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ORIGINAL ARTICLE

Science, Practice and Mythology: A Definition and Examination of the Implications of Scientism in Medicine

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Abstract Scientism is a philosophy which purports to define what the world 'really is'. It adopts what the philosopher Thomas Nagel called 'an epistemological criterion of reality', defining what is real as that which can be discovered by certain quite specific methods of investigation. As a consequence all features of experience not revealed by those methods are deemed 'subjective' in a way that suggests they are either not real, or lie beyond the scope of meaningful rational inquiry. This devalues capacities that (we argue) are in fact essential components of good reasoning and virtuous practice. Ultimately, the implications of scientism for statements of value undermine value-judgements essential for science itself to have a sound basis. Scientism has implications, therefore, for ontology, epistemology and also for which claims we can assert as objective truths about the world. Adopting scientism as a world view will have consequences for reasoning and decision-making in clinical and other contexts. We analyse the implications of this approach and conclude that we need to reject scientism if we are to avoid stifling virtuous practice and to develop richer conceptions of human reasoning.

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Introduction

Debates about evidence-based medicine [13, 17, 72, 79, 80, 83], values-based medicine [41, 77, 81], and person-centred medicine [30, 60, 61] are awash with conflicting claims about the relationship between science and practice: the extent to which medical practice should be 'based' in science [13, 58, 81] and the extent to which medicine is a science or an art, a scientific and/or 'humanistic' practice [21, 24, 60, 53]. Populist contributors to the debate about evidence-based practice disparage the role of 'philosophers' and the humanities more broadly in discussions of medical practice, precisely on the grounds that medicine is a science, and as such should be based in a properly *scientific* understanding of the world [11, 22, 23]. Inferences are drawn from such claims about reasoning in clinical practice, and the proper role (or lack thereof) of such 'unscientific' aspects of human thinking as intuition and value-judgements [23, 24].

While contributors to these debates tend to agree that progress in medicine is significantly associated with progress in scientific research, determining the exact nature of this relationship and its implications for practice is less straightforward. We may have a good intuitive sense of what we mean by 'progress in science', but agreeing a formal account that can settle real controversies has proved more challenging [18, 39, 40, 69, 74] and even if we had a shared account of progress in science, this may not translate easily into a shared conception of progress in medical practice and a consequent improvement of care for patients [5, 50, 63, 79, 80, 83].

In what follows we wish to define and discuss the role of a doctrine called *scientism* in framing the debate about science and medical practice. This term has a long history [26, 34, 76] and has often been used normatively, to characterise the inappropriate employment of scientific methodology or categories in areas better understood in other terms [58, 59, 67, 70]. Because of this usage, authors may be reluctant to accept the label 'scientism' as applying to their own claims, even when they frame those claims with reference to something they call 'the scientific world view' [12, 16]. While we would wish to endorse many of the criticisms implicit in this use of the term [46, 48, 61], to understand the basis for such criticisms, and to determine whether or not they are defensible in specific instances, we need a definition of scientism that does not automatically amount to an accusation.

Defining Scientism

Scientism can be expressed as a view about the relationship between science and either the truth, knowledge or reality. So scientism can be understood as the view that science, and only science, reveals the truth, such that all true claims are part of a true scientific theory, or are reducible to claims of this sort. I may claim that I have a headache, and even though this is not a scientific claim, it may be true, because

'ultimately' it is reducible to a statement (or statements) about neurological processes that are accessible to scientific investigation. This view makes the definition of 'science'—the articulation of criteria distinguishing science from non-science—of fundamental philosophical and practical significance, and its influence explains why this 'demarcation' problem became a major preoccupation of twentieth century philosophy [9, 43]. It is a view closely associated with the work of the logical positivists, who argued that for all substantive assertions (meaning all claims other than 'mere truths of language') an assertion's meaning is its 'method of verification': to say what a claim means is to spell out the scientific process one could use to verify it, and unverifiable claims are either tautological or strictly meaningless [3]. A key feature of this usage is the distinction between 'objective' claims and 'subjective' claims, where the latter are not genuine claims at all but are mere expressions of feeling; perhaps the most notorious application of this view (and one whose implications for medicine we will explore below) being Ayer's insistence that 'Assertions of value are not scientific but "emotive"… They are therefore neither true nor false' [3]—a starting point from which he infers (p 142) that 'if I say to someone, "You acted wrongly in stealing that money," I am not stating anything more than if I had simply said, "You stole that money"'.

Scientism can also be an epistemological thesis to the effect that only science can yield true knowledge. This epistemological thesis is closely associated with an ontological thesis, about reality or 'what really exists', to the effect that science reveals the true nature or essence of the world: real properties are those discoverable by science. Effectively, as we will see, this is because the term 'real' is being defined as 'that which is discoverable by science'.

This idea is evident in many popular and academic expressions of scientism, where the exercise of giving a scientific explanation of a thing, property or process is treated as synonymous with giving an account of what that thing, property or process 'really is'. An account of the neurological processes underlying our ability to feel certain emotions is an account of 'what [those] emotions really are' [25, 35] and a full scientific theory of Spacetime would be 'nothing less than a complete description of the universe we live in' [29]. While such 'everyday things' as 'tables', 'trees', 'daffodils' and even 'people' do exist, this is because they are 'constituted' by more basic, fundamental components of reality, such as 'sums of particles or of temporal parts of particles' [4] and they are nonetheless 'ontologically redundant' in that they do not need to be mentioned in 'a full description of reality': a 'complete inventory of what exists' need not include such things, (*op. cit.*) but it must include the scientific particles which constitute 'what they really are'.

This is why exponents of scientism can claim that, however well we know our friends and our jobs, however well we can describe the features of our local environment, however acute our awareness of its sights and sounds, it is nonetheless true that we 'go about our daily lives understanding almost nothing of the world' because most of us 'give little thought to the machinery that generates' that world, to the gravity holding it together or 'the atoms of which we are made' (From Carl Sagan's introduction to [29], px.). Semantic claims about 'assertions of value' translate into ontological claims about the unreality of value. So Mackie takes it as

read that 'values' are 'not part of the fabric of reality' because if they were, they would have to be 'entities or qualities or relations of a very strange sort, utterly different from anything else in the universe' [52]. As Nagel [64] notes, Mackie 'clearly has a definite picture of what the universe is like' and what sorts of 'entities or qualities or relations' it can possibly contain. That picture is not a discovery of science but rather it is a stipulation about what sort of things we are prepared to call 'real'. It is not as though these authors conducted an extensive search for 'value' in the world but came back empty handed. Rather, they offer a prescription for conceptual lenses that will rule out, a priori, certain properties from being recognised as 'real'.

Scientism and Practice

Does scientism have an influence upon clinical practice and policy? We argue that it does. Some commentators note that many clinicians implicitly assume an account of medical knowledge that is at odds with how they actually practice medicine and which actually risks undermining crucial components of medical knowledge [8, 30, 31]. We may be encouraged to think that we cannot value the patient report of a clinical effect from treatment unless it can be measured 'scientifically', giving rise to the vast literature purporting to give accounts of what feelings of love, pain, shame, anger and other emotional reactions 'really are' in purely neurological terms [35] and the academic industry dedicated to reducing 'quality of life' to something expressible as a numerical value [44, pp 171–6].

Scientism shapes not only our current thinking about biomedicine but our entire world view, including how we interpret and routinely employ such key concepts as 'rationality', 'evidence', 'objectivity' and indeed 'science' itself. It is a philosophical position in that it is not a specific empirical (verifiable or falsifiable) claim, but a *framework* in terms of which we see the world—and as Wittgenstein notes (cf. [35, 71] certain features of the world can appear as *problems to be solved* given one particular framework, while given a different framework they will not appear problematic, and so will not appear as *in need of* a solution. Where practice fails to conform to a preconceived account of how it should be, this can be experienced as a conflict within the practitioner (a sense that one is not practicing adequately) and can—indeed, *has*—formed the basis for published criticisms of practitioners. In medicine, clinicians have been disparaged for failing to 'bend a knee' at certain identified scientific 'altars' [24] and have been compared to irrational defenders of creationism (*ibid*. p 101) for failing to do so. Discussions of what to do about the 'problem' of the failure of practitioners to comply with certain theoretical conceptions of best practice are commonplace [11, 13, 17, 72] but less often is the possibility considered that it may be the underlying preconceptions about the nature and role of science, and its relationship to practice, that need to be reconsidered, rather than the assumed 'problematic' non-conformance of practitioners to those preconceptions [46, 47].

Our goal here is not to dismiss scientism but to understand its significant contribution to our intellectual history, as well as its limitations. Its importance in

ushering in progressive changes in our thinking about human health should not be understated, but nor should we limit future thinking about health care practice with reference to its implications. This framework allows us to understand a rational and objective universe, but its implications for how we formulate questions, conduct debate and evaluate proffered outcomes concerning medicine, health, clinical practice and public health policy are neither necessary nor necessarily desirable [14, 38, 71]. Yet precisely because of its fundamental role, the philosophy underpinning these decisions remains largely assumed, a problem only exacerbated by the fact (noted above) that some of its exponents will not accept any label for their philosophy—other than equating it with the belief in 'science', a strategy that simply begs all of the philosophical questions about the relationship between 'science' and 'scientism' that we discuss in the rest of this paper.

In what follows, then, we attempt to bring scientism into the foreground in order to examine and understand this world view, its implications for practice and at least to consider the possibility of adopting some alternative intellectual starting-point. There are legitimate debates about the appropriateness of 'reductionism' in many areas of science [59] and reductionist science has been enormously successful in medical research. In philosophy, 'reductionism' is sometimes used to mean the doctrine we identify here as scientism, and is associated with the attempt to reduce or eliminate categories of knowledge and reality, to dispense with all ideas and modes of explanation that are thought to have no role in a properly scientific account of the world [28, 68]. It is our belief that this philosophical reductionism is unsustainable and may be destructive to clinical practice. The clinical encounter is an interaction between persons [30] and while scientific knowledge has a vital role, it never works in isolation from many other types of knowledge also being brought to bear, and these types of knowledge are the ones scientism encourages us to ignore, devalue or deny altogether. In this way, scientism may even risk undermining good science, which is a definitively human enterprise [8, 14, 30, 71]. Vickers [82] suggests that the application of an overtly rigid and scientistic approach to evidence synthesis in the form of systematic reviews can create 'empty scientific exercises that teach us nothing' and the application of poorly judged science within this framework 'confirms the predictions of those early critics of systematic reviews' in that 'they make the reviewer appear scientifically productive, but they do little to further science, or help relieve human suffering'.

Scientism and Common Sense

Scientism may appear to be sheer common sense. It equates believing in science, a term which represents many centuries of rigorous investigation, theory and discovery, with believing in the particular philosophy or world view represented by scientism. The assumptions about the meanings of key terms we use and concepts we regularly employ, to classify our experience, our relationship to the world and the nature of reality, have been strongly influenced by theoretical assumptions about meaning and rationality that privilege scientism [35, 46, 47, 71, pp 185–97]. Consequently our current 'common sense' is as heavily influenced by the embedded

constructs of scientism as that of the medieval pre-enlightenment Europeans was influenced by certain sorts of religious metaphysics.

Scientism is a theory about science, not in itself a scientific theory. It embodies claims about the nature and status of science. It has significant implications for the role and interpretation of science in society, and the nature and consequence of objective reasoning in many areas. The truth of scientism is not a logical consequence of the nature of science. Indeed, what philosophers call the 'demarcation problem'—agreeing a formal criterion to distinguish science from non-science—remains unsolved, so we do not have a consensus on any detailed formal account of the nature of science [74, pp 49–95].

One does not have to be pro-scientism in order to be pro-science. Nor, indeed, does one need to be pro-scientism to be a scientific realist. One can believe in the existence of such things as atomic particles and also believe that the 'ordinary things' we interact with in everyday life (e.g. the 'tables', 'trees' and 'other people' mentioned above) are real, in the sense that they are not 'ontologically redundant': a description of the world or 'inventory of what exists' that failed to mention them (describing only such things as particles and other posits of credible scientific theories) would be incomplete [4, 42]. A realist with regard to atoms, or diseases, is someone who believes that atoms, or diseases, really exist [73]. This belief is logically distinct from any more general position to the effect that only things of a certain type (such as the posits of true scientific theories) exist. We can believe that scientific enquiry gives us substantial insight into the nature of the real world, giving rise to conclusions about that world that are straightforwardly true [56, 64, 69], while remaining sceptical about the claims of some authors that science can give us 'the complete theory of everything' [29].

This latter view goes beyond the claims of common sense realism[1] and suggests that only science, however construed, can give us a true understanding of the world [14]. If science not only informs us about but also defines what is real, then other areas of discourse in the humanities, ethics and ordinary dialogue, as well as our descriptions of ordinary experiences in daily life, must either be capable of a logical reduction to the language of science or consigned to the realm of fiction[2].

Such a view is definitive of scientism, and has potentially destructive implications for many of the rich and diverse sources of knowledge that form our human, cultural, religious and intellectual heritage, and ultimately for the ethical and social structures required for any meaningful scientific practice within society.

Scientism as a Modern 'Myth'

The term 'myth' is frequently used to mean something false, but that is not its original meaning and not how we use it here. There are certain ideas and beliefs that we inherit as part of our shared intellectual culture. For instance, most well educated

[1] Arguably, it even undermines it: see Baker [4], Loughlin [42, 46].

[2] As a consequence the ontological status of the 'realm of fiction' becomes highly problematic within this world view [64, 68].

members of developed contemporary societies take it as read that the Earth orbits the sun and that human beings evolved from other animals. We now believe these things in the first instance prior to performing any investigation into these matters and they are based on scientific discovery. We know that even the most intelligent members of societies that came before us did not necessarily share these beliefs. Aristotle took the Earth to be the centre of the cosmos and believed that biological species were fixed 'natural kinds'. [75] These ideas were central components of the 'common sense' of many generations, such that initially the ideas of Copernicus and Darwin met with well documented ridicule. [43] We now think that both Aristotle's cosmology and biology have been superseded, so we believe that we know something he didn't, but it would be absurd for any individual alive today to conclude that he or she is more intelligent than Aristotle. We owe our current knowledge to the intellectual labours of the intervening generations. We stand on the shoulders of our ancestors [55]. This is what it means to have a position within intellectual history, and it is what makes intellectual progress possible.

We inherit whole pictures of the world and our place within it, as well as the complex normative structures that make reasoning possible, and together these frame our intellectual starting point. Myths, in this sense, form a vital ingredient of our intellectual heritage. On the one hand, it is hard to see how any culture could be without myths, or could regard its own myths as no better than any others. Radical epistemic relativism provides no plausible pragmatic basis for the thinking of any realistic human community [44, 45]. We can examine our own intellectual history and sometimes legitimately conclude that the changes that led us to 'where we are now' were progressive ones.

On the other hand, a mature culture sees no need to declare the end of intellectual history, as though its own configuration of underlying beliefs and theories represent the definitive, final word on 'life, the universe and everything' [1, 50, 64]. Such a culture will be at ease with people reflecting on its fundamental assumptions [18, 62]. To the extent that they are correct they will stand up to critical scrutiny and provide the basis for human beings to solve the problems that confront them—a major motivator for theoretical innovation will always be the presence of practical problems requiring urgent solution, particularly those that are apparently insoluble given our current background assumptions [55, 69].

Scientism is a modern myth in this specific sense. Its status as such does not mean we should conclude that it is likely to be false, even less that it contains no insights. Nor should we conclude that it is somehow 'no better' than anything that has gone before. At the same time we should be sceptical of the idea that intellectual history came to an end, that the definitive and final world view was discovered at just the point that we arrived on the scene, and that the rationality of scientism will forever provide the world view that will govern and inform our human milieu. This means we may, quite irrationally and unreflectively, now view scientism as the answer or solution to our cultural debates rather than an enlightened, discrete and plausible approach to well defined and clearly framed issues. We owe it to ourselves and our descendants to think critically about our own underlying assumptions, to be aware that questioning them need not be evidence of either heresy or insanity. Our descendants also have to stand on *our* shoulders.

The Nature and Origins of Scientism

Descartes is often credited as one of the finest exponents of the 'modern' world view [2]. Writing at the dawn of the scientific age, he famously divided reality into two realms, the 'inner' or 'subjective' and the 'outer' or 'objective' realms. The external world was characterised in terms of the language of the emerging, physical sciences. The importance of quantification to the emerging sciences is fundamental to understanding Descartes' conception of the 'external world'. External reality is, by definition, something we can measure. In contrast, 'phenomena' are internal, subjective properties dependent for existence on a perceiving subject. Once this rigid division has been posited, it becomes the job of philosophy to explain the relationship between these radically different realms. However, human beings are rendered inherently problematic entities as they seem to straddle both realms and have properties (such as cognition and choice) that are not easily assigned to either one realm or the other. This is at the core of many of the problems created by scientism when applied to medicine, as the essential human attributes that define us and our society transcend the boundaries of the Cartesian world and have enormous influence and impact on the practice and outcome of clinical medicine.

The phenomenal colours that form part of our everyday visual experience are not (on this view) part of 'objective reality' but are causal products of that reality. Our experience of colour is an inner effect of an outer process, the true nature of which is revealed by science, and is *therefore*[3] something quantifiable: the frequency at which the surface of an object refracts light causing an inner event; the 'perception'. While Aristotle treated teleological explanations as real explanations (a material object falls to Earth because that's part of its telos), for Descartes, purpose, goal, value, intention and all the features of teleological thought belonged to the 'subjective'. The objective world is purely mechanistic, its only processes causal ones[4]. Only 'cause and effect' were suitable explanatory categories for what happened 'out there'. Human activity then becomes an inherently problematic concept because what seems to be an holistic concept (me freely doing something) becomes a combination of an 'inner choice' plus 'outer' events (such as the movement of my limbs) and yet the 'scientific' explanation has everything to do with mechanistic events, fully describable in objective, third-personal terms and nothing to do with my 'inner choice'. As a subjective, internal event it is like the 'green after image' that a twentieth century exponent of scientism explained has 'no place in the world of physics', where colour concepts have no application and hence no explanatory role [68]. Thus the 'mind–body problem' and the 'problem of free will' become major preoccupations of modern philosophy, with science positioned not as an ally to advancing human autonomy, responsibility and control but as a fundamental threat to these very ideas [64].

[3] Note that this inference reveals an a priori assumption that science is concerned exclusively with quantifiable properties: this is not something 'discovered' but is assumed at the outset.

[4] Hume [32] famously took Cartesian scepticism a stage further by questioning the external reality of causality itself.

Table 1

The objective	The subjective
Cause and effect	Purposes, goals, 'the good'
Reality	Appearance
Matter	Mind
Physical properties	Experiences (feelings, ideas)
Knowledge and rationality	Faith, whim, intuition, opinion
Facts (positive/empirical/ mechanistic)	Values (normative/teleological)
Provable/settled by evidence	Not settled by evidence
Quantitative	Qualitative

The Cartesian world presupposes a dualistic view characterised by certain dichotomies. Scientific explanations belong on the 'objective' side (Table 1).

Later versions of scientism turned against the subjective side, insisting on its denial or reduction to the objective side [68]. Descartes famously resisted this, remaining a strict ontological 'dualist'. Many of the problems of modern philosophy are products of this picture, and if the picture is rejected we may find that the problems disappear, rather than being in need of 'solving'. There is something odd about a way of seeing the world that turns apparently straightforward things, like the decision to move my hand, into philosophical problems [36]. There is something particularly odd about an intellectual outlook aimed at providing a complete and unified account of disparate phenomena, functioning instead to render previously unproblematic areas of experience inherently unaccountable [44, 46]. But the most important contribution of Descartes' thinking to the development of science was actually his views about knowledge and reasoning—his epistemology. He posited an absolute dichotomy between beliefs based on faith or trust on the one hand, and beliefs that could be deemed rational or part of our knowledge on the other. It was at this point in our history that 'naivety', the willingness to take things to be the way they appear to be, in the absence of strong reasons not to, became synonymous with irrationality, while 'rationality' meant scepticism: the disposition to refuse to take things to be the way they appear [44, 46].

However methodologically significant both the subject-object divide and the dominance of sceptical reasoning have been for the development of certain important branches of science, this does not mean that these approaches are universally applicable. Their suitability as fundamental features of our understanding of the human condition can at least be questioned. It is by no means 'just plain obvious' that 'rationality' and 'faith' or 'trust' are systematically logically opposed such that it can ('by definition') never be rational to trust something or to take something on faith. Scepticism may sometimes be rational, but at other times, in other contexts, it is unhealthy, equivalent to paranoia and destructive of professional and personal relationships [44]. As students of Descartes' philosophy know, unless we are prepared to take some beliefs on trust, to adopt them simply because they seem natural, then all of our beliefs, including, ultimately, our belief in the external

world, come under threat: 'trust nothing' could be a motto of our times [36]. Descartes attempted to set science on solid grounds [2], but also created a crisis about the justification and scope of scientific activity itself [64].

The philosopher Thomas Nagel [64] notes that this crisis gave rise to many inventive solutions, including the appeal to various 'epistemic criteria of reality'. The nature of such solutions is that they define 'reality' in terms of certain specific methods for discovering facts. So, by definition, scepticism is refuted with reference to those facts discoverable by the relevant methods: if certain conclusions are demonstrable via certain methods then it is strictly 'nonsense', meaningless or self-contradictory, to doubt their truth or the reality of the facts discovered. The price paid for such 'solutions' is the abandonment of all features of reality not discoverable by the specified methods to an irredeemable scepticism, where even the meaningfulness of their claim to be real is challenged [46].

As noted in our opening comments, the most celebrated solution of this sort is logical positivism, the equation of the meaning of a claim with its 'method of verification' [3] and the subsequent (stipulated) definitions of 'objectivity' and 'reality' as concerning exclusively that which is discoverable via the methods of repeatable controlled experiments. For instance, in medicine, the randomised placebo controlled trial has, for some, acquired the status of the ultimate criterion of objective truth, the only legitimate source of 'real' evidence, and we have seen the personal, the intuitive and the anecdotal disparaged as subjective, unscientific and by implication unreliable [58, 61, 80]. Descartes and his philosophical followers had to reassemble the world they had divided into subjective and objective realms, so as to make sense of human life and practice. Having made a strict division between proper scientific evidence as the 'base' for medical practice, and all of the human, 'subjective' features of the clinical encounter, including the judgement of practitioners and the perspectives and values of patients, contemporary theorists of medicine are then confronted with the problem of how to 'integrate' these essential features in order to make sense of the reality of clinical practice. Their lack of progress in doing so [61, 80] might indicate that the problem is insoluble in these terms—if we cannot put something back together again then let us think about ways to evaluate and understand this process without cracking it in the first place.

Logical positivism is strictly a semantic theory, a theory of meaning, but its implications for what we can say we know (our epistemology) and what we can say really exists (our ontology) are definitive of the world view we have identified as scientism. The catastrophic consequences of this doctrine for the investigation of social reality are now very well documented, but its implications for physics are hardly much better [43, 64]. Indeed, so much real science fails to conform to its strictures that its consistent application would condemn us to something very like the general scepticism it supposedly dispels.

Despite its implausibility, many people, including many who have never studied epistemology nor even heard of the term 'scientism', adopt its conceptual framework unquestioningly. Hence our claim that it has become part of our contemporary mythology and perhaps even a new 'religion'. Think how many, for instance, take it as read that value cannot be 'objective' and so cannot be 'real', by

implication condemning the universe to nihilism[5]—as though acceptance of so substantial, contentious and shocking a doctrine could just 'follow' from knowing the meanings of certain common English words [10, 46, p 667]. A theory has really become socially embedded when it 'slips so far into the background that it no longer seems, to the majority of people, to be a theory at all; it is just "the way it is"' [44, p 126].

Insofar as we are identifying a problem here, the problem is not science, not even 'positivist' science. Long before the dawn of modern science (and certainly long before scientism became the dominant world view) the pre-Socratics engaged in forms of enquiry that, on many reasonable accounts of 'science' would qualify for this label, suggesting that science is a practice as definitively human as the socialisation of children [47]. It strikes many commentators as patently absurd to deny the intellectual and pragmatic advantages that the use of scientific methods has brought to human communities. Even when science has been used to serve grotesque ends, its ability predictably to bring these ends about is the best pragmatic evidence one can have for the claim that its methods can yield insights into the workings of reality, and one can only suspect those who deny this rather obvious point of being disingenuous [74].

The problem is positivist-inspired philosophising about science. By focussing on certain aspects of the world (in particular those comprehensible in quantifiable and mechanistic terms) science became a crucial vehicle for progress. But even the proper evaluation of its contribution to progress requires appeal to ideas (most crucially, value) that are not fully expressible in terms of the language of quantification and mechanism [44] Far from being 'pro-science', scientism strictly prevents us from expressing the true value of science in human life, as that expression of its 'value' must be 'subjective' and therefore 'unscientific', therefore having no place in a proper account of the real world. The view that something must either be part of a 'scientific account of reality', or a figment of the mind, has a very significant implication. Popper [69] argued that an ontology restricted to these categories cannot accommodate such things as 'theoretical systems', 'problems and problem situations' and 'critical arguments', and is as such incapable of accommodating the reality of even scientific (let alone moral) reasoning. Therefore, it very much pulls the rug from underneath its own epistemic feet: if the only 'objective' claims are 'factual' and normative claims are 'subjective' then, the very normative structures that make scientific thinking possible lack an objective basis.

Implications for Medicine: Epistemology, Professionalism and Politics

The scientistic world view defined what we currently think of as 'biomedical reductionism', the idea that medicine must be 'based on' objective evidence, and the devaluation of the personal and individual experience that is fundamental to

[5] The view that reality is devoid of value, that people's beliefs about right and wrong correspond to nothing. The only truths concern matters of fact and there are no moral facts, so the holocaust was 'just the Nazi's way of doing things' [10].

medicine is now being challenged by such movements as 'person-centred medicine' [58, 60]. Consider two views about the relationship between rationality, objectivity, judgement and good practice.

One view is based on the old-fashioned idea of 'the virtuous practitioner', and places the concept of professional judgement at its centre. As a consequence, it regards the primary questions of practice and policy as concerning the education of practitioners, and how to cultivate good judgement. On this account, our thinking about good practice has the goal of helping practitioners to develop the skills to evaluate a wide range of possible sorts and sources of evidence, using sound judgement to determine the appropriateness of some and the irrelevance of others within the context of the specific problem they face. So professional judgement is not itself a type of evidence but rather it is the means for adjudicating between alternative sources and weighing their relevance to the individual problem at hand. There need be no universally applicable 'hierarchy', no one sort of evidence that is always and everywhere 'best', to which other forms are therefore, by definition, inferior. It will be up to the properly trained practitioner to assess the merits of different sources of evidence in the specific context of her/his practice, taking into account many considerations—including, in many medical encounters, the goals of patients and the views of colleagues as well as sources of published research [20, 60].

Instead of placing professional judgement at the centre in this way, an alternative approach categorises the thinking of trained professionals and other 'experts' as professional or expert 'opinion' [11, 17]. While judgement in the first sense seemed closely related to, if not equated with, the ideas of rationality and objectivity, judgement-as-opinion seems opposed to these ideas—'opinion' suggests subjectivity and stands in contrast to a view based on proper evidence [23, 24, pp 131–2]. Mechanisms, devised by theorists, are designed to take over the role of adjudicating between different evidential 'warrants' [80], in particular the theoretical construction that is the 'hierarchy'. Because the realm of evidence is assumed to be ordered in terms of a hierarchy, the question arises as to the place of judgement or 'opinion' within it, and the place assigned often turns out to be a lowly one [61].

This down-grading of professional judgement has been accompanied by a reshaping of the politics of the workplace that similarly down-grades the role of practitioners. There are few of us who can seriously regard the relationship between these developments as coincidental. Professional autonomy in many areas is constrained as general guidelines, necessarily insensitive to the specific and individual features of the complex situations practitioners face, become *de facto* regulations which one ignores at one's professional peril. Where rationalisations are offered for this profound change in the status of practitioners and practitioner knowledge, they tend to take as a given the idea that all important decisions should be dictated, as far as possible, by 'impersonal' and 'objective' mechanisms rather than being left to 'personal' or 'subjective' choices, however well informed [24, 37, 78]. The rather obvious social fact that guidelines are drawn up by persons, and often ones far removed from the work contexts they increasingly regulate, is an embarrassment champions of this approach prefer to ignore [30, 44–46, 71].

In short, a conceptual map emerges which depicts 'objectivity' and 'rationality' (and by implication, 'science') as alternatives to thinking that is 'subjective' and 'personal': these categories are treated as oppositions, mutually exclusive, on either side of an absolute dividing line. Yet this is bizarre, because surely reasoning, scientific investigation and experiment are human practices, the activities of persons—whatever their context, all thoughts have subjects. That this division can seem natural to so many commentators today, despite its problematic consequences, testifies to the profound influence of the events in the history of ideas we have been discussing.

Conclusions: Alternatives to Scientism

To reverse this trend we need to find, or revive[6], a conceptual framework that places the cultivation of good judgement at its centre and so replaces the impersonal, overly technical approaches to reason and practice that have exerted such influence in recent times [49]. The most disastrous implication of adopting scientism as our only basis for medical enquiry and for the practice of medicine is its relegation of the study of value to a non-rational pursuit. Scientism has helped us to develop a focus on technical approaches that can assist good practitioners, but at its core medicine is a value-laden enterprise [27, 77]. Academic efforts to reduce or eliminate the evaluative components of such concepts as health and illness [6, 7] have met with serious difficulties [19, 48, 66, 77] and these efforts are aimed not at defending the practice of medicine but at defending scientism. The teleological understanding of health with reference to Aristotle's idea of human flourishing has by no means been 'refuted' [27] by an understanding of the causal mechanisms that make such flourishing possible. A good practitioner is defined with reference to a set of dispositions that facilitate both competent and caring practice, and these dispositions necessarily include moral as well as epistemic attitudes [21, 44, 54].

Alternatives to scientism are possible [38, 58]. In the philosophy of mind and action, authors are developing approaches to reasoning that take seriously the idea that thinking, knowing, questioning, categorising, theorising and a range of other cognitive terms denote human activities [14, 15, 35, 48, 57, 65]. Even observation is the activity of a person; something that a person does in the context of doing all sorts of other things, including all of the activities named in the preceding sentence. These activities have goals, and a full conception of human reasoning cannot detach reasoning from the practical contexts and evaluations that lead us to regard some features of our world as problems in need of solution [27, 50, 77]. The dividing lines enshrined in the modern era, between epistemology and ethics, knowledge and practice, therefore stand in need of revision. The attempt to reduce the world to a series of impersonal events ultimately renders rational practice impossible [64], so a broad theory of rational practice is required which encompasses these elements [44]. Virtue-based approaches to epistemology and ethics are, quite properly, regaining

[6] Is reviving a concept contrary to progress? Not necessarily. It was a good thing from the perspective of intellectual progress that the conceptual framework of atomism, considered in a primitive form by the pre-Socratics but convincingly criticised by Aristotle, was revived, albeit in a very different form, by modern science. We should be careful before consigning an idea once and for all to the 'dustbin of history'.

respectability, focussing on the sort of dispositions we need to defend to cultivate sound judgement [21, 33, 49–51, 54].

In medicine, discussion of the values that underlie practice is quite rightly taking centre stage again. The development of well-rounded individuals who can practice virtuously and autonomously, who exercise wisdom in their clinical practices [54], must be the ultimate goal of medical education. Progress in this and in any other area requires the recognition that we are by no means at the end of intellectual history, and the time has come for medicine to once again draw upon the full range of sources of knowledge that form our intellectual heritage, including insights from the humanities, ethics and philosophy [53].

We agree that the success of science in enabling human beings to achieve extraordinary goals is a good reason to believe that science—including at least some scientific theories—reveals to us something of the nature of reality. But there is a difference between saying that looking at the world in a certain way can help you understand aspects of the truth about your predicament, and saying that looking at the world in a particular way, understood through the lenses of scientism, provides the only truth, such that no other ways of investigating the world can give us a believable and relevant insight into what it is 'really like'.

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