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Editorial

The vital role of transcendental truth in science

SUMMARY

I have come to believe that science depends for its long-term success on an explicit and pervasive pursuit of the ideal of transcendental truth. 'Transcendental' implies that a value is ideal and ultimate – it is aimed-at but can only imperfectly be known, achieved or measured. So, transcendental truth is located outside of science; beyond scientific methods, processes and peer consensus. Although the ultimate scientific authority of a transcendental value of truth was a view held almost universally by the greatest scientists throughout recorded history, modern science has all-but banished references to truth from professional scientific discourse – these being regarded as wishful, mystical and embarrassing at best, and hypocritical or manipulative at worst. With truth excluded, the highest remaining evaluation mechanism is 'professional consensus' or peer review – beyond which there is no higher court of appeal. Yet in *Human accomplishment*, Murray argues that cultures which foster great achievement need transcendental values (truth, beauty and virtue) to be a live presence in the culture; such that great artists and thinkers compete to come closer to the ideal. So a scientific system including truth as a live presence apparently performs better than a system which excludes truth. Transcendental truth therefore seems to be real in the pragmatic sense that it makes a difference. To restore the primacy of truth to science a necessary step would be to ensure that only truth-seekers were recruited to the key scientific positions, and to exclude from leadership those who are untruthful or exhibit insufficient devotion to the pursuit of truth. In sum, to remain anchored in its proper role, science should through 'truth talk' frequently be referencing normal professional practice to transcendental truth values. Ultimately, science should be conducted at every level, from top to bottom, on the basis of what Bronowski termed the 'habit of truth'. Such a situation currently seems remote and fanciful. But within living memory, routine truthfulness and truth-seeking were simply facts of scientific life – taken for granted among real scientists.

Introduction

I have come to believe that science depends for its long-term success on an explicit and pervasive pursuit of the ideal of transcendental truth.

'Transcendental' implies that a value is ideal and ultimate – it is aimed-at but can be known, achieved or measured only imperfectly. So, transcendental truth is located outside of science; beyond scientific methods, processes and peer consensus.

Transcendental truth is not, therefore, evaluated by science; but is instead the proper aim of science. Especially truth is the proper aim of scientists as individuals. In other words, science should be a social system dominated by scientists who are dedicated truth-seekers: who practice 'the habit of truth' and whose practice of science includes 'truth talk' that references current actuality to ideal aspirations.

(Henceforth in this essay, the word 'truth' should always be understood to refer to 'transcendental truth'.)

An experiment in excluding truth from scientific discourse

Although the ultimate scientific authority of a transcendental value of truth was a view almost universally held by the greatest scientists throughout recorded history, and was a frequent topic of discourse among scientists and in the literature until the mid-20th century; modern science has pretty much dispensed with the idea of truth. References to truth in an ultimate sense have by now been all-but banished from professional scientific literature and discourse; being regarded by a younger generation of hard-nosed and technically-orientated researchers as wishful, mystical and embarrassing at best – and hypocritical or manipulative at worst. Instead, all disputes are constrained to operate within an evaluation system of proximate methodology and peer approved standard practice.

Such exclusion of references to truth from scientific discourse could be regarded as an experiment which has been gathering support for about 50 years – although the overlapping of scientific generations meant that senior scientists continued to discuss truth in a transcendental fashion at least into the 1980s, and a handful still continue. The experiment in exclusion of truth talk was driven (presumably) by the desire for greater efficiency – on the belief that transcendental values are nonsense, and serve no function except to waste time and energy, to confuse and mislead. The assumption was that science could more-efficiently be done using just internal evaluations.

This profound shift within science is described most tellingly in *Real Science* by the late John Ziman [1] – a British physicist of great distinction as well as a philosopher and sociologist of science. He termed the transformation a change from 'academic science' to 'post-academic science'. Post-academic discourse is framed such that questions of truth have lost their meaning.

When truth was excluded, what replaced it? The answer is that without truth 'professional consensus' is left as the highest remaining evaluation mechanism. Peer review is now the ultimate validation procedure beyond which there is no higher court of appeal. Yet in science up to the last quarter of the twentieth century, peer review had a modest and inessential role [2,3]. Furthermore, peer

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review is not distinctive to science; but is a characteristic of all academic disciplines. In so far as peer review is the highest court of appeal in science, then science has been replaced with generic administrative procedure. In sum, peer review is neither necessary nor sufficient as a definition of science; and domination by peer review marks the disappearance of 'real science' and the inclusion of its activities within the system of large, complex trans-national bureaucracies.

The lack of any anchor of practice to transcendental truth has rendered many areas of modern science a kind of 'glass bead game' [4], disciplines that are free-spinning cogs with little or no explanatory, predictive or manipulative connection with the natural world. By its ultimate reliance on professional evaluations (various different versions of peer review applied to research funding, publication, prizes, promotions, etc. [5]) some branches of modern science have become structurally indistinguishable from academic literary criticism: arcane, rigorous, sometimes brilliant – but ultimately a fashion-driven pastime of ringing variations for the sake of career advancement.

This experiment in trying to do science without reference to transcendental truth has – I believe – failed, as evidenced by several linked phenomena including the decline of scientific genius [6,7], impaired efficiency in science (i.e. escalating input of resources with declining or static substantive scientific production) [8], and a pathological dependence upon social consensus as the ultimate arbiter of reality [5,9].

Charles Murray's Human accomplishment

In his magisterial book *Human accomplishment* [6], Murray suggests that the highest level of genius is attained more frequently in societies which explicitly and pervasively incorporate concepts of the transcendental values of 'the good' 'the true' and 'the beautiful'; or virtue, truth and beauty:

> "...A culture that fosters great accomplishment needs a coherent sense of the transcendental goods. *Coherent sense* means that the goods are a live presence in the culture, and that great artists and thinkers compete to come closer to the ideal that captivates them."

Murray used bibliometric methods to evaluate the importance of individuals in the sciences, arts, music, philosophy and literature from the earliest recorded times up to 1950. In essence, he created a representative sample of standard authoritative historical texts of different types, and used a variety of methods for measuring the relative attention devoted to different individuals or the numbers of their achievements. When these measures were totalled and ranked, Murray discovered (or confirmed) the relative importance of specific individuals.

So that, for example, Beethoven and Mozart were given most attention in texts of the Western Classical Music Tradition; in Literature it was Shakespeare; in Western Philosophy – Aristotle; in Western Art – Michelangelo. To turn to the sciences: in Chemistry number one was Lavoisier; in Physics – jointly Newton and Einstein, in Mathematics – Euler; in Biology the top 10 are Darwin, followed by Aristotle, Lamarck, Cuvier, Morgan, Linnaeus, Harvey, Schwann, Hales and Swammerdam; in Medicine the top ten are Pasteur, Hippocrates, Koch, Galen, Paracelsus, Paul Erlich, Laennec, McCollum, Fleming and Pare.

Murray also performed quantitative analyses across historical periods and between countries and tested several putative explanatory variables (mainly using multiple regression statistical methods) to try and understand why the highest levels of individual human accomplishment are often clustered spatio-temporally – e.g. Classical Greece and Renaissance Italy.

Murray's suggestion when applied to science is that a system of science which fosters a significant rate of great accomplishment by individuals (i.e. genius at an above-random or more-than-sporadic incidence of occurrence) needs to incorporate the concept of transcendental truth as a 'live presence' in its functional discourse [6].

Transcendental truth therefore seems to be real in the pragmatic sense that it *makes a difference*. The difference is systemic: one scientific system out-performing another [10] according to scientific criteria. A scientific system including truth as a 'live presence' seems to perform measurably better than a system which excludes truth – at least it performs better in terms of generating geniuses attaining the highest level of accomplishment.

But transcendental truth cannot be proven to exist in any *direct* way since it is neither detectable nor measurable – it is an ideal. Truth cannot be extracted, isolated, cloned or photographed. Truth is not a 'fact' within a discipline. Any real world measure of truth is approximate, incomplete and subject to distortion. So proximate 'performance' measures such as positions, prizes and awards, publications, citations, or amount of research funding are not the same as truth, and need to be distinguished from truth. Therefore – although real – truth is not *scientifically* demonstrable.

It is, in a sense, obvious that science must aim at something *outside* science; because if science was guided only by values from *within* science, then science would simply revert to an axiomatic or circular activity in which science validated science – so that false or useless science would be indistinguishable from true or useful science so long as it did not contradict its own internal rules.

Ultimately the value of science is measured in terms of its performance as judged from outside science, using non-scientific criteria. Science as a whole is evaluated on a criterion of truth, since what the rest of human life wants from science is reliable knowledge [11].

The habit of truth or a habit of hype?

Truth-seeking science is a product of the domination of the social system of science by intrinsically truthful scientists – and such a system will also evolve social mechanisms for the enforcement of truthfulness. One example of a practice of science that embodies truth-seeking is that which Bronowski termed the *habit* of truth [12].

Bronowski argues that for science to be truthful as a whole it is not sufficient to aim at truth as an ultimate outcome, scientists must also be habitually truthful in the 'minute particulars' of their scientific lives. The end does *not* justify the means, instead the means are indivisible from the end: scientific work is 'of a piece, in the large and in detail; so that if we silence one scruple about our means, we infect ourselves and our ends together' [12].

I believe that Bronowski's understanding of truth is a profound insight. However, it can readily be observed that at all levels of *modern* science, but especially among the scientific leadership, quite the opposite to a habit of truth applies: scientists practice a 'habit of hype'.

Routine modern scientific discourse, especially at the highest levels, is often as dishonest as it can get-away-with [13]. It is not merely that people are failing to aim-at truthfulness, which would be bad enough; scientists are too often aiming at the maximum amount of self-serving falsehood that is compatible with a fear of being denounced by those powerful enough to harm them. And when such denunciation is unlikely – i.e. when self-serving falsehood is compatible with the needs of established power – then the level of dishonesty among modern scientific leaders can be very great indeed.

The habit of hype is inculcated by the fact that scientific self-promotion has become a daily, even hourly, requirement for

optimizing career-survival and success [1]. That social reality is itself a consequence of the experiment in excluding truth from science, since hype is unlikely to be confronted with truth talk. And for a successful modern scientist, there is a pervasive need for competitive self-justification to promote demands, activities and achievements – expressed in papers, grant and fellowship proposals, requests for space and personnel, actions to attract and retain staff and leaders, engagement in media activities... the list is endless, the task continuous, and the consequence is that scientists receive a thorough training in marketing their research to any and all powerful stakeholders, until the activity becomes habitual.

Some scientists have so deeply ingrained a habit of hype that they never switch-it-off – even in private and off the record. Others have developed a dualistic cynicism whereby their public face is denied and mocked by their private opinions [14]. So that world famous scientists may privately and off the record acknowledge the triviality or falsity of work for which they are honoured and rewarded; work which they will advertise and hype to the skies when they appear in the public domain.

Dishonesty among powerful scientists is not necessarily selfish – often enough hype is done for the benefit of the research team, members of whom are dependent on the ability of their leader to 'spin' the team's research in a highly competitive marketplace of science. And anyway, in the environment of modern science, a one-off individual scientist who behaved with scrupulous honesty would nevertheless usually be assumed to be engaged in hype like everyone else; and would see the magnitude of their achievement discounted on this assumption.

But whatever the motivations, whether good or bad, selfish or altruistic, the pervasive abandonment of the scientific imperative for truth-telling has debased the currency of communication and eroded the integrity of modern science in the same way that monetary hyper-inflation damages the economy [13].

Is truth true, or just a convenient fiction?

It seems that transcendental truth is needed in science for many reasons.

One reason relates to the motivation for individual scientists to aim as high as their abilities allow. Only when science is truth-seeking can its practice mobilize the most profound dedication from its practitioners – a level of motivation far greater than that elicited by peer-approval-seeking science, or science done from a sense of duty [6]. Another reason for valuing truth is the need for science as a social system to tolerate (and if possible actively support) individuals who seek truth – even when this generates greater risk and a short term reduction in performance. Likewise to tolerate also the fact that the most brilliant and creative scientists will often have unworldly, erratic or abrasive personalities [15]. In other words, only the living presence of truth may provide a higher context for decision-making in which considerations of social expediency can potentially be transcended.

A third factor is that without transcendental truth the professional practice of science will drift away from its proper end and become something else. I believe that this has already happened – especially in medical science, which is the dominant world science – and the results are perceived by observers outside of science [8]. Yet the situation of ineffective, inefficient and misguided science is tolerated due to the apparent lack of viable alternatives. It is in order to generate alternatives that a greater understanding of the role of truth in science is needed.

But despite these advantages, the 'big question' for any modern scientist is whether transcendental truth really is 'true' or is merely a convenient fiction.

By 'convenient fiction' I mean the idea that even if it could convincingly be argued that scientists work better when they believe in transcendental truth; such 'truth' is actually no more than a delusion, albeit a useful delusion. The convenient fiction argument is that in reality there is no such thing as truth but it is a good thing for science and for society when scientists act *as if* truth is real.

Early scientists generally assumed that the truth was a property of the universe created by a God, communicated in outline to humans by divine revelation, understood by God-given reason, and applied to the study of Nature by God-given human ingenuity. They believed in both God and truth. Later scientists were atheists about God and realists about truth. For example Albert Einstein had an abstract, pantheistic view of the universe and a belief in the fortunate (but not God-given) rational and intuitive ability of humans to understand the nature of reality. Another generation or two onwards, and most of the best scientists were atheists about God and also did not believe in the reality of truth. They disbelieved in both God and truth, nonetheless the best scientists behaved *as if* they did regard truth as real. For example Richard Feynman was not religious and did not believe in transcendental truth but anyway lived and worked by a strict ethic of truthfulness and truth-seeking. Modern scientists have abandoned all this as so much useless baggage. They are atheists about God, relativists about truth, and careerists in their behaviour: they neither *believe*, nor behave *as if* they believe in transcendental truth.

How a scientist behaves is clearly more important than his or her belief system. But – viewed through the 'retrospectoscope' – I am not convinced of the coherence or long-term sustainability of Feynman's views – nor even Einstein's. The problem is that while the overall performance of science can serve as an empirical justification for the necessity of truth-seeking, if the truthfulness of science is a product of individual truthfulness of a multitude of scientists in the minute particulars of their everyday practice, then a goal of enhancing the overall performance of science seems too remote and weak an incentive to enforce a personal ethic of truth-seeking. A more proximate and powerful reason for truthfulness may be required if the endemic corruptions of parasitic selfish expediency are to be avoided.

So, in retrospect, Einstein and Feynman's attitudes both look like steps along the path which has led to the modern exclusion of truth from science. I suspect that for science to function over the long term might entail a basis of faith in 'scientific revelation' – specifically the revelations of transcendental truth transmitted by the great scientists of the past, upon whom modern scientists rely for a basic understanding of the reality of truth. For those who are both dedicated and fortunate, this basic understanding of the nature of truth may be validated and supplemented by the experience of personal revelations of truth.

In a nutshell, it seems that there are several ways to live by transcendental truth – ranging from formal theology to the assumption that an apprehension of truth and the validity of rationality were hit upon by chance, but amplified by natural selection mechanisms because they led to better results than the available alternatives. Some belief systems relating to truth may be more stable and coherent than others, but for scientists the crucial matter is that each should work according to an ethic of transcendental truth.

Recruiting only truth-seekers and truth tellers, encouraging truth-talk

Even when they regard it as desirable that science be truth-guided, modern scientists may find it puzzling to understand how truth could be operationalized in scientific practice; despite the fact that truth actually *was* operationalized in science until a couple of generations ago.

Essentially, what is needed is that the social system of science should be staffed by devoted truth-seekers and that transcendental truth should be (to adapt Murray's quote) a live presence in the culture of science such that scientific leaders compete to come closer to the ideal of truth that captivates them. Once such a system is established, then science should grow by recruitment of similar personnel – by a kind of 'apostolic succession' in which genuine truth-seekers recognize others sharing their own motivations. So science depends on a restoration of the truth-seeking apostolic succession of scientists.

(This mechanism of apostolic succession is most clearly seen in a field such as classical music, where the abilities and motivations of composers, conductors and solo performers are so refined and subtle that they can only be recognized and measured by the best of the previous generation by direct personal apprehension. So there are lineages of elite composers, conductors and performers – of pupils and teachers – stretching-back over many generations. But for music the ruling transcendental value would be beauty, not truth [16].)

One consequence of a restoration of the apostolic succession of truth-seeking scientists would be a return of 'truth-talk' in mainstream scientific discourse. Such an outcome would probably irritate philosophers of science (who might well see scientists' truth discussions as unacceptably lacking in rigour or question-begging) and also the large proportion of scientists who are actually technicians in terms of having a purely professional and instrumental perspective. It would also, no doubt, lead to a great deal of hot air and hypocrisy. Nonetheless, it is a necessary development.

Following this might come a restoration of the 'habit of truth' [12] at all levels within all legitimate branches of science. In other words a reinforcement of the primacy of truth evaluations that tend to hold science to its core function; and a focusing upon truth evaluations rather than – as so often at present [5] – a focus upon discriminating validity solely on the basis of secondary matters of standard technique, or peer evaluation, or non-scientific evaluations whether political, moral, financial, marketing or whatever.

The first necessary step is then to ensure that truth-seekers are recruited to the key scientific positions, and to exclude from leadership those who – no matter how valuable are their other qualities – have a record of untruthfulness either in minutiae or in big things; or exhibit lack of devotion to the ideal of truth. A further step would then be to enforce truthfulness within the system, with scientific sanctions against those who infringe this imperative. And individual scientists also need recurrently to reference their thoughts and activities to truth, if they are to mobilize their best efforts and strongest motivations for truth-seeking, and to direct their purpose toward transcendental goals.

In sum, to remain anchored in its proper role, science must frequently through 'truth talk' be referencing current professional opinion, standard practice and long-term strategy to the values of transcendental truth – a matter of modelling and comparing science as it is with science as ideally it should be. Ultimately, science should be conducted at every level, from top to bottom, on the basis of an habitual ethic of truth. Such a situation currently seems a remote and fanciful prospect. But within living memory, routine truthfulness and truth-seeking were simply facts of scientific life - taken for granted among real scientists.

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