AGAINST SCIENTISM: Corrupted science and the fight for medicine's soul

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Abstract

This article maintains that via the current form of Evidence-Based Medicine (EBM), scientism (a pseudo-religious belief in science that is itself not scientific) has encroached into medicine. By asking what it is science can do, this encroachment is discussed in terms of upsetting the balance between the *necessarily conflicting* art AND science of medicine. In this context, one effect of Covid19 might be as a reminder of the Hippocratic Oath's overarching importance, which has always been the soul of medicine.

Keywords: scientism; Evidence-Based Medicine; inductive reasoning; Hippocratic Oath

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Introduction

"We must be guided by the science" has been the UK government's daily Covid-19 mantra, grateful for scientists to guide them… and as fall guys should things end up going south? Possibly, so questioning science's medical benefits and Evidence-Based Medicine's (EBM) success might seem absurd [1]. But is Covid-19 science concrete enough to provide the sought-after guidance? And is medicine just about 'the science' (as the EBM movement would have it), or does an older Hippocratic covenant still command its primary allegiance?

As nations emerge from lockdown, several versions of the science 'script' their actions. This raises questions about science's trustworthiness. And here in lies the rub. Trust implies belief, and belief in science is dangerous generating hubris, then resistance to revision and renewal. For science is unfinished and evolving.

Indeed, quietly eating away at its innards has been for science's successes to become objects of uncritical (and unscientific) veneration. Such pseudo-religious belief in science is called scientism, and it corrupts everything it touches, including medicine.

Science, it seems, is at a crossroads. On the one hand, scientism makes it a victim of its own success, threatening to stifle its creativity and renewal. On the other, 'alternative facts' (which like trapped wind, regularly escape from the bowels of the US White House [2]) and highly emotive post-truth politics [2] (plus the unapologetically hypocritical behaviour of government advisers [3]), are ensuring people might lose trust in expertise, especially scientific. Could science's perceived unemotional objectivity be partly to blame?

Based on (observed and agreed) facts, science is considered rational. Viewed dispassionately, however, history suggests such rationality has a sinister side, e.g., there was nothing irrational about the planning and execution of the Nazi's Final Solution [4]. War, destruction, genocide, all require rationality decouple from emotion. This is not however, the whole story.

Before asking how self-satisfaction at science's successes (from which scientism grows) arises, we will look at how EBM began, what it is now and how it has drifted from what its chief founder Dr David Sackett originally intended [5]. Then we shall examine science's logic and see how its misunderstanding is the soil in which scientism can flourish.

Evidence-Based Medicine (EBM) and scientism

Sackett envisaged EBM as a tripartite approach to healthcare:-

> "…that promotes collection, interpretation, and integration of valid, important and applicable *patient-reported, clinician-observed, and research-derived evidence"* (author's italics) such that;

- "The best available evidence, *moderated by patient circumstances and preferences*, is applied to improve the quality of clinical judgments." [6] Further; -
- "EBM *is not restricted to RCTs and meta-analyses*. It involves tracking down the best external evidence to answer clinical questions...if no RCT has been carried out… we follow the trail to the next best external evidence and work from there." [7]

RCTs were seen as part of a *3-fold evidence package* and that for the *patient's benefit*, these other forms of evidence were to be included. Then, in the mid-1990s, Sackett noticed [7] EBM was being reduced to *an evidence 'monoculture'.* Only evidence from RCTs and meta-analyses was to be considered; *patient-reported* and *clinician-observed* evidence was downgraded or ignored. So, deconstructing *current* EBM theory and practice reveals: -

- Intolerance [7]: therapies not 'proven' via RCTs/meta-analyses leads to their attempted eradication of pluralism in healthcare systems [8];
- Logical inconsistency [9], e.g., "*EBM's strict distinction between admissible (based on RCTs) and other supposedly inadmissible evidence is not itself based on evidence, but rather, on intuition…",* and, *"Ultimately, to uphold this fundamental distinction, EBM must seek recourse to (bio)political ideology and an epistemology akin to faith"* [9].

In other words, scientism has imposed itself on a more ecumenical EBM.

Is it wise to rely solely on RCTs/meta-analyses? Answering that requires, understanding the distinction between internal and internal validity. Thus, *internal validity* reflects whether a causal conclusion is warranted from a scientific study and whether the study minimises systematic error (or 'bias'). *External validity* is the extent to which the results of a study can be generalised to situations other than the target population.

Thus, Nancy Cartwright noted, *"RCTs have high internal validity but the formal methodology puts severe constraints on the assumptions a target population must meet to justify exporting a conclusion from the test population to the target*." [10].

Sir Michael Rawlins, a past Chair of the UK's National Institute for Health and Care Excellence (NICE) went further [11], "*RCTs, long regarded as the 'gold standard' of evidence, have been put on an undeserved pedestal. Their appearance at the top of hierarchies of evidence is inappropriate; and hierarchies are illusory tools for assessing evidence. They should be replaced by a diversity of approaches that involve analysing the totality of the evidence base.*" Rawlins argued for carefully conducted and interpreted observational studies which could provide useful evidence about interventions' benefits and harms.

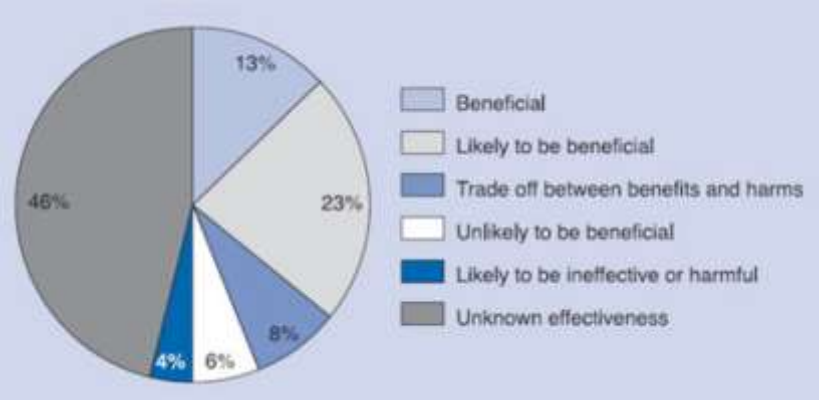
So as far back as the early 21st Century, exclusion of non-quantitative evidence and over-reliance on RCTs/meta-analyses was already being viewed as mistaken. But it gets worse. Greenhalgh *et al* consider there is a crisis for the whole EBM movement [12]. Thus: -

- *"The evidence based 'quality mark' has been misappropriated by vested interests.*
- *The volume of evidence, especially clinical guidelines, has become unmanageable.*
- *Statistically significant benefits may be marginal in clinical practice.*
- *Inflexible rules and technology driven prompts produce care that is management driven rather than patient centred.*
- *Evidence based guidelines often map poorly onto complex multi-morbidity."*

Greenhalgh *et al* go on to recommend [12], "*…refocusing on providing useable evidence that can be combined with context and professional expertise so that individual patients get optimal treatment…"* Basically, returning to what the founders of EBM originally intended [7, 8].

But if EBM is now so against 'unproven (i.e. via RCTs and meta-analyses) therapies', how do currently accepted interventions measure up according to EBM's own exacting criteria? According to the figures and pie chart below [13], not well: -

- *"Of around 2500 treatments covered, 13% rated as beneficial, 23% likely to be beneficial, 8% as trade-off between benefits and harms, 6% unlikely to be beneficial, 4% likely to be ineffective or harmful*, ***and 46%, the largest proportion, as of unknown effectiveness****…".*



So, if conventional medicine followed to the letter current EBM strictures, *nearly half of all medical procedures would cease until time-consuming and expensive RCTs had been performed to 'prove' their worth*. Conventional medical practice would grind to a halt.

Also, over 18000 RCTs are performed every year, which *"Because of the paucity of high-quality evidence, the data available – though voluminous– may have little meaning or value for informing clinical practice.*[14]*"* How has EBM got into this mess? Time to look at science's logic.

Scientific logic: the impossibility of black swans

Science's evidence-based approach – grounded in (observed and agreed) facts – should make it superior to emotion-based opinion. Obviously, but drilling down into science's logic does not provide the expected rock-solid base of reason.

This is because science's predictive logic is based on inductive reasoning [15] which crucially suggests the future will resemble the past. For example: '*I saw a white swan yesterday, and a white swan today. Ergo, the next swan I see will be white…*' Such naïve inductivism [16] is fine until you get to a place like Australia where black swans were first discovered.[1]

Imagine how a scientific community (minus instant communication, modern methods of analysis and Sir David Attenborough) might react to the first sightings of Antipodean black swans… "*Nonsense, impossible! Everybody knows swans are white, so they can't be swans. A new species of black avian, perhaps? Of course! Giant moorhens, grown large from lack of predation…!*" etc, etc.

Inductive reasoning in all its glory because '*the next swan I see will be white'*. And it comes with an unscientific subtext. "*We MUST hold on to what we have, or we might lose the lot, especially our reputations!*" Emotional, hardly rational and it affects basic research.

A proposal to study these 'black swans' is submitted, but 'There-are-no-black-swans' scientific orthodoxy sit on all the relevant research-funding bodies and control the purse strings. They will not fund anything as 'far-fetched' as black swans.

This is because 'white swan-based theory' is highly advanced – along with the reputations and careers of the eminent scientists who developed it - so even admitting the possibility of black swans would cause havoc among the 'There-are-no-black-swans' orthodoxy. *"Horror! Science as we know it will collapse. This cannot happen…!"* The proposal is rejected before referees even have a chance to review its scientific merits.

[1] In order to make the case as concisely as possible in an article of this length, technical details of long philosophical discussions have been deliberately over-simplified. Incorporating more philosophical detail would, in a referee's opinion, detract from the core argument, making it less clear.

Unperturbed, the proposal is rewritten, all mention of black swans being excised. Funding is now requested to study this new species of 'giant moorhen', and the proposal is resubmitted via a collaborator with different name and writing style. The referees love it and award full funding.

Meanwhile, sporadic reports of black swans keep on appearing in minor journals - so less likely to attract attention - amid vociferous denials from (so-called 'sceptic') supporters of the 'There-are-no-black-swans' orthodoxy, which of course does attract attention.

Eventually, a 'giant moorhen' is captured, dissected, and its obvious biological connection with white swans – not moorhens - firmly established. The 'ground-breaking discovery' is published amid great fanfare in a leading 'There-are-no-black-swans'-supporting scientific journal.

This helps catalyse what in 1963 Thomas Kuhn politely described as a 'paradigm shift' [17] (aka a scientific revolution), involving the figurative spilling of much orthodox 'There-are-no-black-swans' academic blood.

Before, it had been eager younger black swan 'revolutionaries' whose careers had been prematurely curtailed [18]. Now, the successful black swan survivors, having assumed the mantle of 'heroes of the revolution', do what all successful revolutionaries do on the way to becoming the new *de facto* orthodoxy: clear out the 'old guard' and suppress any discovery that challenges them. On and on it goes, emotions and unbridled feelings to the fore. So much for 'objective rationality'.

What science cannot do

But surely this is not about science *per se*, more about scientists' emotional responses. At which point the plea goes up (similar to some religions) that human beings are not perfect. Should we then not throw out the (scientific) baby with the (scientist) bathwater?

Because if science is a product of human imperfection, then the problem is properly understanding what it is science can do. Though created by 'imperfect' humans, ironically, this is not far from the truth. In order to begin the process of 'lancing the boil' of scientism, it might be better to ask what it is science *cannot* do.

First surprise; applying 18th century Scottish philosopher David Hume's strict empiricist notion of reasoning, *science cannot prove or disprove anything*! Hume asserted inductive logic could not be rationally justified at all [19, 20] and the word 'proof' belongs solely to *deductive* logical operations [21], e.g., mathematics. Hume's position is admittedly extreme, but it gives an insight into why science's predictions sometimes fail, or when they do succeed, might not stand the test of time.

What then about science's (presumed) greatest strength, that experimental observations must be independently verified? Surely this means scientists must be able to generate objective and infallible knowledge about the world.

Second surprise; no, it doesn't, as Galileo demonstrated (unwittingly) over four hundred years ago [22]. He measured the diameters of stars simply by hanging a movable piece of string in front of his telescope. Then, pointing it at a star, he moved the string until the star just disappeared behind it. Knowing the distance of telescope to string, string to star and string width, simple geometry revealed the star's diameter.

Galileo's experiment can be reproduced any number of times by anyone with a telescope and a piece of string. Yet to call the knowledge it generates infallible is plainly ridiculous, as the whole experiment rests on a false assumption. Like his contemporaries, Galileo believed stars existed in a sphere at a fixed distance from Earth. Of course, we now know different yet, in many ways, epistemologically science has not moved on.

Take for example dark matter [23]. There appears to be insufficient observable matter - stars, dust and gas - in spiral galaxies to provide enough gravitational strength to hold them together. Galactic rates of rotation are such, centrifugal force should scatter their contents to the corners of the cosmos. How, then, do galaxies manage to stay together for billions of years?

Easy: there must be vast amounts of extra matter that somehow disobeys known physical laws, so it is unobservable (i.e., dark) and interacts only weakly with ordinary matter. According to this

hypothesis, most of the universe consists of dark matter. Not only does it hold galaxies together, it also keeps huge galactic clusters in order. This leads to sophisticated maps of dark matter, and to years of as yet futile experiments trying to detect it.

Déjà vu, perhaps? Is it not just as likely that there could be something wrong with our underlying assumptions? For as with Galileo, such an assumption lurks beneath the quest for dark matter. It is called Universal Gravitation (dating back to Newton, then later to Einstein), and it assumes gravity's laws are constant and consistent throughout the whole universe.

But how could we possibly know? Our most successful probes – Voyagers I and II – have only just left the Solar System [24], a minuscule volume of space compared to our Milky Way galaxy; itself an infinitesimal speck in the whole cosmos. Universal gravitation is a convenient assumption gleaned from our Solar System and presumed to operate over the whole cosmos.

And the point of all this astrophysical speculation if this article is supposed to be about the effects of scientism on medicine? Simple: it raises the perfectly valid question as to whether science is capable of generating infallible objective knowledge. The answer is no!

This is because scientific knowledge has to be *objective,* in so far as it can be publicly tested by straightforward procedures, *but it also has to be fallible* so that it is capable of modification - even total rejection - by future advances in science and technology. Put simply, *fallibility ensures scientific knowledge is a) able to grow and evolve, and b) is protected from the corrupting influence of scientism*.

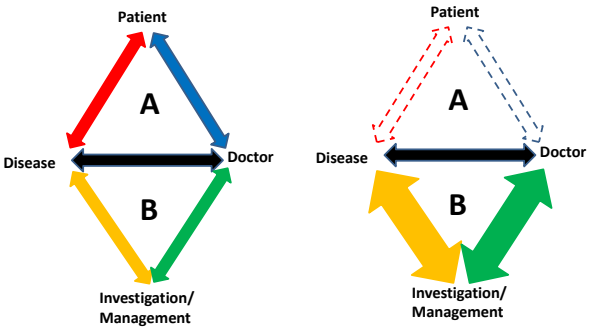
Scientism, its effect on medicine and Leggett's warning

Similar concerns led Paul Feyerabend [25] to conclude *science has no special features making it superior to other forms of knowledge*. Scientism's pseudo-religious belief in science [26] should therefore be treated with profound scepticism. Its 'catechism' maybe stated as: -

- Only *scientific* knowledge may be classed as *real* knowledge.
- There is no rational, objective form of inquiry that is not science.
- Science is the absolute and only justifiable access to truth.

Attractive as it might appear, this 'catechism' suffers from the problem of self-refutation [27], i.e., *scientism is itself NOT scientific because it cannot be scientifically verified*. Philosophers like Popper, Kuhn and Quine, etc reached this conclusion last century, rejecting scientism along with logical positivism. However, many scientists still unknowingly accept scientism which as students, they imbibed from their teachers like 'mother's milk'; a powerful argument for compulsory philosophy classes during the training of scientists [26].

Scientism's relevance here is that medicine is one of several disciplines (e.g., politics, economics, sociology, etc) that tries to emulate science's success. Unfortunately, this means adopting science's perceived outer trappings including scientism's pseudo-religiosity; its effect on medicine was suggested in a seminal paper by JM Leggett [28].



Thus, before scientism, the *art* of medicine was encapsulated in balancing the two essentially contradictory triangles A and B (left diagram). So, there is the individuality of the patient in relation to their disease and the doctor (triangle A), balanced by the commonality of the medically recognised disease, its diagnosis and treatment (triangle B).

Scientism's effect on medicine, Leggett maintains, is that by over-emphasising the science, it causes triangle B to be exaggerated, while negating triangle A (right diagram of figure). This can so diminish the patient's individuality, it effectively disappears. Leggett concludes: -

"***The conflict between the claims of individuality and uniformity may never be reconciled, but the 'art' of medicine has always been the dynamic interaction between these contradictory positions. This requires that we 'close the loop' of triangle A. If there is truth in both positions, then we must hold the two in tension. The only way in which this can be achieved is for each to be interpreted in the light of the other. It is necessary to develop not only an understanding of the common behaviour of disease within the context of infinite variety, but also an understanding of individuality within the context of similarity.***" [28]

Inspiring words: so, why have they been seemingly ignored? Possibly because scientism had already 'set in'. Several years after EBM's founding, only quantitative evidence gathered from RCTs and meta-analyses was considered valid: qualitative evidence was downgraded or ignored [7]. As noted, this effectively reduced EBM to an autocratic evidence 'monoculture'.

A reason for this might be that a reductionist view of reality (a necessary condition for scientism) has difficulty dealing with emergent behaviour arising from multiple simultaneously interacting variables. Its scientific *modus operandi* is to hold as many variables constant while changing one at a time, observing responses and then combining the results in an easier-to-follow linear fashion.

A holistic view of reality observes systems interacting with their environments and managing sometimes chaotic and variable multiple non-linear inputs and outputs. However, these are much harder to fit into neat linear schemes. By excluding qualitative variables, EBM becomes easier to manage and able to give apparently 'definitive' judgements on therapeutic efficacy.

Interestingly, the English poet William Wordsworth could have been eerily prescient about the negative effects of scientism, when over 200 years ago he wrote [29],

"*…Science appears but what in truth she is, not as our glory and absolute boast, but as a succedaneum* [30] *and a prop to our infirmity…*"

Conclusion: Hippocrates vs Hypocrisy and Covid-19

Arguments about the effects of scientism might appear academic, but that should not detract from their relevance. Thus, scientism strikes at the heart of clinical medicine: -

- Directly via current EBM's one-size-fits-all RCT/metanalyses evidence base as the only 'gold standard' criterion for therapeutic efficacy [7, 10, 11];
- Indirectly via Big Pharma which can bring pressure to bear on regulators and governments, because of its huge financial and synthetic hold over the development, testing, manufacture, marketing and availability of drugs [31-34].

The resulting profits mean if Big Pharma is caught in unethical or fraudulent practices [31-34],[2] it easily shrugs off fines that would cripple other businesses. Could Covid-19 change this?

Daily broadcasts featured poorly equipped and unprotected medical staff Hippocratically struggling against rising infection. In stark contrast, a hypocritically self-serving UK government dithered as, ignoring the EU, it awarded lucrative contracts for vital equipment to its Brexit-supporting allies in industry [35]. With Big Pharma misappropriating the EBM 'quality mark' [12], there could be dystopian consequences as with too rapid approval, the world rushes headlong after a Covid-19 vaccine.

[2] In this respect, it is worth remembering that the root of the word 'pharmaceutical' is the ancient Greek 'φαρμακον' or 'pharmakon' which apart from 'remedy' can also mean 'poison' or 'sorcery'.

For if and when it comes, who will take responsibility if the vaccine exhibits long-term, damaging side-effects? Assuming Big Pharma benefits financially, be in no doubt it has learned its survival lessons well since the demise of the Distillers Company over thalidomide [36]. Worse, will vaccine refusers (so-called 'anti-vaxxers') be further stigmatised and ghettoised as global panic erodes freedom of consent from vaccination?

In conclusion, this essay might suggest like Feyerabend [25], science isn't special or superior to other forms of knowledge. Yet he freely admitted science's obvious power. What he feared was its (mis)use via scientism, to 'bully' other forms of knowledge into accepting its methodology as the only route to 'truth' [37].

This article suggests scientism [28] (via a narrowly focussed, non-ecumenical form of EBM) is dragging medicine in a dangerous direction. If so, then clearly Leggett's warning [28] has been ignored and Feyerabend's fears have been realised. So, what to do?

As the very soul of medicine, the Hippocratic Oath is about more than the physical. Via word, deed and intention, a healer's beliefs can also do harm, e.g., the unique human being in front of them disappearing under layers of dogma or a welter of impersonal statistics.

Clearly, current EBM is not what its cheer-leaders would have us believe [8-12]. So, to begin with, there is an urgent need for Tricia Greenhalgh's trenchant criticisms [12] of current EBM to be heeded, and her recommendations implemented. At the same time the shortcomings of current EBM practice need emphasising, in the medical training and in CPD of qualified practitioners.

As far as its evidence base is concerned, this could have the effect of returning EBM to the more ecumenically humane state its founders originally intended [5-7]. It might also help reenergise the dynamic interplay between individuality and uniformity Leggett [28] felt was the 'art' of medicine.

Science advances when it is shown to be imperfect, wrong, or when scientists realise they just don't know. As the Covid-19 pandemic plays out, we are witnessing the process of science in action, as new discoveries about the virus sometimes force quite rapid turnover of earlier hypotheses. This is cause for hope for although it has as yet to produce the much sought-after cure, the alternative paths forward it generates make it more likely one might be found, rather than getting stuck up scientism's blind alley of belief.

However, there is another far more important cause for hope and that is the heroism and self-sacrifice shown by frontline medical staff during the pandemic. This has been massively appreciated by the public, while putting to shame the painfully obvious hypocritically self-serving incompetence of the UK government.

In the process, it has served to remind us of something. That regardless of the corrupting influences of Big Pharma and scientism, when the chips are down, the very soul of medicine is and always has been the Hippocratic Oath [38], and it is non-negotiable.

Conflict of Interest: none

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[33] Chen J, Luo X, Qiu H, Mackey V, Sun L, Ouyang X. Drug discovery and drug marketing with the critical role of modern administration. *Amer J Trans Res* 2018;10(2):4302-4312. See also pwc.com/gx/en.pharma-life-sciences/pdf/pph2020-marketing.pdf.
[34] Around the same time as the events recorded in [32], GSK acquired the contract to run the anti-doping lab at the London Olympics; a case of globalised 'poacher' turned expensive gamekeeper? See *GlaxoSmithKline celebrates its role in supporting the biggest anti-doping operation in the history of the Olympic Games*. https://www.gsk.com/en-gb/media/press-releases/glaxosmithkline-celebrates-its-role-in-supporting-the-biggest-anti-doping-operation-in-the-history-of-the-olympic-games/.
[35] See, *Coronavirus: Government orders 10000 ventilators from Dyson*, www.bbc.co.uk/news/business-52043767, 26/03/2020: *Coronavirus: 'Mix-up' over EU ventilator scheme*, www.bbc.co.uk/news/uk-politics-52052694, 26/03/2020.
[36] *Silent Shock: The Men Behind the Thalidomide Scandal and an Australian Family's Long Road to Justice* by Michael Magazanik, Text publishing, Melbourne, Australia, 2015, ISBN: 9781922182098.
[37] Feyerabend was not anti-science *per se*, more *anti-scientism.* For an introduction to his anarchic philosophy, see John Horgan. Was Philosopher Paul Feyerabend Really Science's "Worst Enemy"? Feyerabend, who defended astrology and creationism, denied that he was anti-science. *Scientific American*, October 2016.
[38] 'The government's herd immunity plan is callous and dangerous'. *The Guardian Letters*, Sunday, 15th March 2020: Packianathan S, Vijayakumar S. Compassion, kindness: Amid Coronavirus, Hippocratic oath a guiding light, doctors say. *Clarion Ledger*, https://eu.clarionledger.com/story/opinion/columnists/2020/03/28/coronavirus-mississippi-hippocratic-oath-matters-doctors-say/2929391001/.