Faraday Papers

Understanding Science, Scientism and Religion

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Summary

Scientism refers to the belief that the methods of the natural sciences are the only, or at least the pre-eminent, way to find real knowledge. This belief, often adopted implicitly, is a central confounding factor in the relationship between science and religion. Scientism can be repudiated without rejecting science. Humans possess much knowledge that is not scientific, and on which science itself depends. If, then, religious belief is not scientifically demonstrated, it is not by that fact ruled out as possessing knowledge.

Science and Scientism

"Whatever knowledge is attainable, must be attained by scientific methods; and what science cannot discover, mankind cannot know." Thus wrote philosopher Bertrand Russell in 1935.[1] He thereby set forth a succinct statement of what is now called Scientism.[2] Although the attitude had been increasingly common over the prior 200 years, the term scientism was then practically unknown, and gained its first major impetus when Nobel-prizewinning economist Friedrich Hayek used it in his 1952 book[3] indicting the sterility of the viewpoint in sociology. The word consequently has a ring of disapproval; and so, naturally enough, people who adopt scientism rarely call their view scientism or attempt to justify it. It is more usually an unspoken assumption.

Scientism underlies a variety of philosophical positions opposed to religion: the naturalistic claim that there is no divine agency, materialism, ontological reductionism, and so on. But, in accordance with Russell's summary, scientism refers primarily to what counts as knowledge and how we must acquire it. It is therefore, initially at least, a philosophy of knowledge (an epistemological position): namely that we obtain real knowledge only through science, rather than a philosophy of being (an ontological position): such as that the material world is all that exists. However, the epistemological opinion expands into a broad and highly influential set of attitudes toward policy, society, and even morality. And anti-religious viewpoints often proceed from an implicit assumption and adoption of scientism. So distinguishing between science and scientism is of prime importance for understanding the relationship between science and religion.

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One difficulty in this discussion is confusion about what is meant by science. In the English language, most people today use the unqualified word to mean natural science, what was once called 'natural philosophy'; it encompasses disciplines like physics, chemistry, biology, geology, cosmology, palaeontology, and so on. But in earlier centuries when Latin was the primary language of intellectual endeavour, the corresponding word scientia did not mean that. Instead, drawing on the magisteria of the great philosophers like

1 *Religion and Science* (Thornton Butterworth, London, 1935), p243.

2 See for example Ian Hutchinson *Monopolizing Knowledge: a scientist refutes religion-denying reason-destroying scientism* (Fias Publishing, 2011).

3 Friedrich Hayek, *The Counter-Revolution of Science* (1952, Reissued 1980, Liberty Fund, Carmel Indiana).

4 See for example Peter Harrison T*he Territories of Science and Religion* (University of Chicago Press, 2015).

Aristotle and Aquinas, scientia was considered a virtue or habit of mind, developing knowledge in any field by long study and especially by logical demonstration[4]; and by extension it referred to any body of knowledge obtained through the practice of this scientia. If science today meant the scientia of the Middle Ages, the way to a body of systematic knowledge in any field, then the scientistic outlook would be almost a tautology - true by definition. There are modern academic department names like "Political Science", "Social Science" and so on, that have nothing to do with natural science. Those names are appropriate only if they mean 'Political Scientia' etc. A frequent source of misunderstanding comes from unacknowledged conflation of these different meanings of the word science: confusing natural science with scientia. Since the great majority of the vexed questions of the relationship between science and religion are about natural science, we shall here keep to that meaning of the word. It makes no sense to suppose that theology is a natural science, but when (historically) theology was called 'Queen of the Sciences' it meant 'Queen of the Scientiae'. She might be queen no longer, and she never was natural science, but theology can certainly still be considered scientia.

Most people are aware of the characteristics that make science (natural science) what it is. These include systematic experiment and observation, the documenting and analysing of the results, formulation from these of general principles governing the behaviour of the natural world - the so-called laws of nature - and working out the consequences of those laws. Scientific experiments and observations, to be useful, have to be reproducible. Science is focused on the ways that the world behaves reproducibly. And to know that they are reproducible, the results have to be unambiguous, otherwise we cannot tell if they are reproducible. We observe that unsupported objects fall to earth with an acceleration of approximately 9.8 m/s^2. One can demonstrate this by trying it, whoever and wherever on earth you might be.[5] That's science applied to gravity. It is reproducible (independent of when we drop something), and it is clear (provided we know the units of measurement, what 9.8 m/s^2 means).

I take these to be the defining characteristics of natural science: insistence on (1) reproducibility, and (2) unambiguous clarity of expression.[6] Reproducibility here does not mean only repeating at will laboratory experiments. Observation of physical events or specimens whose appearance is beyond experimental control, for example in astronomy, palaeontology, geology, or botany, achieves reproducibility by having multiple opportunities for investigation, at different times or places, of identifiably similar phenomena. Scientific investigation of the past, of natural history, likewise depends on the assumption that today's reproducible behaviour (the laws of nature) apply in the past, but also indeed on reproducible observation. This is true even of unique events like the Big Bang, of which present-day effects (for example microwave background, or relative abundance of elements) can be repeatably observed today. The fossil record of biological evolution, and the interpretation of geological strata derive their observational reproducibility from discovery and availability of multiple similar examples, not controlled reproduction at will.

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Modern natural science is the study of nature, but it resolves the vexed question of what is meant by nature[7] in a particular way. One of the most important developments of the scientific revolution itself was to drop the Aristotelian explanation that bodies fall (for example) because of an inbuilt teleological "nature", and instead study the reproducibilities of their behaviour in terms of clearly measurable properties. Since that time, science has achieved its enormous successes in understanding the natural world by its insistence on reproducibility and clarity. Scientific papers are expected to meet rigorous standards of clarity in their presentation of experimental or mathematical methods, and to be rejected if they are woolly and ambiguous in meaning or fail to provide clear documentation of the results. Also, reported results that, on further investigation, turn out to be unreproducible (beyond their anticipated uncertainties)[8] are regarded as suspect and eventually discredited.

As a professional scientist myself, I am committed to these sorts of practices. They have proved their worth in the study of the way that the universe is reproducible, the study of nature. But I also recognise that they cannot be applied to every aspect of knowledge. By contrast, the confidence of a growing number of thinkers of the eighteenth century Enlightenment, and the direct explicit claim of Positivism in the nineteenth, and Logical Positivism in the twentieth century, was that the methods of science apply exhaustively to everything. Positivism asserted that rudimentary pre-scientific knowledge of any topic needs to grow up into proper scientific knowledge; and that given time and vision, either it will, or it must be dismissed as being not knowledge but nonsense. That viewpoint is scientism: saying, in short, 'Science is all the real knowledge there is.'

5 But choosing conditions to ensure that gravity is really the dominant force.

6 These characteristics of natural science are developed at length in Chapters 2 and 3 of *Monopolizing Knowledge*. I invite the reader who is sceptical of their universality to regard these chapters as a clarification of what *I mean* by science in this paper.

7 Robert Boyle, a cofounder of the Royal Society, wrote a whole book called *A Free Inquiry into the Vulgarly Received Notion of Nature* see doi:10.1017/CBO9781139166836.

8 Clarity does not mean exact precision of experimental values, but it does mean indicating how precise we think the results are.

Reactions to Scientism

The climate of formal philosophical opinion today mostly regards Positivism as a dead end. Perhaps its greatest logical weakness is straightforward self-contradiction. If all we can truly know must be discovered by science, how do we know that? Scientism is not scientifically demonstrated, it is not a finding of science; so if it scientism is true we don't and can't know it! Furthermore, scientism has come under strong criticism in the intellectual movement called Postmodernism. Under the influence of scientism, scholars in a host of human disciplines like history, sociology, philosophy, language, and even literature, had laboured mightily to turn their subjects into science, proposing that there would soon be, for example, in historical studies "laws to be accepted and reckoned with as much as the laws of gravitation, or of chemical affinity, ...".[9] But as these aspirations' failure became increasingly evident in the mid twentieth century, there was a reaction against the scientism that had provoked them - especially in literary studies and philosophy. One important emphasis of that postmodern reaction is that 'narrative' can represent and convey true knowledge; and that science is not the only way to get to know something.[10] This is a welcome corrective to the monopolistic claims of scientism. Unfortunately though, postmodernist critiques often fail to distinguish between science and scientism, and attack science itself. The more extreme critiques imply that even in describing the reproducible behaviour of the natural world, scientific theories are no more appropriate than sociological or historical analysis of the same data. Science certainly depends upon many human skills and knowledge that are not science, for example language, and there are human and social influences in the practice and historical development of science, but postmodern speculation that the content of well-established scientific theory would be different if society were different, is regarded as absurd by most natural scientists. They think they are discovering reliable truths about the universe that are equally true for everybody, and I think they are right.[11]

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It has nevertheless been widely held by philosophers of science during the past few decades that there is not, and never has been, an identifiable "scientific method" or other criterion by which one can decide what knowledge is scientific and what is not.[12] This philosophical failure to solve the 'demarcation problem' of identifying where to draw the line between science and non-science does not bother scientists, who don't seem to need their methods of discovery to be theoretically prescribed for them. Nor (less consistently) does it seem to have caused a collapse of the field of the history and philosophy of science. Its scholars and journals continue to show that they know what they mean by the discipline, and that overwhelmingly it is about science in the sense here presented. If one subscribes to scientism, then demarcation between science and non-science becomes demarcation between knowledge and superstition, or even between sense and nonsense. It is mostly this demarcation that has failed, not surprisingly since scientism has enormously raised the stakes, giving the demarcation a significance it does not deserve and cannot bear.

Despite the undoubted difficulty of demarcation, there is in fact something rather special about scientific knowledge. Science gives knowledge that is remarkably reliable. It does so precisely because of its characteristic focus on the reproducible aspects of the world. The raw power (for good or ill) of the technology that springs from it is undeniable, because reproducibility is precisely what is most needed by technology. A critique of scientism that denies the success of science in its own sphere is hollow and unpersuasive. Distinguishing between science and scientism is therefore essential to restoring a recognition that while science yields knowledge of great elegance, persuasiveness, and practical importance, it does not encompass everything that one can know, and it is incompetent to answer the deep transcendent questions people find most important.

Non-scientific Knowledge

History is an example of a field that has real knowledge springing from careful and disciplined study, but is nothing like natural science. History is not reproducible, and indeed the events that attract most attention in history tend to be the most unusual, least reproducible. So history illustrates that not all of knowledge is about the reproducible aspects

9 Edward P Cheyney, *Law in History*, http://www.historians.org/info/AHA_History/epcheyney.htm, Presidential address delivered before the American Historical Association at Columbus, December 27, 1923. *American Historical Review* 29:2 (January 1924): 231–48.

10 *The Postmodern Condition: A Report on Knowledge,* Jean-François Lyotard (1979) is widely considered a definitive expression of postmodernism.

11 Roger Trigg, in Faraday Paper number 2, points out postmodernism's rejection of *all* Grand Narratives like this. The rejection is clearly articulated by Lyotard with no distinction between science and scientism. Religion is another Grand Narrative that is suspect. I do not share that rejection either of science or Christianity.

12 Paul Feyerabend, *Against Method* (NLB, London, 1975) was highly influential in the adoption of this view. My identification of reproducibility and clarity as modern natural science's key characteristics does not claim to be a comprehensive solution of demarcation, just part of its actual character. This is explained at length in Chapter 4 of *Monopolizing Knowledge*.

of the world. Human history is also about subtle and ambiguous factors of politics, emotion, value, and justice, which are incapable of expression with the clarity that science demands. Subtle understanding and knowledge about human and intangible factors can be just as important as the laws of nature, even though they are not like those laws.

And the same can be said to varying degrees concerning other humanities and social studies such as language, sociology, literature, economics, ethics, philosophy, and so on. To suppose that these will all eventually somehow be reduced to science, and studied using methods similar to botany, metallurgy or astronomy, is to ignore their true character. Non-scientific disciplines follow their own methods, suitable for the character of their own subjects of interest, and by doing so they contribute to knowledge. It is often knowledge that gives less reliable predictive ability, or is ambiguous, and harder to confirm, but that is because of its subjects. Mathematics and science are commonly thought of as intellectually challenging hard subjects, but one can truthfully say that science has chosen the easy aspects of the world to study, by restricting its focus to the clear and reproducible aspects. The unmeasurable, subtle, and irreproducible aspects of the world are in a sense much harder to systematise into coherent knowledge, and it is generally knowledge that does not provide the same reliable prediction and control, or command the same level of expert consensus, as science.

Concerning religion, media commentators habitually draw a contrast between science-based and faith-based beliefs or actions as if science is knowledge, and religious faith is, well - guess-work, superstition, wishful thinking, or at any rate belief without evidence. But a more accurate contrast is between science and non-science. Questions of religion are not at all unique in not being approachable through science. Religious beliefs can in fact be discussed rationally in terms of evidence, thoughtful justification, utility, and personal experience, just as questions of history can, but the evidence in either case cannot be expected to take the form of experiments or observations that possess scientific reproducibility and clarity. Instead, it is more like the evidence that is used to decide a legal case. That generally takes the form of testimony from different witnesses, maybe some documents or other 'exhibits' that bear on the questions, all of which have to be evaluated by lawyers and especially judges who are practiced in the interpretation of statutes and knowledgeable about past case history. But they are also assessed in jury trials by non-experts who, though they have no particular legal expertise, bring their life experience of understanding people, which they use to assess the plausibility of the testimony and its significance. Forensic science can also play a supporting role. But in court even such scientific evidence is presented by witnesses, who are called upon to explain and defend the trustworthiness and significance of their findings. A legal verdict has far less comprehensive a scope of evidence than well-established scientific laws or findings, simply because legal cases are all unique and cannot be subject to repeated testing. Yet juries have to decide that the accused is "guilty beyond any reasonable doubt", and society relies upon those legal verdicts, despite their actual uncertainty, to decide momentous questions that are sometimes matters of life or death. Religious questions are decided by similar sorts of assessments. So when antitheists say there is 'no evidence for religious belief', they cannot possibly mean that there is no evidence of the type that the law courts routinely examine. More often than not they mean religious doctrine cannot be demonstrated by science. Most religious believers accept that it cannot. But that does not convert their faith into blind belief without evidence or knowledge; not unless science is the only source of true knowledge. It is not – there are many ways of knowing.

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Scientism's aspirations versus Science's impersonal principles

Scientism nevertheless persists. Even though probably the majority of practitioners of the humanities have thankfully abandoned the "science envy" provoked by scientism, there remain high profile writers and advocates who think they are wrong to have done so. In the study of history there are those who think that by constructing giant historical databases and analysing them with "machine learning" tools and other mathematical techniques, one can discover scientific "laws". For example, Peter Turchin, a University of Connecticut population ecologist, is motivated by the belief that "All sciences go through this transition to mathematisation", aiming to promote this transition in historical research.[13] His 'basic premise' is that "historical societies can be studied with the same methods physicists and biologists used to study natural systems".[14] He coined a name and started a journal for his approach entitled Cliodynamics. He is not alone in

13 Graeme Wood, *The Historian who sees the future* Atlantic Magazine, Vol 326, No 5 (2020).

14 Turchin, P. and Nefedov, S. (2009), *Secular Cycles*, Princeton University Press, cited by Graeme Wood.

15 Steven Pinker, *The better angels of our nature,* (Penguin Books, London, 2011).

his aspirations. Cognitive psychologist turned populariser, Steven Pinker, also published (in 2011) a book analysing 'why violence has declined',[15] backed up by 'datasets' and 'graphs' attributing the decline to the Enlightenment. He, like Turchin, sees himself applying scientific methods to the humanities, and is unabashed by the uncomplimentary assessment of his book by professional historians. (It should not go unnoticed that the overall trends of history identified by these two authors contradict one another: Turchin sees cycles, Pinker continuous progress). I am not saying that mathematical analysis of databases is improper in history; I am saying, though, that history lacks the clarity and reproducibility to make such analysis the primary tool for understanding it. If scientific techniques were to come to dominate the study of the human past, the result would no longer be history as we currently know it and need it; it would instead be a greatly impoverished scientistic statistical exercise.

Nobel-prize winning biologist Jacques Monod summarised his philosophy thus:[16] "The cornerstone of the scientific method is ... the systematic denial that 'true' knowledge can be got at by interpreting phenomena in terms of final causes - that is to say, of `purpose'." He thus implicitly embraced scientism by identifying `true' knowledge with science, but he also correctly identified a crucial character of modern science - that it seeks explanations more by reproducible mechanisms than by addressing questions of goal and intention. Because the explanations of science deliberately, and on principle, exclude from consideration purpose or agency, science is powerless to address the particular nature and value of personhood. Science gives what are sometimes called 'bottom up' explanations, meaning explanations of the more complex aspects of the world in terms of its less complex components that are more accessible to scientific methods of enquiry. The power of this approach is well established; but a person is an agent whose defining character is that they have intentions, and act with purpose to accomplish desired ends. Personal action does not possess the reproducibility or clarity that science insists on, so science cannot really address it. A person frequently causes events by conscious thought and intentionality. That may be called 'top down' causation. Rational personal discourse involving intentionality and a discussion of meaning, lies beyond science. Science says that water is boiling in the kettle because of the heat raising its temperature till its vapour pressure is greater than that of the atmosphere. It is a good explanation. But it might be an even better, and equally correct, explanation to say the water is boiling because I am making a cup of tea. That illustrates the distinction between 'bottom up' and 'top down' explanations, and also that top down explanations are extremely common in human thought because we are persons.

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When sceptics are asked what it would take to convince them that God exists, frequently their answer involves an obviously supernatural event, witnessed by many people, and involving a voice or communication of the personal nature of God. The personhood of the Deity is a well-recognised feature of most theistic beliefs, but an aspect that sceptics generally reject. Impersonal Pantheism is, after all, a view that presents few difficulties for the naturalism and materialism that is today's main secular alternative to theism. If, though, the personhood of God is the main issue, God's existence is evidently not a scientific question, since science, by its focus on bottom up explanation, has deliberately avoided tackling questions of personal intention.[17] When an antitheist asserts there is no evidence for God's existence, that can surely only mean scientific evidence. The many other forms of evidence – historical, personal, philosophical and so forth - that have persuaded billions of people that God does exist, do not amount to formal proof, but do provide a solid, rational basis for belief. For some, science itself acts as a powerful pointer towards belief in God,[18] but to suppose that science is the only type of evidence that counts is scientism, not science.

Science and Faith

Science since the seventeenth century has achieved a profound and wonderful knowledge of the natural world, and in doing so has transformed society and the planet. For the understanding of the regular behaviour of nature, it has replaced the speculative interpretation of revered texts with experimentally verified observation and unambiguous theory. Although mature sciences like physics have recently slowed in their headlong discovery of fundamental principles, the growth of scientific knowledge in more complex fields like biology continues at a dizzying pace. Phenomena that were once utterly mysterious have again and again yielded

16 Jacques Monod *Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology* (English edition, Vintage Books, 1972).

17 Saying the existence of a personal God is not a scientific question does not rule out natural theology or interpreting the findings of science as evidence for the existence of God; it just means that the interpretive step, and indeed natural theology, is not itself natural science.

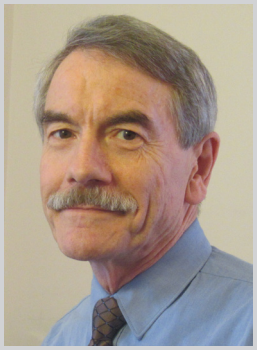
18 For example, Sy Garte, *The Works of His Hands: A Scientist's Journey from Atheism to Faith*, Kregel, 2019.

their secrets to science's seemingly inexorable progress. Such awesome growth of knowledge inspires a presumption that there is no end to what science can discover, that there is nothing beyond science's eventual competence. Today, only the foolhardy suppose that there are features of the material world that will forever remain beyond science's ability to understand. So is an insistence that certain types of knowledge are not science foolhardy in a similar way?

Believers in historic religions like Christianity, for whom Divine revelation is authoritative, despite being themselves greatly instrumental in science's development, do face the challenge of understanding whether that authority is credible in the face of modern science. And religious commitments have often been portrayed as continually on a defensive retreat before science's progress. A theological strategy that is nowadays largely discredited in this situation is often called 'The God of the Gaps', meaning locating the presence and actions of God in the current gaps in our scientific knowledge. As a religious defence against scientific progress, such an approach appears doomed to eventual defeat if scientific knowledge continues to grow at its present pace. The idea is also profoundly problematic theologically, since the Bible portrays God as acting throughout all of creation, not just in the things we don't presently understand. Is the rejection of scientism an adoption of a 'God of the Gaps' type of argument?

This is a fair question. No one knows what science will eventually discover about the natural world. But if natural science really has something like the character presented here, then there are real forms of knowledge that science is unequipped to acquire, as a matter of principle and definition, rather than contingent fact. Humans are composed of quarks and electrons, atoms and molecules, genes and cells, biological machinery like muscles and organs, and so on upward. The levels of true description ascend further and further into the complexities of consciousness, rationality, and indeed knowledge itself. Those higher levels are the residence of all that we know; they are not discoveries of science, but experienced personal realities. Science undoubtedly will discover much more in the coming century about the physics, chemistry, and biology of brain function, but whatever it finds out cannot, without becoming self-contradictory, deny the reality of personal knowledge.

Only by changing what is meant by natural science could 'science' provide an understanding of fields such as ethics, philosophy, economics, theology and history – but by that time we are back to scientia and not the meaning of science as referring to the natural sciences as used here. There is a long and largely unfruitful history of trying to turn many of these fields into science with the meaning of 'natural science', and only an unquestioning faith in scientism can sustain the presumption that such a process will ever be completed. The fact that some disciplines, for example psychology, economics, and sociology, benefit from mathematical or statistical analysis of data is no demonstration to the contrary. If humanities - even those with strong connections to biology - were to be pursued purely as science, it would either be by ignoring a vast fraction of the scope of their proper concerns, or reverting science to scientia. Religion can also be studied as if it were a natural phenomenon, by collecting and analysing statistical data, setting aside its meaning and significance, and supposing that a bottom up causation in terms of evolutionary advantage provides its true explanation. But to take such an approach in religion, as in other non-scientific subjects, impoverishes rather than enriches our understanding. It sets aside questions of meaning and significance, declining to address anything beyond mechanism. The dissolution of the humanities would indeed be a big price to pay for the sake of defending the mistaken philosophy of scientism.



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The Faraday Institute for Science and Religion

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