



Ladyman, J. (2018). Scientism with a Humane Face. In J. de Ridder, R. Peels, & R. van Woudenberg (Eds.), *Scientism: Prospects and Problems* Oxford University Press.

<https://doi.org/10.1093/oso/9780190462758.003.0005>

Peer reviewed version

Link to published version (if available):

[10.1093/oso/9780190462758.003.0005](https://doi.org/10.1093/oso/9780190462758.003.0005)

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PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via Oxford University Press at

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‘Scientism with an Humane Face’¹

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1. Scientism: Sin or Salvation?

Scientism is usually thought of as sinful but it can be redeemed for our salvation. All that is required to arrive at a worthy form of scientism is application of the heavenly virtues of charity, humility and temperance. Scientism should not be dogmatic or uncritical, nor should it ignore the actual limitations of current scientific knowledge. There are other modes of inquiry that deserve epistemic respect, and scientists should not be deferred to about matters beyond their expertise.² However, limits should not be placed on what science can study and we cannot say in advance what the limits of future science will be. Where it conflicts with common sense, religion and tradition, science should be regarded as authoritative for the purposes of education and public policy as well as objective inquiry; and scientific knowledge is even relevant to moral and political deliberation.³ This is the core of scientism.⁴ Section 3 of this paper elaborates a way of thinking of scientism as a stance (in the sense of Bas van Fraassen explained in the next section) characterised in terms of positive and negative components. Section 4 characterises and defends an humane form of scientism worthy of further development.

The term ‘scientism’ is standardly used pejoratively to refer to:

- (a) The misapplication of scientific methods outside of appropriate domains;⁵

¹ Thanks to the organisers and the other contributors to the Amsterdam conference, from whom I learned a lot about scientism. Special thanks are due to Alex Rosenberg, Susan Haack, and Don Ross. I am extremely grateful to Jeroen de Ridder, Rik Peels, Damian Veal and René van Woudenberg for detailed comments on a draft.

² As discussed further in Section 4, to say that an activity deserves epistemic respect means among other things that it makes a contribution to knowledge.

³ ‘Science’ should be taken to mean well-established science, not the latest hypotheses. Of course, there are borderline cases and they should be taken on a case by case basis.

⁴ There are many forms of scientism and many ways of categorizing them, as explained by Rik Peels in his chapter in this volume. The core of scientism is epistemological and methodological. The humane scientism defended here does not match exactly any of the varieties identified in the literature, but it is has something in common with many if not all of them.

⁵ Susan Haack (2003) makes this number (5) among six features she associates with scientism (the last of which is (c) below, and more of which are discussed in Section 3). It is the most important since, fundamentally, the debate about scientism is about whether or not we should set limits to scientific inquiry, or so this paper argues. Haack is right that the way the term ‘scientism’ is standardly used makes it definitively a bad thing. However, here it is argued that it can be reclaimed and used positively because it

- (b) excessive faith in science's ability to replace existing forms of inquiry;
- (c) disdain for the contribution of the arts and humanities to our knowledge and self-understanding; and,
- (d) extreme forms of scientific realism and reductionism about current science, and internalism about the history of science.⁶

Scientism is usually portrayed as a kind of scientific imperialism that urges scientists to conquer new domains. For example, neuroscience, cognitive science and Darwinism being used in literary criticism might be so regarded. However, the metaphor of conquest is not apt because the scientific study of a new domain need not involve conflict with existing forms of inquiry, even if some enthusiasts (often popularisers in evolutionary psychology or neuroscience) overreach by claiming so. The term 'scientism' was introduced to criticise those who advocated that human beings and society could be studied with scientific methods. It was largely (a) that was at issue then as now. The charge of scientism was first brought against those who had the temerity to argue that there is something to be learned from what we now call the behavioural sciences.⁷ Despite the tradition of philosophers of social science arguing against naturalism, the view that there is no knowledge at all to be had in economics, scientific psychology, and so on, is implausible in the extreme, and current critics of scientism do not defend it. Instead, the boundary of what cannot be studied scientifically is standardly placed at consciousness or experience. Scientism that denies limits to science need not support (b)–(d).

To reclaim scientism as a badge of honour, and to advocate the unlimited application and/or further development of scientific methods, does not require regarding scientific knowledge of human beings as replacing all the other ways people study their humanity and culture. The scientific cause need not devalue and threaten the arts and humanities as in (b) and (c). Indeed, far from replacing them science has of course given the arts and humanities much more to study; since, for example, one can now study literary form in scientific writing. Moreover, the arts and humanities have to some extent abandoned traditional presuppositions about human beings and the world, for example, essentialist ideas about gender and race, and geocentric ideas about cosmology that science has refuted. To a significant extent we now have an arts and humanities that reflects and is indebted to our scientific knowledge of the world. However, these developments do not undermine the fundamental goals of humanistic study, and indeed any sensible humanist does not want to be in the grip of falsehoods. The appreciation of facts is not exclusively a trait of scientists. The arts and humanities have evolved with the advancement of science, and rightly so. It would be absurd for literary critics, historians or philosophers to

was originally deployed to criticise a scientific expansion that proved successful.

⁶ In debates about the historiography of science, 'internalism' is taken to refer to the idea that scientific theory change can be explained with reference to arguments, evidence and experimental results, and without reference to economic, political, psychological, and social factors.

⁷ Some, such as Hayek (1979), use the term 'scientism' to criticize particular forms of putative social science that they regard as pseudoscientific. Misapplication of scientific methods is always bad science, and the superficial imitation of science and unwarranted appeals to scientific status are not scientism but pseudoscience.

continue to think in the terms of the kinds of theories we had about ourselves before we acquired our scientific understanding of our bodies, our brains, and our evolution.

Insofar as charge (a) presupposes that there are a priori limits on what can be scientifically studied, it begs the question against scientism. There may be good arguments for limits to science, but putative examples have been repeatedly refuted by the progress of science so far, and the prospects for further extensions of science into new domains are good. For example, the study of the brain and consciousness is at an early stage, and big data and supercomputing is opening up new possibilities. However, how successful they will ultimately be remains to be seen, and in both domains there is a good deal of pseudoscience or at least overreach. The defender of scientism does not say in advance how and where the application of scientific methods will be successful, or what kind and extent of knowledge is possible. Often the questions science ends up answering are not the ones with which we began, since the scientific study of the world teaches us how to think about it better. Science also teaches us how to do better science. These arguments are made in more detail in Section 3.

As for (b), clearly, scientific hubris is as bad as any other kind.⁸ Scientism must guard against an uncritical attitude to science. It must frankly acknowledge how much remains speculative or unknown, and avoid complacency about the extent to which current science is free from economic, ideological and political influence. However, such self-critical vigilance is no ad hoc modification of scientism. Rather, it is compatible with the scientific spirit given voice in this paper, which is arguably just the spirit of science itself (about which more is said in Section 3).

In relation to (d), there is a scientific view that all scientific theory change is rational and independent of cultural, historical, psychological, social, and political factors, and that our best scientific theories are entirely and literally true. However, arguably that is undermined by the scientific study of science. Any defender of scientism who reflects with a scientific attitude on the history and philosophy of science can reasonably be expected to have an appropriately circumspect view of science, in contradiction of (d), and again in keeping with the scientific spirit. Similarly, strong forms of reductionism are arguably not scientifically defensible and need play no part in scientism (see Ladyman and Ross 2007 chapters 1 and 2 for a discussion of reductionism and scientific realism and antirealism). The issue of whether scientism must involve some form of materialism or physicalism is taken up in Section 3.

Scientism can be seen as a struggle for science's self-determination in seeking to liberate territory from the forces of superstition and the supernatural, and denying non-scientists the power to stipulate what can and cannot be studied scientifically. Disdain for the arts and humanities (c) is not a core component of scientism, but it does regard beliefs about human nature and the world based on common sense, intuition, religion, and other forms of tradition, as having no privileged claim to truth over rival beliefs based on differing

⁸ Haack (2003) defines scientism as "a too uncritically deferential attitude toward science".

intuitions or traditions, and no immunity to revision in the light of scientific knowledge.⁹ It also denies that there are any domains of inquiry that are in principle off limits for science, while accepting that actual science and scientists are imperfect and limited. (The relationship between science and value is discussed in Section 4).

In philosophy scientism is similarly a struggle for liberation, but this time from common sense, intuition and tradition. Ladyman and Ross (2007) argue for a rebellion against the dominant concepts and methods of analytic metaphysics and their replacement by naturalised metaphysics. They articulate and defend a form of scientism in metaphysics that synthesises empiricism and materialism as characterized by van Fraassen, adopting his notion of a philosophical ‘stance’, as briefly explained in the next section. They say little about scientism outside of philosophy, and are much more circumspect than those advocating strong generic forms of scientism such as Alex Rosenberg (2011). Notably, unlike the latter they do not advocate physicalism.¹⁰ Brown and Ladyman (2009) argue for a weak form of physicalism, and argue that, like empiricism and materialism, it has positive and negative components. In what follows I build on all the above work to defend ‘the scientistic stance’. I argue that scientism, like empiricism and materialism, is so fundamental to the philosophical views of its adherents that it is arguably best considered as a stance or orientation rather than as a particular doctrine. So construed, various positive and negative components characterise stronger and weaker forms of scientism. I argue that the scientistic spirit should be identified with the intellectual qualities that many scientists and philosophers of science have valued most in science, and so ought to be similarly valued. It is compatible with a humane form of scientism that avoids the excesses of (b)–(d) above.

2. Van Fraassen on Stances¹¹

The motivation for the idea that some venerable philosophical positions should be recast as stances is the implausibility of the alternative: namely, understanding them as doctrines. Van Fraassen characterises the latter view as implicitly adopting what he calls ‘Principle Zero’: for any philosophical position X, there is a statement X+, such that to adopt X is to believe X+ (2002, p. 41). While it is interesting and important to explore the various different doctrines associated with philosophical positions such as empiricism and materialism, to reduce them to such doctrines does not do justice to the depth and breadth of their influence, nor to what it is to be an empiricist or a materialist. To have such a stance is to engage in certain forms of life and not others, to have various attitudes,

⁹ Common sense beliefs are of course often true and confirmed by more systematic study. Likewise traditional belief systems embody much knowledge. That is not the issue here. Rather the point is that if scientific study determines that a folk remedy is inefficacious the fact that its use is entrenched in a culture cuts no epistemic ice.

¹⁰ This paper is compatible with everything that Ladyman and Ross 2007 says but it says things about scientism more broadly with which Don Ross may not agree, or that he may think are too weak. Note that everything that follows is compatible with denying the very strong form of scientism that Rosenberg defends which tends towards including (c). Ladyman (2011) develops the scientific stance in relation to metaphysics.

¹¹ What follows is a brief exposition of ideas in *The Empirical Stance* (Van Fraassen 2008).

commitments and values, and to adhere to certain norms. The concept of a stance is a much richer one than the concept of a belief or doctrine. The appraisal of beliefs takes place from the point of view of a stance, and the methods and background beliefs associated with different stances may differ. Van Fraassen's epistemology is voluntarist in the sense that there is no ultimate source of epistemic authority, and we have a choice about upon what to rely. Stances do not admit of neutral adjudication or justification. However, a stance may lead to one's life going more or less well by one's own lights and one may adhere to a stance, or abandon it and adopt another one accordingly.

In the case of empiricism, X+ is the claim that all knowledge comes from experience, with the corollary that there is no a priori knowledge. Van Fraassen points out, however, that it is implausible to claim that we know by experience that all knowledge comes from experience. On the other hand, the claim that there is a priori knowledge seems to be ruled out of empirical confirmation a priori by empiricists. These principles of empiricism cannot be treated as falling within their own scope on pain of inconsistency. The attempt to grapple with these problems under the grip of Principle Zero leads to the dichotomy between 'naturalised' and 'transcendent' empiricism, where the former takes empiricism to be empirically justified, and the latter takes it to be somehow uniquely lacking the need for empirical justification. Van Fraassen takes it that neither of these two positions is acceptable and so concludes that Principle Zero is false, and that empiricism is best understood as a 'stance'. He goes on to present materialism as a stance too.

Stances have positive and negative doxastic and methodological components. In the case of empiricism, the positive components are to take one's knowledge from experience, and to regard any proposition as in principle subject to empirical consideration. The negative components of empiricism are the view that there is no substantive a priori knowledge, and that rationalist methods do not deliver knowledge of concrete reality.¹² Explanation should not be by posit. Indeed the demand for explanation must at some point be rejected and many empiricists disdain explanation in terms of unobservable entities, properties and processes.

As characterized by van Fraassen, materialism has much in common with scientism insofar as among its positive commitments are that we should defer to science about what exists, and that science is complete in the sense that there is nothing real that it does not describe. The materialist also thinks science tells us that everything that exists is material. Among its negative components are the attitude that there is nothing supernatural, and the value that science should not posit *sui generis* intentional, mental or spiritual entities or properties to explain human behaviour, and intentional, mental or spiritual phenomena such as they are.

The problems with empiricism include the role that a priori thought plays in science, how

¹² The restriction to 'substantive' knowledge is intended to allow the empiricist to concede that there is analytic a priori knowledge of a sort, for example, knowledge that a vixen is a female fox had by someone who has no experience of foxes. Empiricists of course have the problem that rationalist methods seem to give knowledge of mathematics. Hence the restriction to 'concrete' reality in my formulation may be too concessive.

to deal with the problem of induction and confirmation of theory by evidence, and the importance in science of the search for explanations of phenomena in addition to regularities that subsume them, and the success of positing unobservables such as fields and particles. The problems with materialism are that we need to know what exactly science is for us to be able to defer to it, that current science is nowhere near complete, and finally and fatally, that science tells us that not everything is material, indeed arguably it tells us that nothing is.¹³ In both cases, and in the case of physicalism (about which more below), the positive components are harder to defend than the negative ones. For example, the view that all knowledge comes from experience is harder to defend than scepticism about the pretensions of those who claim a priori knowledge of reality, and scepticism about the pretensions of those who claim to know of the existence of immaterial things retains its appeal even if matter is not what it was thought to be. Arguably, materialism can be revised to physicalism in a way that retains its core negative commitments (Brown and Ladyman 2009). In the next section it is argued that scientism is best thought of as a stance, and that as such it synthesises elements of empiricism, materialism and physicalism.

3 The Scientistic Spirit

If there were a Principle Zero for scientism it would be a doctrine such as that all knowledge comes from science. So understood it would face the same dilemma as empiricism in answering the question as to how we know scientism is correct. Furthermore, the idea that all knowledge comes from science is not plausible because we have plenty of other sources of knowledge including memory, perception and testimony. All of these are fallible, of course, but so is science. Both the idea that science tells us that all knowledge comes from science, and the idea that the latter claim is uniquely self-justifying can make scientism so characterised seem idiotic and dogmatic, but neither is part of what we should take the position to be. It is more appropriate to think of scientism as a stance because it too is richer than doctrines like the above and it involves norms, values, commitments and forms of life.¹⁴ It is helpful in this regard to distinguish between the positive and negative components of scientism, by analogy with the positive and negative components of the other aforementioned stances.

The core positive commitment of scientism is that there are no domains of inquiry that are in principle off-limits for science. Everything real can in principle be investigated by scientific methods and no limits should be placed on what science can study.¹⁵ It follows

¹³ Science tells us not everything is material because the ontologies of the special sciences include such things as mating strategies and markets. Physics tells us that ordinary matter is mostly empty space and that subatomic particles are very different from motes of dust. See Ladyman and Ross (2007).

¹⁴ A lot more could be said about all of these in relation to all the stances mentioned in this paper, especially about the associated forms of life. The commitments, norms and values of the scientific stance are like everything in science, subject to self-critical scrutiny and revision and this makes it very different from other stances.

¹⁵ Of course making this precise requires a specification of what science and scientific methods are, about which more below. As a first approximation, take them to be given by ostension of the actual scientific community (as Ladyman and Ross do in formulating their 'Principle of Naturalistic Closure', which is

that we should not believe in what is claimed to exist but posited to be inaccessible to science in principle. What can be studied by science is what we take to be the natural world. In particular, we ourselves and our cultures and societies are part of nature. This all clearly has much in common with aspects of materialism as characterised by van Fraassen (and very much echoes Wilfrid Sellars). In common with empiricism, scientism holds that science based on experience is the best way to acquire knowledge about the world. Scientific culture and its methods are supremely reliable and self-correcting.¹⁶ It is important to add the commitment that science be regarded as authoritative for the purposes of education and public policy. Scientific knowledge is even relevant to moral and political deliberation, as argued in the next section. A further positive commitment is to science replacing all other forms of inquiry. As discussed in the introduction, the latter is not necessary for scientism. In the next section it is argued that it should not be adopted.

The core negative commitment is that, as said above, beliefs about human nature and the world based on common sense, intuition, and religion and other forms of tradition have no claim to the truth over rival beliefs based on differing intuitions or traditions, and no immunity to revision in the light of scientific knowledge. This can be thought of as subsuming empiricism's rejection of a priori knowledge, and materialism's repudiation of the supernatural. According to scientism, common sense, intuition, and religious and other traditions have no epistemic authority over science. There is no systematic institutional source of knowledge of the objective nature of the world that trumps science.¹⁷ A further negative component is disdain for the arts and humanities, and all other forms of humanistic inquiry. Again, as discussed in the introduction, this is not necessary for scientism. In the next section it is argued that it should be repudiated as not in keeping with the scientific spirit.

Scientism is popularly associated with many other ideas. As noted in the introduction in (d), these include unrealistic ideas about how science itself works, as well as strong forms of materialism and reductionism (about which more below). Scientism is also associated with various forms of ethical and political views, some of which are discussed in the last section. However, none of these are part of the core idea of scientism, and many of them conflict with its spirit, as argued below.

As with empiricism and materialism, the positive components are harder to defend than the negative ones. For example, the claim that science tells us about the fundamental nature of space and time is much less defensible than the claim that we cannot learn about them by any other means. Similarly, the claim that science tells us about everything is

critiqued in the René de Woudenberg's contribution to this volume). Note that scientism can also study itself from its own point of view.

¹⁶ There are numerous cases from recent science, such as that of the expansion of the universe, where the relevant scientific community has corrected its own errors in response to new evidence without external pressure being brought to bear. The replication controversy in psychology and the disputes about the evidence base in behavioural economics are examples where the process has not yet produced answers and may show some orthodox science to be badly flawed in some respects, which often is the case.

¹⁷ Journalism and the law, and disciplines such as archaeology and history, in so far as they establish facts about objective reality, rely on scientific methods and proto-scientific reasoning.

less plausible than the repudiation of putative realms of being that are posited by religious and other traditions. The best reason to adopt the core scientism characterised above is the track record of science compared to other forms of inquiry. Without science we would have a tiny fraction of the knowledge that we have, and we would still be in the grip of various dogmas about life and the planet depending on our particular cultural background. Religions and traditional forms of knowledge agree on little with regard to the objective nature of reality, and disagree substantially about the nature of the human body, mind and soul (if any). Many religions also have internal doctrinal disputes about fundamental metaphysical matters, such as the doctrines of transubstantiation in Christianity and reincarnation in Buddhism. Science, by contrast, is a uniquely universal form of culture. At the time of writing the largest radio telescope in the world is being built in China to test the same theories, by the same kinds of methods, as the largest optical telescope in Chile. The powerful particle collider, also being built in China, uses the same physics as CERN in Geneva. Science is uniquely successful as a form of epistemic inquiry, and the track record of attempts to curtail its scope is poor. In the next section more is said in favour of scientism.

It is ironic indeed that some defenders of scientism lend it the air of dogmatism and a lack of epistemic humility when science itself is so often characterized by scientists echoing Karl Popper, as involving fallibilism and a constantly critical attitude to one's own beliefs (see, for example, Deutsch 2011). Of course, much has been said in response to Popper, echoing Thomas Kuhn (1962) about how everyday scientific activity does not involve the scientists involved questioning their fundamental theories at all. Indeed, science is now so vast and specialized that the average scientist must accept and learn how to use a huge amount of theory that they may only dimly understand. However, Popper's point can be taken to apply to the scientific community as a whole, in which case one does indeed find that even the most cherished assumptions are forever under scrutiny and subject to refinement and further testing. For example, the equivalence of gravitational and inertial mass has been known since the seventeenth century and tested repeatedly ever since, but physicists still devise new ways of verifying it to ever-greater precision. However, there is a division of labour in such respects, and the vast majority of physicists never question the equivalence principle in their daily work.

Fallibilism is integral to the scientific spirit, and it is entirely in accord with it to say that science is the worst source of knowledge about the world apart from all the rest. The history of science teaches us that even cherished laws may be subject to revision. For example, the 'fundamental dogma' of molecular biology, according to which information can pass from the genotype to the phenotype but never vice versa is not entirely correct. The denial of Lamarckian inheritance (or 'inheritance of acquired characteristics') that the fundamental dogma expresses was central to the synthesis of evolutionary biology with molecular genetics, but the revised understanding we now have through epigenetics was not developed by creationists or intelligent design theorists but by biologists themselves. Similarly, it was physicists striving for scope and accuracy, and being prepared to challenge their own principles, who brought about revolutions in physics that led to profound departures from the orthodoxy of Newtonian science.

Three objections to the above are as follows:

(1) scientism is empty without a definition of science;

(2) science cannot tell us about right and wrong, but moral norms and values are part of reality, so scientism is refuted; and,

(3) science cannot tell us about the first person perspective, but the latter is real, so scientism is refuted.

(1) raises an analogue of Hempel's dilemma for physicalism for the positive doxastic components of scientism. The problem is that in assertions such as 'scientific methods can be extended to any domain', the scope of quantification can be read two ways. Either, for any domain, there is a scientific method for studying it; or, there is a scientific method such that any domain falls within its scope. The first reading is obviously weaker and allows for the fact that the methods of science have developed as science has been extended to new domains. These methods, and indeed the domains themselves, are integrated to varying extents (as argued below). Nonetheless, it would be rash to bet that the current range of scientific methods won't change as science continues to develop and to study new domains, as well as continuing to study itself. Hence, the promise of the scientific method for every domain might seem to be either false of current scientific methods, or only trivially true, if it is taken to mean that some scientific method can be found, and if no constraints are put on what counts as a scientific method.

The nature of the latter is of course highly contested. It is unreasonable to demand that the advocate of scientism give a full account of the scientific method but they must have something to say about it. Haack regards what she characterises as 'preoccupations' with the demarcation of science from nonscience, and with identifying the scientific method and regards, as characteristics of scientism. She thereby presupposes that the study and articulation of scientific methodology is unnecessary. However, the demarcation of science from pseudoscience is, arguably at least, more important than ever, because there is a lot of material that adopts the superficial form of good science but violates standards of rigour that are required for reliable inferences to be drawn from data. Even the most expert scientists must guard against misapplications of statistics, because there are so many subtle traps into which to fall. Continual scrutiny of methodology is integral to science's capacity to produce reliable knowledge and to correct its own errors. Given that science has such an important role in the law, medicine and public policy, the demarcation of science from pseudoscience is vital. While we may not be able to say precisely what is and is not scientific, we have learned a great deal about the difference between good and bad ways of reasoning inductively. Statistics is a science that barely existed before the twentieth century.

Despite the sophistication and variety of techniques current science uses to study the world it is unlikely to be apt to understand everything. Science evolves new methods as it extends into new domains, so the right way to understand the optimism of scientism is in terms of the indefinite extendability of current science rather than its all-encompassing

nature. One thing we have learned from the history of science is that science adapts and evolves. The social sciences don't use the same measuring devices as physics. It is reasonable to conjecture it will continue to do so. Hence scientism too must continually evolve along with science itself. For example, the ideas now used to describe genetics and the brain incorporate ideas of function and information that could have had no place in the scientism of the past because they had no place in the science of the past. It took Darwin's theory of evolution by natural selection to transform what could count as scientific by redeeming teleological reasoning. Scientism must continually evolve as science evolves.

However, there is a common core of both scientific theories and methods. The whole of natural science is based on the taxonomy of the periodic table of atomic structure, the fundamental forces and particles of the Standard Model, and the common system of scientific units and fundamental dimensions. These theories and their experimental technologies are applied to everything from the early and distant universe to the human brain.¹⁸ The use of logic and mathematics is common to all the sciences, and all scientists recognise the need to consider competing explanations, to look for sources of error in their experiments, to make precise measurements and so on. The idea that empirical testing is the ultimate source of epistemic authority in science is pretty much universal. Extensions of the scientific method must be integrated into the existing edifice, and of course old methods are often used to assess the reliability of measurement devices and background theories. The integration of methods and theories is essential to the success of current science, which is often highly multidisciplinary and hugely collaborative. In sum, (1) can be met by characterising science in evolutionary terms as whatever evolves from current science. In any case, the arguments that matter in practice are those concerning extending current science into new domains in which case the extension of the term 'scientific methods' is clear (though again it is routine in science for there to be new methods and modifications of existing ones).

As for the relationship between scientism and physicalism, it must be noted that the successful application of the physics of particles and fields to chemistry and biology has made science integrated and unified, and at least provides *prima facie* grounds for some kind of asymmetric supervenience of everything on the physical. Whether or not this vindicates strong forms of reductionism it certainly means that there is something to the idea that every putatively non-physical thing, such as a mind, somehow depends on the physical stuff associated with it. For some, of course, all this is very much understated and we have good reason to be more or less eliminative reductionists about everything except fundamental physics. Scientism as understood here, however, is definitely not committed to such views, nor to materialism. Indeed, far from reducing everything to matter in motion, as mentioned above, physics itself has refuted materialism and in its place we have at best a more vague kind of physicalism. Nonetheless, atomism did triumph in chemistry and led us to the more complex conception of the atomic world that

¹⁸ While there is no doubt that these theories are only approximations that will be refined by future developments, they, like Newtonian mechanics and ray optics, will continue to have their domain of applicability, and should be expected to be explained as a limit in future science, in accordance with the 'correspondence principle' (see Ladyman and Ross 2007, chapter 2).

we now have.¹⁹ Sui generis chemical and vital forces were not fecund for the development of explanatorily and predictively detailed and successful theories, and the pursuit of unity by building bridges between disciplines is one of the hallmarks of current science. However, even strong reductionists must concede that when it comes to epistemology and methodology, simple reductions seem unavailable. The best we can say is that science does not advance by positing new kinds of physical entities, properties or processes solely to account for biological or psychological phenomena. This is an inductive hypothesis that may ultimately turn out to be false, but it seems to be a warranted generalisation of the lessons learned when the programmes of sui generis chemical, physiological and vital forces failed (Brown and Ladyman 2009).

In respect of objection (2), it is no part of the core of scientism as understood here to say that scientific knowledge includes what is right and wrong, nor to say that science tells us there is no right and wrong. However, conceding that moral norms are part of reality does not refute the scientism characterised here, since nothing that has been said about the latter so far entails denying the former. Those who adopt the scientific stance may hold some form of the fact/value distinction and argue that science is completely silent about the moral norms we should adopt, and hence about all or part of ethics and politics. However, they may also insist that we should be scientifically informed about the biological and social facts that bear on the practicality of ethical and political policy proposals. They may also argue that advertised sources of moral knowledge need not command our assent. Scientism as characterised above is nonetheless compatible with allowing that different sources of beliefs about various matters, and especially ethics, may legitimately play an important role in social and public policy. If science conflicts with those sources of belief, that can only be because the relevant science establishes facts that they deny, and in those circumstances it is hardly appropriate to criticise the new scientific knowledge for correcting error. In the next section it is argued that this has indeed happened with ethics and the human sciences, and a good thing it is too. In any case, adhering to epistemic norms and values is already part of scientism as characterised here, since science relies upon them. Accepting moral norms and values is not relevantly different, so, while so doing is not part of the core of scientism, it is compatible with it.

(3) is an interesting challenge. It is closely related to the idea of the hard problem of consciousness. In reply, note that science has already at least told us some things about the first person perspective, by distinguishing different forms of consciousness and experience, and revealing the existence of blindsight and other phenomena that shatter a priori presuppositions about perception. If we characterise science in terms of what can be understood from the third person perspective then it is true by definition that it cannot tell us about the first person perspective. However, even if there are ineffable truths about the latter this is hardly a threat to scientism, which is intended to take a stand against taking anything other than science as a source of knowledge.

The rest of this paper defends a form of scientism that has (i) the core positive and negative components discussed above, but not stronger ones; and (ii) the epistemic

¹⁹ The price of success was the discovery that atoms are not in fact 'atomic' in the original sense of indivisible and mechanical.

charity, humility and temperance that is in keeping with the spirit of science discussed above. The resulting form of scientism is cognisant of the limitations of current scientific knowledge, and the ways in which seemingly supremely well-confirmed theories have turned out to be wrong in significant respects. Furthermore, a realistic grasp of the depth and breadth of current science, and its conceptual and mathematical sophistication, means that we should be very sceptical about grand metaphysical claims that are alleged to follow from theories, especially if the latter are speculative and have not enjoyed their own predictive success. Not everything that comes out of the mouth or pen of a scientist is science, and scientists discussing other specialisms, philosophy, and indeed scientism may be particularly liable to what Ken Waters calls 'science overreach' (2017). Scientism demands eternal vigilance and perpetual critique. Scientists should not be deferred to about matters beyond their expertise, and there are other modes of inquiry that deserve epistemic respect, such as history and law. The next section outlines an humane scientific stance.

4 Humane Scientism

Scientism began with the extension of science to the study of human beings and societies. As Richard Olson says, 'scientism' is "the transfer of ideas, practices, attitudes and methodologies from the context of the study of the natural world (which was assumed to be independent of human needs and expectations) into the study of humans and social institutions" (Olson 2008, p.1). Whether the critics of scientism like it or not this has been done successfully. In response, they make much of the importance of humanistic values as if the pretensions of science to tell us about ourselves were a threat to our humane treatment of one another. It is worth reflecting on how our ethics have also evolved along with the scientific image of people. Ironically, there is certainly a correlation between the development of the naturalistic understanding of human beings, and the development of the idea of universal human rights and the abolition of forms of cruel punishments and various forms of ill-treatment. This is most clearly seen in the case of atypical human psychology. The identification of conditions such as autism, dyslexia and dyspraxia has led to a much better understanding of the normal range of human variation, and a much better way of treating children as they develop. Ideas of naturalness in cultural and religious traditions are the alternative to the scientific understanding and they are associated with a punitive attitude to deviation from the norm. The treatment of the mentally ill leaves much to be desired, and pharmacology arguably determines taxonomy and treatment in a scientifically dubious way. Compared to the 'madhouses' of recent history, however, we have come a long way. If we care about human wellbeing, we should note that what science has taught us about ourselves and society has had a largely positive impact on our treatment of people that do not fit the prescientific conceptions of how they are meant to be.

The claim that we would be better off without the scientific understanding of human behaviour, character and cognition seems completely absurd once it is made explicit. However, it is the logical consequence of the rejection of the core scientism argued for

above. Critics of scientism should be careful for what they wish, and careful not to take for granted the understanding we have of ourselves as natural beings. In the absence of science, we know that often what fills the void is prejudice and superstition. This is why it is important that scientism decrees that beliefs about ourselves based on common sense, intuition, religion, and other forms of tradition, have no prima facie claim to the truth over those of other traditions, and certainly no immunity to revision in the light of scientific knowledge. If science establishes facts that inherited belief systems deny, it is hardly appropriate to criticise the new scientific knowledge for correcting error.

In his book on scientism Tom Sorell discusses 'philosophy and the infatuation with science' (1991) as if this was something aberrant, but if we think of science as the human institution that gives us reliable knowledge of objective reality then it is quite right for philosophers to be infatuated with it. The sciences are the progeny of philosophy and philosophers are right to be appreciative of them. The problem is rather that too often discussions in philosophy presuppose accounts of cognition or physical reality that are uninformed by and even incompatible with what science is telling us. Similarly, rather than science being culturally dominant and informing decision making too much, governments are much more often beholden to other interest groups and scientific evidence is ignored. For example, in the UK, bishops sit in the House of Lords but there are no ex officio representatives of science, and very few politicians have been scientists.

Scientism might be associated with cold and uncaring approaches to decision making, reducing individual people to units of economic output, and neglecting the value of public and social goods. However, there is nothing about the core values of scientism that encourages these attitudes, and they arguably conflict with it. Science tells us that every individual human being is born utterly incompetent and remains unable to fend for itself for years as a result of the brain having the flexibility for the child to be taught the cognitive content of whatever culture into which it is born.²⁰ Sociality is essential to the unique features of our cognition, and collective endeavour is essential to our flourishing. Hence, scientific knowledge of our nature does not support individualism, and there is no reason to associate clinical impartiality or the determination to be objective with a lack of compassion.

Current scientific knowledge is the product of a social history of experiment, theorising and application, interacting and refining each other through the constant dialogue of people questioning and correcting each other. Of course, scientists too are susceptible to confirmation bias; some even cheat and lie, distort and dissemble, and abuse power just as people do in other walks of life. More prosaically sometimes people are marginalised unfairly or are ignored because they lack status. However, the scientific community functions to produce reliable beliefs, albeit imperfectly, because of shared commitments to knowledge, understanding and truth that are enacted every day when people exchange and explain ideas to each other, and debate with the common goal of reaching a better

²⁰ I am not here taking a stand on the nativism debate, but pointing out that human infants remain wholly dependent upon caregivers for a much longer period of time than the young of other species.

understanding of the world.²¹ Any association of science with rampant individualism and selfishness would be wholly unwarranted. Current science is collaborative and fundamentally reliant on epistemic respect and trust between those among whom scientific labour is divided. The culture of science also essentially involves questioning the calculations, methods or beliefs of one's collaborators on occasion. Science is not a fixed set of beliefs but rather a dynamic network. It is sustained by checking and double-checking, and the relentless search for greater accuracy and precision, both in measurements and models. Science is social knowing based on testimony, but it is also based on the actuality and possibility of third-party scrutiny. In many cases the scientific knowledge we have is the product of the collaborative efforts of many individuals over many years, each playing their part in accumulating data and correcting error²².

In the previous section it was pointed out that adherents of scientism may also hold some form of the fact/value distinction and argue that science is silent about the moral norms we should adopt, and hence about all or part of ethics and politics. Hence, they may completely agree with Haack when she says, "results from the sciences can give us information about the relation of means to ends, but cannot by themselves tell us what ends are desirable." (ibid., p. 45) However, we should be scientifically informed about the biological and social facts that bear on the practicality of ethical and political policy proposals. In this minimal sense, science is relevant to moral deliberation, but in some cases it may do more and transform how we think about the issues. To many critics of scientism, the idea that we are natural beings subject to the causal nexus of the physical world seems somehow to reduce our humanity. However, we owe it to those afflicted with organic problems such as the brain tissue degeneration that occurs with dementia to understand the biological processes involved as well as possible. Better scientific knowledge has been accompanied by demands for more compassionate treatment of dementia sufferers and their carers. Science cannot tell us what our ends should be, but it transforms our conception of ourselves, the world and what is possible for us.

Science clearly cannot tell us what we should value, but given that we do value individual people extremely highly, it can help us enact our beneficence. Scientific medicine is obviously the most striking example of the miraculous humanitarian intervention that is made possible by science and technology; others include mitigation of famine and natural disasters. Liberals accept that there are competing conceptions of the good and that our political institutions should accommodate them, not favour any one of them in particular. Hence they may be construed as arguing that since we do not know what a good human life is, different beliefs about the matter are politically legitimate. The extent to which economics and political science incorporate norms and values varies, but when it comes to matters such as predictions about the effect of policy proposals there is nothing comparable to the precision and predictive success of the physical sciences, and in some cases there may be little that can be said that is objective. Analogously, scientism may be understood as making science authoritative in respect of knowledge while allowing that

²¹ This does not presuppose scientific realism since even empiricists like Bas van Fraassen accept that science tells us the (approximate) truth about the phenomena.

²² Scientific papers are now almost always co-authored and in many cases co-authored by dozens of individuals.

different sources of beliefs about various matters, especially ethics, may legitimately play an important role. It is also consistent with scientism as characterised above that there are legitimate sources of belief and knowledge other than science. To say that an activity or group merits epistemic respect means, minimally, that it is a seat of rational inquiry, is methodologically reliable to some extent, and makes a contribution to knowledge. There are many such examples including legal inquiry, folk local and natural history, academic history, and so on.

Humane scientism must take account of the hugely varied methods of the sciences and the rich role of experiment and practice, as well as theory and modelling. The previous section argues that scientism does not require either materialism or reductionism, although arguably it does depend on the integration and unity of science that supports a weak form of physicalism. Scientism does not require the denial of the first person perspective, nor need devalue the explorations of the latter in the arts and humanities. Scientism does not demand belief in the omniscience or omnicompetence of science and the replacement of all other forms of inquiry, including the traditional modes of study in the arts and humanities. However, it does deny that science has any particular limits in principle, in the sense that there are no domains to which scientific methods and theories cannot be applied. On what grounds could it be decided that some domain is out of reach of science?

Haack is right that there are various rhetorical weaknesses with scientism as hitherto formulated. It is associated with an uncritical attitude to science, and the use of the word 'scientist' and its cognates as epistemic honorifics is sometimes suggestive of a tribal mentality. There is too much deference to scientists outside of their areas of expertise in the media, and a lack of appreciation of how specialized science now is, and how easy it is for a scientist to know nothing about even the basics of other disciplines (and even other parts of their own disciplines) especially when it comes to pronouncing on conceptual or philosophical issues. Heather Douglas (2009) and Philip Kitcher (2011) argue that we should defer to scientists' judgments in their areas of expertise, but not on questions of public policy. Again, this seems uncontroversial, and required by scientism, as we should only ever defer to experts in their domains of expertise. Some scientists become experts in the relevant area of public policy, but many do not; and being good at, for example, designing nuclear warheads, obviously does not ipso facto make one good at deciding whether to build them and if or when to use them.

Scientism must not be pseudoscientism. Humane scientism must be especially careful to insist that much of the use of quantification and metrics outside scientific research in, for example, corporate or government documents and procedures is pseudoscience, bearing none of the epistemic hallmarks of true science, because it involves only the superficial guise of measurement lacking features such as calibration, precision, and empirical reliability. This happens a great deal with so-called 'evidence-based decision making', which in fact consists in the manipulation of numbers which disguise massive value judgments; judgements that may have been made on the most dubious of grounds, about what categories should be used, how they should be aggregated, and how the scores assigned by different scorers should be combined. The fact that the methods in these

domains are in constant flux is a sure sign that something is wrong.

Among current sciences there are forms of highly theoretical reasoning, at one extreme, and forms of experiment and data gathering with little in the way of theory at the other. Mathematical manipulation may be used to provide the superficial appearance of science and statistics can be deployed in ways that even the cognoscenti may not (at first at least) realize are bogus. Trust in science must be differentiated and proportionate. Established science that has been the subject of ever more rigorous testing over decades or centuries, is obviously not on a par with the latest speculations about string theory or the multiverse. Many scientists are very good at what they do, but less good at describing it, and many say very confused things when they come to discuss the bigger picture or how science works. Accordingly, scientism does not involve blind faith, dogmatism or uncritical adherence to some imagined complete corpus of scientific knowledge. Indeed, science thrives on the relentless search for and reduction of error and imprecision within its own theories, models and data.

In sum, humane scientism takes science to be authoritative in respect of objective knowledge, including about human beings and society. It recognizes no limits to science in principle, but is also antithetical to scientific hubris and hype. However, humane scientism holds the best of the arts and humanities in high esteem and recognises the role that culture and custom, and religion and tradition, play in good human life.

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