

Good science or bad – who's to tell?

Philip Hayes proposes a quasi-humorous learning aid for those intent on studying scientific research and how (not) to do it.

(Slightly) Abstract

Yes it is, but would you hold that against me? If, as the philosopher Wittgenstein (1953) suggests, the whole of philosophy (and I will include the scientific method) could be written as a series of jokes, could this paper be better written by Billy Connolly? The probability of this occurring is $p < 0.05$ (actually a good deal less than 1 in 20), so instead please settle for a bit of philosophy of science, showing that the scientific method is only about as useful as the presuppositional bases of the people who use it. The results arrived at, following a not unholly line of reasoning, show a set of questions used to examine the quality of scientific research according to generally accepted principles (these may change as fashion dictates). The paper ends on a note of desperation and delight, and having examined just some of the difficulties and limitations of the method of scientific research, encourages you to just 'put up with it' and have some fun.

'The words of truth are always paradoxical' Lao-Tse

Introduction

Good or not-so-good science? How would you know? In a world well practiced in the art of deception and self-deception, what criteria will you use to make your judgement? Many times you might hear the claim that what is being recommended is 'scientifically proven', the assumption being that this somehow validates what is being advocated. The question to ask is whether the proof arises from good science or not? In the field of nutrition and diets, there are many claims made for the wonder of new supplements, new miracle substances, new and better ways of behaving, but how may you judge the reliability and truth of such claims? Even the most reputable of science and the most august of

professional bodies sometimes make huge blunders in their appraisal of what constitutes healthy behaviour and healthy nutrition; it is only with the benefit of hindsight and further investigation that the new truth is revealed.

Hoodwinked or blinded

One would surmise that some false claims for the wondrousness of products or practices are borne out of deception, a deliberate attempt to misguide in order to promote sales. Other falsehoods arise from an individual or group whose enthusiasm is so focused that their powers of criticality are lost or severely hampered. This is not a deliberate attempt to swindle others so much as a self-deception, within which information is filtered in a very skewed fashion. Acting in accordance with the mechanisms of belief, all information that might contradict the belief in the value of the 'wonder substance' is unconsciously deleted. Only those experiences that validate the efficacy of the promoted product are brought to the conscious. Such filters are basically determined by how the person or persons have wired up their brains, and are 'predetermined' by the overall scientific or not-so-scientific paradigm within which said persons culturally and socially exist. It is as if the landscape of the mind in which the person creates their experience only allows perception of pictures s/he is capable of painting. In simple terms, people only experience what they truly expect; beliefs act like self-fulfilling prophecies.^{1,2} It could be said that we are all victims of our own self-deception, though dispassionate observation would indicate that levels of self-deception vary greatly.

The philosopher, a comic & the search for truth

As you can appreciate, this ability all humans have to construct a world according to their beliefs means that

the search for any kind of absolute truth is likely fruitless. Those philosophers who have embarked on such a hapless quest have usually ended up mad or in torment, unless they come to appreciate the truly wonderful paradoxes of existence and enjoyed the humour therein! Groucho Marx probably had a much jollier existence than Wittgenstein!

It would probably be rather presumptuous of me to say that the pursuit of science is the search for truth. More often than not science is regarded as any systematic field of study or body of knowledge that aims through experiment, observation and deduction to produce reliable explanation of phenomena, with reference to the material and physical world.

In a sense, science has ducked out of the really 'difficult questions' surrounding happiness or the meaning of life and so on, restricting its activities to 'things'. Science does not, however, remove itself from the difficulties associated with working within any existing framework of truth. Note the difficulties associated with moving humanity's views about living on a 'flat world' to being stuck to a 'round world'. Nicolaus Copernicus was neither popular with, nor believed by, his 16th-century brethren when he demonstrated, with a reasonable degree of (mathematical) proof, that the world was not the centre of the universe. For the majority of his contemporaries it simply did not compute on the basis of previous experience and knowledge.

Forward to our own time and further examination of the physical world requires we re-evaluate many of our concepts of a 'Newtonian' universe in the light of a well-proven Quantum Theory. We are still coming to grips with the consequences of this last new (truth) thinking, and the real significance of this evolving paradigm shift has yet to permeate society and culture as a whole.

So in a sense we are trapped within the confines of any present way of thinking and perceiving, disabling us from any true objectivity or non-bias in our examination of anything new. Even the supposedly most innocuous and transparent of questions we ask about anything contain some prejudice and presupposition, which restrains the possible answers that might otherwise be available to us. We impose value and belief (and thus

bias) on our investigation by virtue of the beliefs and values we operate out of.

Given that this is likely always to be the case, science accedes to a fall-back position. The rules of science suggest we adopt certain attitudes, commensurate with the process and content of enquiry, which value a certain way in which we know what we know. This is exemplified by the branch of philosophy known as epistemology, the theory of knowledge. In simple terms, how do we know what we know? Within this philosophy is the uncomfortable but necessary prime directive that states 'That which we know is not the means by which we know it'. It is reported that over 60% of US citizens (within the group surveyed) believe in angels, but very few have categorical evidence of their existence. ('Have you seen one?' 'No.')

The epistemology that supports faith in the existence of angels is not the same epistemology used to prove that $50 + 50 = 100$. Likewise a truly hard-nosed scientist can, within one epistemological stance, prove that the universe is expanding whilst 'knowing' (different personal epistemology) that the world is besmirched by 'original sin'.

Hypothesis

Within the epistemological stance that we take in normal science, there are certain rules of conduct. Work within these rules, rules that others also endorse, and then just about everybody agrees with how things would evolve according to the accepted logic. The same evolving state (including that of being) would be experienced very differently by others of a different epistemological persuasion. No epistemology can (without self-deception) be viewed as any more right or wrong, good or bad, than any other. It is illogical to make that value judgement, as the judgement itself is born out of the epistemology used. Astute observers will realise that the previous sentence is itself illogical and self-referential.

Method (?)

To be seen to do good science, according to scientific epistemology, is to accept the terms and conditions of that particular epistemological club. Once you agree to enter through that particular club gateway, then it is as well to know the dress code, ethics, polite behaviour and rules of expression!

Background to method (unorthodox)

What I am guessing is that of late, almost-unnoticed forces (AUF) have increasingly driven the club's etiquette into the backwaters, as survival of the individual members becomes pre-eminent in their consciousnesses. Actualisation of higher principles is subsumed in the need to continue to feed the kids, and to feed the world.

Method cont.

As a student of the sciences, and wanting to be able to appraise what I was reading, I cooked up a tasty little mnemonic to help me remember what to pay attention to when perusing the literature. I now offer you the barely definitive delight that is VALOUR.

Results

VALOUR – or what to look for when reading scientific research.

- V valid ~ are the results a consequence of the intended experimental procedure?
internal validity: can the results of the study be attributable to the treatments or interventions used to influence the change?
external validity: can the results from a laboratory/controlled study be generalisable in the real world?
- A accurate ~ are the data and results measured, recorded and calculated accurately?
- L is it logical and systematic, in reasoning and interpretation?
- O objective ~ are those things observed and data reported unaltered by feelings, preferences and attitude?
- U unbiased ~ check, are the results and conclusions biased by virtue of the nature of the way in which the hypothesis is expressed, the number and selection of subjects, fiscal filtering (desperation!), self-deception and other (attitudinal and belief) filters of perception.
- R are the data/results reproducible with repetition and by other people?

The three most important things about learning to apply VALOUR with rigour and elegance are: a) practice, b) practice, and c) practice. The fourth, which is also a part of the first three, is to become a prolific reader of science, good or bad. Once you have read around enough topics and are considering writing in your

chosen area, remember at least this one thing. The quality of the science is only as good as the quality with which it is communicated. Please write well. Any scientific writing is a case to convince the reader. Despite the rules of science (or is it because of?) the reader has to be won over. There are tedious and entertaining ways of doing this. Please tend toward the entertaining. For expert and congruent guidance on how to communicate your science well, take some note from the well-communicated book written by Montgomery (2003).³

Discussion and conclusions

Does VALOUR work? Well it does for me, but as you may surmise from the above that's about as far as any belief will carry you. If it does nothing else, VALOUR will give you an enhanced perspective of what could possibly go wrong with your own research, and why you might want to pay a little more attention to the detail, who awarded the grant/funds, and what you can read between the lines.

It is customary within the discussion to recognise the limitations of the experiment and comment on one's own results in the light of these limitations. Usually the author(s) also evaluate the new findings (or lack of them) in the context of the previous knowledge (literature) and attempt to bring forward a slightly more integrated and perhaps developed perspective of the area of study under investigation. Often suggestions are made as to what to do next.

So be it. The limitation imposed by the notion of VALOUR is that you have to take things on trust; you don't really ever know if people are lying or not. Praise be to karma, and you just hope that people are as reputable as you would like to be, or perhaps more so. In VALOUR the V, A and R components do not pose too great a hurdle in terms of appraisal; at worst you could repeat the experiment yourself, to test the reliability of the written word. At least there is not quite the same potential as there is in the other categories (L, O and U) to expose some fundamental flaw or raging paradox in what you/they are attempting to do.

Any system of logic can be shown to contain anomalies (see Paulos (2000) for a light-hearted description of many of these).⁴ Objectivity can always be called into

question, as highlighted by Velmans (1990) (see box), and the whole question of bias and objectivity are considered indirectly but at great length within the seminal work of Kuhn (1962),⁵ celebrating the concept of a ‘paradigm shift’. All in all, it’s messy.

The assumption of objectivity is just that, an assumption, and represents at best a kind of shared inter-subjectivity. The ability to remain unbiased probably has a lot to do with how people stack their values. If the value of ‘unbiased’ is higher up the hierarchy than, say, ‘maintaining one’s position or standard of living’, then perhaps ‘unbiased’ would win out. If not, then there may be an alternative pragmatic decision, which will not necessarily become conscious or declared.

In conclusion, any scientist, now and in the future, would do well to be aware of the conundrums and difficulties associated with the pursuance of their craft. Maybe a level of self-knowledge (how would one know self?) and self-reflection (on what basis is that reflection made?) mixed with a goodly serving of the above deliberations, and catalysed by a sense of humour, might provide a personal instrument for the investigation of ‘things’. But, as for the ‘difficult questions’, well... that’s much too difficult and important to be left to science.

Quote taken from Velmans M (1990). Consciousness, Brain and the Physical World. *Philosophical Psychology* 3, 77–99.

Consider the conventional model of perception of an object O by a subject S, as viewed from the standpoint of an external observer E. From E’s perspective, the object (stimulus) and S’s responses to it (verbal, behavioural, physiological) are public, objective and observable; S’s experience is private and subjective. In fact E’s perception is no less subjective than S’s. Research on spatial localisation in various sense modalities, perceptual illusions, the treatment of blindness, and virtual reality has demonstrated that the world as experienced (the phenomenal world) is a projection based on clues from ‘out there’. Representations of external events are actually formed in the subject’s mind, but the mind models the world by projecting experiences to the judged location of the events they represent. With this reflective model of perception, the phenomenal world is part of consciousness: it cannot be thought of as separate from consciousness. Furthermore, the phenomenal world is only a representation; it cannot be the ‘thing itself’.

About the author

Philip was formerly a Principal Scientific Officer at the RAF Institute of Aviation Medicine, before becoming Director of Research at the National Hyperbaric Centre in Aberdeen, Scotland, in the late 1980s. Following twenty years of medical research he spent some time in business as a Director and Company Secretary of two health resource companies prior to retraining in NLP and other therapeutic processes. He was elected a Member of the Physiological Society of London and holds Master Practitioner Certificates in Neuro-Linguistic Programming (NLP) and Time Line Therapy, and has specialised knowledge of dealing with trauma and PTSD as a certificated practitioner of Parks Inner Child Therapy.

References

1. Dilts R (1999). *Sleight of Mouth – The Magic of Conversational Belief Change*. Capitola CA USA: Meta Publications.
2. Evans D (2003). *Placebo – The Belief Effect*. London: HarperCollins Publishers.
3. Montgomery S L (2003). *The Chicago Guide to Communicating Science*. London and Chicago: The University of Chicago Press.
4. Paulos J A (2000). *I Think, Therefore I Laugh*. London: Penguin.
5. Wittgenstein L (1953). *The Philosophical Investigations*. Oxford: Blackwell.
5. Kuhn T S (1962). *The Structure of Scientific Revolutions*. Chicago and London: The University of Chicago Press, 3rd edition, 1996.

To those who appreciate rational thought and good science; to those who understand and appreciate Enlightenment values; and to those who have tired of the limitations of new age solipsism, I recommend Francis Wheen’s excellent new book How Mumbo-Jumbo Conquered the World (4th Estate). This is a great read and an excellent antidote to the emotionally charged but often deeply illogical positions that still prevail in certain areas of nutrition. If (pharmaco) nutrition/naturopathy is ever to become the dominant model of healthcare that it could and should be, we must learn to make our hypotheses live in the light. Wheen’s book, which is thematically related to Philip’s article, is a milestone along the way. Paul Clayton