogus theories would likely not work in the first place; and if it did happen to survive construction then would soon fall from the sky, collapse, or otherwise crash and burn.

(Of course, such technical disasters can sometimes themselves be explained-away — and thereby covered-up — by yet further phoney theoretical elaborations, especially when there is monopolistic control of information. However, so long as there

are rival competing technologies being chosen by those who use them and depend on them, the inferiority of technologies based on bogus science is usually apparent.)

So, zombie science is not useable by applied science. What, then, is its function? In a nutshell, zombie science is supported because it is useful *propaganda*. Zombie science is deployed in arenas such as political rhetoric, public administration, management, public relations, marketing and the mass media generally. It persuades, it constructs taboos, it buttresses some kind of rhetorical attempt to shape mass opinion.

Indeed, zombie science often comes across in the mass media as being *more plausible* than real science; and it is precisely the superficial face-plausibility which in actuality is the sole and sufficient purpose of zombie science.

Can zombie science be killed?

Zombie science can be seen as the ultimate consequence of the practice of scientists evaluating theories in terms of their propensity to enhance scientific careers in the short- to medium-term — when this propensity is unconstrained by the imperative to use science in applied technology. Immediate personal careerist benefits seem easily able to overwhelm the more theoretical and abstract scientific benefits of trying to establish and adhere to the 'real world' truth.

What does this mean and what can be done about it? For one thing it suggests that the process by which science moves towards the truth may be much slower and coarser than it apparently used to be. In current science, there seems to be a greater possibility that large scale change may be fashion rather than progress, and such change may be serving propagandistic goals rather than advancing scientific understanding.

The emergent slowness in self-correction may perhaps be a consequence of the greatly increased *size* of the scientific enterprise as it has grown over recent decades — science now has a great deal of inertia. Science in the past was fast, light and nimble; and as easily redirected as a fleeing antelope. By comparison modern science may have a lumbering pace, but its vast bulk means that once it has begun moving in a particular direction, trying to deflect its path is like stopping a charging rhinoceros.

Any realistic prospect of reversing the expansion of zombie science would seem to involve greater competition among the suppliers of research grants. Where science funders are few, it is easier for a bogus theory to survive uncontested — whereas in situations where there are many potential sources of funding there is likely to be some competition among funders to debunk and replace bogus theories supported by rival grant givers.

(This model assumes that grant-awarders are engaged in some kind of competition to become the agency that supports the best, most revolutionary and most technologically useful scientific research — however, it is uncertain whether funders do in fact operate in this way. Certainly it would be desirable if grant agencies did compete to fund the best science and scientists — but perhaps funders cooperate, coordinate and collude, and therefore should instead be regarded as a cartel.)

In a world of competition among science funders, a particular research foundation (so long as it was sufficiently large and influential) could use its resources to help build-up a rival new theory to challenge, then supplant, an old and scientifically unsuccessful (because phoney) theory. By backing a winner and thereby triggering a scientific revolution, a competitive research foundation could expect to grow in fame and influence.

The natural desire of one scientist to thrive, even at the expense of another scientist's reputation and livelihood, would in this instance be additionally fuelled by the incentive of new sources of research support.

The resulting combination of individual ambition and acquisitiveness should ensure a sufficient supply of would-be debunkers to keep the gardens of science weeded of bogus theories, and to banish the zombies of science to the graveyards where they belong.

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