THE RISE, FALL, AND RESURRECTION OF (IDEOLOGICAL) SCIENTISM

by Christian Baron

Abstract. The term "scientism" is often used as a denunciation of an uncritical ideological confidence in the abilities of science. Contrary to this practice, this article argues that there are feasible ways of defending scientism as a set of ideologies for political reform. Rejecting an essentialist approach to scientism as well as the view that ideologies have a solely negative effect on history, it argues that the political effect of ideologies inspired by a belief system (including scientism and various religions) must be judged case by case—and that the appearance of complex politico-scientific problems such as the climate problem in effect warrants some kind of ideological scientism.

Keywords: evidence; evolution; history of science; ideology; scientism; worldview

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This article is about the historical role of scientism as a political ideology. The concept of scientism is mostly used as a negative term in academic literature (e.g., Hughes 2012). A case in point is a recent anthology (Williams and Robinson 2015), where the introductory note denounces scientism as an ideology that "entails a zealous metaphysical commitment and requisite orthodoxy in method and in thought regarding the nature of the world and how understanding of the world is to be approached" (Williams 2015, 3). Elsewhere, we are told that this zealous metaphysical commitment is a commitment to reductive materialism; that scientism holds that the methods of the natural sciences should be expanded into the social sciences and the humanities; that scientism promotes an overconfidence in the abilities of science; and even that scientism is a major obstacle to critical scientific inquiry (Williams 2015, 5–7).

Having a background in evolutionary biology in combination with formal training in philosophy of science, I consider myself the ideal target

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audience for this volume. Parts of my academic work have centered on the role of epistemic and metaphysical commitments in controversies in evolutionary biology (Baron 2009, 2011, 2013), and over the years I have encountered numerous students and colleagues with views I would consider "scientistic" in some sense or other. Yet I cannot escape the feeling that the above diagnosis is unsatisfying. First, I find it difficult to align this essentialist treatment of scientism with the plurality of opinions that I encounter among my fellow scientists in the biosciences. Many of those probably hold some metaphysical commitment to materialism. But that certainly does not mean that they are also proponents of *reductive* materialism. In fact, the whole claim of scientism as wedded exclusively to reductive materialism seems rather *altmodish* here in the first part of the twenty-first century, where epistemic discussions on complexity and uncertainty pervade most of the biosciences (see also Gallopin et al. 2001).

The claim that scientism is a major obstacle to critical scientific inquiry per se also strikes me as somewhat odd. I have encountered many scientists who justify their commitment to (nonreductive) materialism *precisely because* they believe it serves as the best precondition for making critical inquiries about reality. This is perhaps unsurprising when noting that the conjunction of scientism and evidentialism is often identified as a prominent feature of the New Atheism (see, e.g., Taylor 2018 as well as below). But it does leave us with a question about how exactly we are to understand the relations between scientism, materialism, critical inquiry, and the role of evidence. It also beckons the question of whether scientism should be treated as having an essentialist "core" (more or less fulfilled in specific instances)—rather than as a set of historical entities clustered together as family resemblances that may individually be pointing in different epistemic directions.

This suspicion is fueled even further by the introduction's contention that proponents of scientism seldom identify themselves as such (because of negative connotations of the term), but have to be diagnosed *post facto.* Although I agree with this statement, it also means that the process of identifying examples of scientism may easily lend itself to cherry-picking confirmations.

Yet another oddity is the way the introduction slips back and forth between treating scientism as a worldview and as an ideology. The distinction between worldview and ideology may appear to be tentative given that these terms are associated with many different meanings in academia. But at the very least, further scrutiny is needed before it can be claimed with confidence that scientism is both at the same time.

In short, I suspect a straw man to be at play that misrepresents the state of scientism and its history. As a correction, this article offers an alternative argument that denies several common premises for analyzing scientism. This argument concludes that there are feasible ways of defending a

considered role for scientism as an ideology (or rather a set of ideologies) for political reform. Analyzing three historical "instantiations" shows that ideological scientism has diverse applications with both "progressive" and "reactionary" aspects, but that the appearance of complex politico-scientific problems such as the climate problem—rife with uncertainties but also strongly dependent on the acquisition of scientific knowledge if solutions are to be found—in effect warrants some kind of ideological scientism.

Following the above, the focus of this article is on scientism as a set of political ideologies rather than as a general worldview. As already noted, "ideology" may refer to disparate meanings in academia. Perhaps most prominent of these is the Marxist understanding that views ideologies as the set ideas by which the ruling class justify their control over the means of production (Marx [1871] 1978) that function in turn as a justification of the ruling class itself. However, this definition is inadequate here for two reasons. First, it ignores the possibility that it is not only the ruling class who may adhere to a certain ideology. Other groups may be proponents of subversive counter-ideologies as well. And second, it treats ideology as an overall *negative* term, ignoring the possibility that some ideologies might play a positive role in the process of democratization.[1] This is consequential for how we treat scientism and also how we treat religion and other belief systems. One contention between Christian scholars and New Atheists like Richard Dawkins (see below) is the charge that the latter ignores the great diversity of religious beliefs and practices, instead viewing it as having an essential core that, when turned into an ideology, necessitates totalitarian fundamentalism. But this conveniently overlooks that, for example, Christianity has served as ideological inspiration for long-term democratic supporters such as the Christian Democrats (see, e.g., Grabow 2011). The political ambiguity of religion in our political history is misrepresented by treating ideology as a purely negative force, and I suspect this to be the case of scientism as well.

Instead, I have adopted the approach of Robert M. Young, who maintained that

> When a particular definition of reality comes to be attached to a concrete power interest, it may be called an ideology. . . . In its early manifestations the concept of ideology conveyed a sense of more or less conscious distortion bordering on deliberate lies. I do not mean to imply this. . . . [T]he effort to absorb the ideological point of view into positive science only illustrates the ubiquitousness of ideology in intellectual life. . . . We need to see that ideology is an escapable level of discourse. (Young 1971, 180–81)

Following this, I will argue that ideological scientism, in addition to containing a "particular definition of reality" (a worldview), is also defined as being attached to a concrete *power interest.* As this article will emphasize, it is by focusing on the role of scientism as a tool for various power interests

(and in conflict with the ideologies of other competing power interests) that we should understand the importance of scientism as a beneficial factor in the history of democratization.

What Is Scientism?

Most analyses of scientism tend to regard it as a worldview rather than as an ideology. Accordingly, Mikael Stenmark (1997) delivered a thorough taxonomy of different forms of scientism that may serve as a useful starting point for this article. It should be noted that I also have some reservations toward it—precisely because it concerns itself with scientism as a general worldview rather than as an ideology. The basic distinction in Stenmark's analysis is between what he terms *academic-internal scientism* and *academic-external scientism*. Stenmark describes academic-internal scientism as "The view that (a) all, or at least some, of the genuine, nonscientific academic disciplines can eventually be reduced to (or translated into) science proper, that is, natural science (academic-internal scientism$_1$), and that (b) all natural sciences can eventually be reduced to (or translated into) one particular natural science (academic-internal scientism$_2$)" (Stenmark 1997, 17).

Although Stenmark offers this as a definition of academic-internal scientism, it seems to me that it would work equally as well as a definition of epistemic reductionism as such. I write this not to enter into a trifle about semantics, but because it seems to be a hidden assumption of many critics of scientism (as well by some of its proponents) that this position by necessity entails reductionistic ambitions on behalf of the natural sciences, and the possibility that these may eventually be able to engulf the disciplines of the social sciences or the humanities. That Stenmark seems to share this assumption can be further illustrated by the fact that he describes one version of academic-internal scientism—*methodological scientism*—as "the attempt to extend the use of the methods of natural science to other academic disciplines in such way that they exclude (or marginalize) previously used methods considered central to these disciplines" (Stenmark 1997, 18). He also notes that

> What is characteristic of scientism is that it works with a narrow definition of science. Before any reduction or translation has taken place, the advocates of scientism use the notion of science to cover only the natural sciences and perhaps also those areas of the social sciences that are highly similar in methodology to the natural sciences. How broad the definition in the end will be (when the programme is completed) is a matter of how many academic disciplines one thinks could be successfully turned into a natural science. (Stenmark 1997, 20)

As noted earlier, I disagree with this claim to the extent we regard it as a *universal* claim concerning scientism as such. Elsewhere, Stenmark quotes former Indian Prime Minister Jawaharlal Nehru as a proponent of

scientism. The quote, which also appears in Tom Sorell's (1991) analysis, goes as following: "It is science alone that can solve the problems of hunger and poverty, of insanitation and illiteracy, of superstition and deadening custom and tradition, of vast resources running to waste, of a rich country inhabited by starving people. . . . Who indeed could afford to ignore science today? At every turn we seek its aid . . . . The future belongs to science and to those who make friends with science" (Nehru quoted in Sorell 1991, 2).

Note that there is nothing in this quote entailing anything about the precise internal relations between different scientific disciplines. In claiming that the future belongs to those who make friends with science, Nehru (arguing in the context of fighting hunger and poverty) is stating that the solution to the great problems of hunger, poverty, insanitation, and illiteracy lies in taking a scientific approach to the problems. Now, the word "science" in English carries a double connotation (as opposed to the German *Wissenschaft,* the Swedish *vetenskap*, and the Danish *videnskab*) in that it may sometimes be taken to mean the natural sciences per se and sometimes to mean the academic disciplines more generally. We have no way of deciding precisely how Nehru conceived the term (or whether this distinction was in fact clear to him at all). But judging from the context, there is no reason to conclude that he supposed these problems to be the domain of the natural sciences alone.[2] Clearly, the toolbox for solving the problem of illiteracy is more to be found in the area of social engineering (and, hence, with the help of the social sciences) than the natural sciences.

What we *can* deduce from this quote is that Nehru was a strong proponent of enlightenment (see below) as a way of improving the condition of his people, and that the believed science could serve as a means to that end. This seems to hint that there is an important political aspect of scientism that is not captured by insisting too hard that reduction to the natural sciences must be a necessary part of any scientistic position. Returning to Stenmark's analysis, he notes that academic-external scientism encompasses "The view that all or, at least, some of the essential nonacademic areas of human life can be reduced to (or translated into) science" (Stenmark 1997, 18).

Of course, the expression "essential nonacademic areas of human life" is a fairly vague term. In the context of Nehru's quote, these "nonacademic areas" mostly appear as problems that need to be addressed, and solved by the means of science: hunger, poverty, insanitation, and illiteracy. Comparing this quote with the various undercategories of academic-external scientism presented in Stenmark's analysis, we find that the content of some of them are epistemological or metaphysical in nature, rather than prescriptive claims per se. This goes for *epistemic scientism* (the view that the only reality that we can know anything about is the one science has access to), *rationalistic scientism* (the view that we are rationally entitled

to believe only what can be scientifically proved or what is scientifically knowable), as well as *ontological scientism* (the view that the only reality that exists is the one science has access to). In stating this, I am of course not arguing that these descriptive claims may not have normative or prescriptive implications, but only that the precise content of such implications are ambiguous and only surfaces semantically when they are combined with prescriptive statements about goals or aims.

However, Stenmark also gives us two versions of academic-external scientism that has a sort of "hybrid" character, having both strong descriptive and prescriptive components—as well as two versions having a primarily prescriptive message. Stenmark denotes the two first versions *axiological scientism*, distinguishing between *axiological scientism*$_1$ (the view that science is the only truly valuable realm of human life, and that all other realms are of negligible value) and *axiological scientism*$_2$ (the view that science can completely explain morality and replace traditional ethics). Here, it seems that we enter a somewhat different realm, as both of them emphasize ambitions on behalf of scientism that belongs to the domains of ethics or (even) politics.

This is also the case (perhaps even more so) for the last two versions of academic-internal scientism mentioned in Stenmark's analysis. Although we are told that *redemptive scientism* contends "that science alone is sufficient for dealing with our existential questions or for creating a world view by which we could live" (Stenmark 1997, 27), *comprehensive scientism* goes even further in claiming that "science alone can and will eventually solve all, or almost all, of our genuine problems" (Stenmark 1997, 30).

Of course, these analytical categories are to some extent empty of content. For instance, claiming that science "alone is sufficient for dealing with our existential questions or for creating a world view by which we could live" is a statement that leaves us with a range of questions. Exactly how is science supposed to be sufficient for these things? And, which view of science lies behind this claim?[3] Those questions remain unanswered by Stenmark, who seems to presuppose that we already agree upon a clear understanding of what kind of activity science actually is.

However, as many practitioners of science are aware of, the devil is in the detail. The Beast of Science looks very different, depending on the angle from which it is viewed. Members of scientific communities that study, say, the dynamics of complex systems or the appearance of minds with consciousness in the history of human and primate evolution may be adherents of one or several of the various categories of "scientistic world views" outlined in Stenmark's analysis. But this does not necessarily mean that they share the same visions for what is entailed by a scientific conception of the world. They may, or may not, for instance, be proponents of ontological or epistemological reductionism; they may, or may not, share a logical positivist, Popperian, or even hermeneutical view of science and its

practices; and they may, or may not, be proponents of desirability of the ultimate unification of the sciences. And even if they agree overall on these questions, they may still disagree about, say, which causal or explanatory principles should form the base of their ontological reductionistic commitments, or about which principles a unification of the sciences should be based on. It is, in other words, by no means certain that adherents of scientism, when put together and forced to discuss this subject, will agree internally upon exactly what a scientistic position entails, much less how any political program basing itself on a "scientistic worldview" should be implemented.

This reflects the fact that the notion of scientism, as already noted, is somewhat empty of content in terms of prescriptive aims or goals. As such, a scientistic worldview (or a set of scientistic worldviews) can therefore be employed (or even hijacked) in the service of a variety of power interests, and, hence, in the service of political ideologies with a variety of different agendas. But at the same time, this also means that a specific scientistic worldview only develops into a full-scale ideology with the adding of normative and/or political content.

Critics of various forms of scientism have often pointed to this fact in the process of fleshing out examples of the "ideological abuse of science" (e.g., McGrath 2010). Such a critique often seems to imply that science is an activity which is inherently "value-free" or "value-neutral." However, if there is one thing that the manifold and diverse studies of science during the last five decades have shown us, it is that such a position is no longer tenable. As already argued by Robert Merton [1942] 1973, science itself is based on a normative system of different imperatives installed in order to secure the credibility of scientific claims. Later scholars, such as Michel Foucault ([1962] 1969) and Lorraine Daston (1995), have taken a contextualist approach to the origin of such normative systems, arguing that they may arise (and go extinct) as historical contingent entities whose endurance may depend on their compatibility with societal demands or limitations. Thus, science constitutes an activity already enmeshed in the messy world of ethics and politics. To point to the fact that there may be possible ethical and political biases behind certain scientific knowledge claims does not make these claims illegitimate per se.

One may also argue that this implicit view of "real" science as an inherently "value-neutral" or "value-free" activity turns out to be strangely in accord with a principle that these critics would probably see themselves opposing. I am here talking about the contention that scientists should be exempted from having a moral responsibility for the consequences of their research. The basic argument against this contention is that scientists, like everyone else, are morally responsible for the consequences of their choices, including the consequences of making empirical claims that may either be erroneous or be used in the construction of technological

devices that may have harmful effects (Douglas 2009, 66ff). The moral obligation to consider not only the consequences and credibility of making certain knowledge claims public, but also the wider public and political consequences of their research in general, is thus a part of what constitutes a scientist's civic responsibility.

Still, questions remain as to what exactly any notion of "a scientist's civic responsibility" entails. For some scientists, the very attempt to carry out such a civic responsibility is no doubt connected to their embrace of ideas or viewpoints that may rightly be considered scientistic in one or several of the many senses presented above.

Undoubtedly this is the case for Richard Dawkins's public attacks on religion as developed, for instance, in his *The God Delusion* (2006). In the preface of this polemical book, he offers the following vision:

> Imagine, with John Lennon, a world with no religion. Imagine no suicide bombers, no 9/11, no 7/7, no Crusades, no witch-hunts, no Gunpowder Plot, no Indian partition, no Israeli/Palestinian wars, no Serb/Croat/Muslim massacres, no persecution of Jews as 'Christ-killers,' no Northern Ireland 'troubles,' no shiny-suited bouffant-haired televangelists fleecing gullible people of their money ('God wants you to give till it hurts'). Imagine no Taliban to blow up ancient statues, no public beheadings of blasphemers, no flogging of female skin for the crime of showing an inch of it. (Dawkins 2006, 23–24)

One may, of course, take issue with the diagnosis (which seems to be embraced in the above quotation when taken out of context) that religious division is responsible for the appearance of all of these conflicts mentioned here and the violence associated with them. But in all fairness, this is not really Dawkins's claim. Elsewhere, he notes that wars and feuds between religious groups are seldom actually about theological disagreements but rather about issues like economic and political repression or revenge for earlier misdeeds. Dawkins's main point, however, is that the religious labeling is a potent tool often used to escalate these conflicts and keep the enmities alive across generations (Dawkins 2006, 294). Following this, it also seems ill-advised to conclude that Dawkins has no case at all, and that religious division has played no role at all in creating and maintaining these conflicts. So, perhaps we might solve this by speaking of the "ideological abuse of religion" in the same way that McGrath and others have been speaking of the "ideological abuse of science."

There may certainly be numerous instances of ideological abuse of science or religion. However, as noted near the beginning of this article, I find the labeling of *any* kind of crossover between ideology and science or religion as mere "abuse" (thereby forbidding them any place in political discourse) to be intellectually dissatisfying. Can we really *a priori* claim that these domains have nothing positive to contribute to the ideologies that enter political discourse?

I think a considered answer to this question must be no on both accounts. The merits (positive or negative) of importing values, norms, ideas, or simply ways of thinking from these domains into political discourse, or using them as inspiration for full-fletched political ideologies, must be judged case by case, by the specific content of these ideologies, and the context in which they appear.

So, the question that remains as to what extent science should inform political discourse, or serve as the foundation of the development of political ideologies, is not simply a matter of yes or no, but *how*. How has a specific political ideology made use of science? Which elements of "scientism" are included in its content? Which power interest does it serve? And what moral values inform it? With questions such as these in mind, the following three sections will address three historical instances of (British) scientism (as political ideologies), assessing their differences and commonalities.

The Rise of Scientism: The French Revolution and the Rise of Scientism as an Ideology of Dissent and Egalitarianism

Historically, the entrance of scientism as a political discourse probably has its origin as a major political force somewhere around the beginning of the Enlightenment, with the appearance of the *encyclopédistes.* Major *encyclopédistes*, such as Denis Diderot and Jean la Rond D'Alembert, argued that the purpose of this exhaustive presentation of knowledge in the *Encyclopédie* was to make humans more virtuous (Sorell 1991, 196).

Forerunners, of course, include Francis Bacon's programmatic declarations in the *Novum Organum* that science should be put to use to serve for the betterment of Mankind, and his attempt to flesh out an utopian society based on science in the *The New Atlantis* ([1627] 2008)—and perhaps to a certain extent somewhat later Thomas Hobbes's *Leviathan*, whose *state of nature* (his term for human life without government) is claimed to be based on a "mechanical" (the term is Hobbes's own) understanding of human beings and their passions.

Likewise, an early satirical *critique* of scientism can be found in the third book of Jonathan Swift's *Gulliver's Travels*, where Gulliver goes to land of Laputa, a place that is ruled by world-weary scientists who involve themselves in petty internal squabbles or occupy their time ordering the hapless people of Laputa about according to the whims of their latest theories (Swift [1726] 2007).

However, a major boon to the rise of scientism was undoubtedly the French Revolution, which, for the first time, gave rise to a political system that took the secular aspirations of the first generation of the *encyclopédistes* seriously. The road to influence came by way of the *ideologues*—a group of rationalist historians, scientists, politicians, and educational reformers,

who (writing in the years before the French Revolution) advocated that matter contained the potential for sensation, and that this potential was actualized in living animals. Prominent members of this group included the atheist Baron d'Holbach; historian and deputy of the National Assembly Constantin de Volney; the physician Pierre de Cabanis; and the mathematician Marquis de Condorcet (Desmond [1989] 1992, 42ff). On the premise that ideas were the refined result of sensory associations (and could therefore be derived from external stimuli), they maintained that the health and moral character of Man could be perfected through the control of his social environment, and campaigned for political, medical, and educational reforms in order to remove religious obstacles perceived to be in the way of this progress.

Despite having reservations about certain of the *ideologues*' doctrines, Jean-Baptiste Lamarck began to extend this approach to the entire organic realm. For him too life was a property of organization rather than matter per se. In his *Philosophie Zoologique* (1809), he argued that animal life could be organized in a continuous ladder of complexity that reflected the "march of nature" from microscopic "infusorians" (in the terms of the day) up to and including Man. According to Lamarck, this progressive series of organisms reflected the natural ability and drive of living animals to self-transmute into new more complex forms from simple spontaneous generation. He also noted that this drive might be diverted or arrested by obtained habits through which the organisms sought to accommodate to changing environments. Through the inheritance of the habits acquired as adaptations to environmental challenges, Lamarck argued, the self-transmuting drive of a lineage might be led astray, resulting in its evolutionary entrapment at a lesser stage.

Lamarck's evolutionary theory, and the egalitarian view of human nature inherent within his theory of the inheritance of acquired characters, served as a metaphysical inspiration for the political radicals in Britain during the first half of the nineteenth century. When British (meaning primarily Scottish) radical students (barred from a medical education at English universities by privileges reserving it for the Oxbridge establishment) arrived in Paris in the 1820s, Lamarck's transformism was under attack from French ultra-royalists seeking to reassert the authority of the church and monarchy in French politics. At the heart of the scientific part of this politico-scientific controversy was the dispute between Lamarck's pupil Étienne Geoffroy Saint-Hilaire and his age-old rival Frédéric Cuvier about the origin of animal morphological structure (Appel 1987). Geoffroy, siding with the radicals, believed that animal structure was characterized by an all-encompassing "unity of plan" according to which all animals were built on the same basic principles of construction (which in turn could be discovered by examining their anatomy). Cuvier, on the other hand, siding with the royalists, advocated a complete functional explanation of animal

structure, and denied the existence of any such unity of plan, instead claiming the existence of four uncrossable divisions (*embranchements*) of animal life—*Vertebrata* (vertebrates like fish, amphibians, reptiles, birds, and mammals), *Mollusca* (snails, cuttlefish), *Articulata* (crustaceans, insects), and *Radiata* (starfish). According to Cuvier, each of these was defined by insurmountable differences that made any transition among them impossible.

This French dispute was quickly imported into pre-Victorian Britain. Although Cuvier's approach had already been apprehended by Tory-sympathizing Paleyites aligning themselves with the providence-based arguments of natural theology, democratic-minded British radicals sided with Lamarck and Geoffroy arguing for a wholly materialistic and reductionist anatomy, devoid of any divine influence. In the words of Adrian Desmond,

> [P]rogressive evolutionary theories and related naturalistic sciences ... served to legitimate the radical's democratic convictions. They were adopted by outsider groups set on breaking the old religious authority and transferring its power to the secular state. As these political strategies were designed to achieve a fundamental redistribution of power, the new sciences were hotly contested. Geoffroy and Lamarck became symbols of resistance; they were the tricolor banners waved by medical democrats massing outside the corporation porticos. (Desmond [1989] 1992, 23–24)

The first destination for these radical doctrines within the confines of the British monarchy was the University of Edinburgh. Having encountered the doctrine of transmutation during their earlier stay in Paris, a number of radical dissenters took up positions at this university, making it a site (much to the dismay of the Oxbridge establishment) for spreading the new continental "philosophical anatomy," as it was called. The most prominent of these was Robert Grant, who is renowned for being the first to introduce a young and rather skeptical Charles Darwin to the theories of Lamarck (Secord 1991). Based on the then-common belief that the Earth's temperature had been declining, Grant pictured life's evolution as a slow migration away from the poles resulting in a loss of uniformly warm global environment, and the appearance of climatic and temperate zones. Together with the Sun's gradual increasing influence on the Earth's climate and the appearance of seasonal changes, tides, and volcanic activity, this environmental diversification in turn led to a biological diversification, as living organisms adapted themselves to their local habitats by Lamarckian use-inheritance. The result of this process was that the fossil record would appear as a unidirectional and infinitely graded progressive series of forms. In this respect, Grant's conception of nature as connected and continuous was very close to Geoffroy's (Desmond [1989] 1992, 66f; see also Secord 1991).

Grant took a faculty position at London University in 1827, and by the late 1820s the main geographical facility for radical medical dissent had been transferred to London. This development opened up new doors as new alliances were formed between radical scientists and radical members of parliament (MPs) seeking to abolish the system of "rotten boroughs" by which a number of seats in the House of Commons (chosen by a very small electorate) could be used by a patron to gain undue and unrepresentative influence by bribery or other means.[4] The most famous of these alliances was undoubtedly the one between Grant and Thomas Wakley, radical MP from 1835 and founder of the medical journal *The Lancet* in 1823 (A. N. Wilson 2003, 35). In parallel with the general campaign against the rotten boroughs, Wakley was engaged in a campaign against the "rotten boroughs" of the medical profession by which medical titles and licenses were reserved as a privilege of the Anglican Oxbridge elite. As a coroner, Wakley was also engaged in a campaign bringing cholera to public attention. Wakley's medical profession provided an ideal background for uncovering the authorities' attempts to falsify death reports in order to avoid the spread of panic, and *The Lancet*'s tireless campaign to ensure a rational (i.e., scientifically grounded) method of dealing with cholera was finally crowned with fruition when John Snow in 1849 uncovered a link between cholera and drinking water, thus enabling practical measures against the spread of the terrible disease (Snow 1849).

Like Grant, Wakley was committed to the *ideologues*' environmentalist view of nature (Desmond [1989] 1992, 74). For Wakley and like-minded radicals, Grant's Lamarckism

> provided a "natural" legitimation for democratic self-development, for power stemming from the base and mandating "upwards," rather than the aristocratic ideal of a "downward" delegating authority. In 1833, medical Tories were already shivering at talk of the new "laws of medical science," based on "truth" and "reason," being "*universal* and *republican*," and at demands that medical society should therefore emulate the French revolutionary model, becoming "one and indivisible." (Desmond [1989] 1992, 107)

For the early nineteenth century British radicals, "scientism" (as construed above) thus provided both the metaphysical and ideological fabric for their egalitarian ideals concerning the medical profession and beyond. Their metaphysical insistence on materialism gave rise to the ideological claim that neither king nor bishop had any God-given right to their privileges. And although not met with immediate success, this commitment to scientism served as an ideological weapon in the struggles of chartists and other radicals whose continuing pressure in the end pushed the British Empire toward democratic reforms during the nineteenth and early twentieth centuries.

The Fall of Scientism: Eugenics and the Crisis of Technoscientism

The shadow of eugenics has been the most important force shaping contemporary views of scientism, by far. In accordance with the analysis above, it is worth noting, however, that the main features of this historical instantiation of scientism are very different from the ideology described in the previous section. As opposed to the egalitarian scientism of the Enlightenment, this ideological scientism is built on control as its central imperative, and, hence, may be best described as *technoscientism.* It is the kind of scientism that is most often attacked by critics of scientism and often connected more directly with Francis Bacon's vision in a continuous, but perhaps somewhat tentative historical narrative (e.g., Olson 2004).[5]

The historical association between eugenics and technoscientism means that it may easily become a convenient straw man—both by those wishing to dismiss this ideology of scientism, because it was employed in the service of the Nazi extermination programs up to and during the Second World War, and by proponents of technoscientism, who wish to argue that this is a special case that is not really relevant for contemporary discussions on this topic. So in order to address this complex of problems from a more sober perspective, it might be prudent to approach a version of eugenics that may at least appear a bit more "benevolent."

In fact, postwar British eugenics offers such an example. The history of British eugenics dates all the way back to the speculations of Francis Galton ([1869] 1892). By the time of the appearance of Nazi eugenics, British eugenics itself had evolved into a socially respectable field with prominent scientists such as geneticists R. A. Fisher and J. B. S. Haldane among its supporters. Yet another supporter was Julian Huxley, famous evolutionary biologist, self-professed internationalist and humanist, and the first president of UNESCO. In his contribution to the organization's preparation committee, Huxley argued that while the pseudoscientific practices of Nazi eugenics were certainly to be abhorred, a genuine *scientifically* based eugenics was in fact a necessary component in fighting biological inequality.

> It [eugenics] has been on the borderline between the scientific and the unscientific, constantly in danger of becoming a pseudo-science based on preconceived ideas or on assumptions of racial or class superiority. It is, however, essential that eugenics should be brought entirely within the border of science, for, as already indicated, in the not very remote future the problem of improving the average quality of human beings is likely to become urgent; and this can only be accomplished by applying the findings of a truly scientific eugenics. (Huxley 1946, 37–38)

Interestingly enough, several elements in Stenmark's characterizations of scientism are clearly *not* a part of Huxley's position. First, techniques

coming from the natural sciences (i.e., eugenics) play only a minor role when compared with the big "social engineering" efforts of advancing education, knowledge, and culture that are at the heart of UNESCO's activities. In this respect, Huxley's technoscientism is closer to Nehru's understanding than to that of Stenmark. Second, it appears that Huxley, having a background in evolutionary biology, is actually somewhat skeptical toward crude attempts to quantify the social sciences. Huxley's technoscientism is thus not one that endorses Stenmark's *methodological scientism*—at least not if quantification is regarded to be the prime methodological tool for the natural sciences. Third, note that Huxley's technoscientism emphatically does *not* entail any strong program for engulfing the humanities and social sciences and sweeping them into the natural sciences. Furthermore, Huxley also seems keenly aware that any actual application of eugenics would be strongly dependent on the choice of values and qualities that direct it, and sees an introduction into arts and humanities as a way to imbue future practitioners of eugenics with balanced and critical thinking:

> Thus UNESCO, which is concerned with all the higher activities of man, must endeavor to see that science is tempered with art, that the classical tradition in education is not replaced with some new system, equally rigid and one-sided, based on natural science, and, in, general, that society is imbued with a proper scale of values. (Huxley 1946, 38)

Given these formulations, one might question whether it is really fitting to view Huxley as a proponent of any kind of scientism at all (as there are so many components in Stenmark's analysis of the concept he does not share). However, I believe such a skeptical position is untenable for anyone who considers Julian Huxley's biography in detail. As argued Paul Weindling (2012), Huxley's strong adherence to a "scientific" or "evolutionary" humanism and his underlying commitment to eugenics and a biologically based social philosophy and ethics is the one single constant parameter in an otherwise rather transformative lifetime in terms of public views. This appears continuously in Huxley's writings, from his early endorsement of American claims of racial "Negro" inferiority (1924); through his rejection of Nazi eugenics and of the scientific viability of the race concept (e.g., Huxley and Haddon 1935; Crew et al. 1939); to his postwar advocacy for abortion and birth control (Huxley 1962). Even environmental concerns were subsumed under this agenda by the later Huxley (as president of the British Eugenics Society 1959–1962), who gave the opening address at the now (in)famous Ciba Foundation conference *Man and his Future* in 1963. Here, he deployed the ecological problems pictured in Rachel Carson's *Silent Spring* (1962) as part of an argument that recommended more education on evolution and an eugenically oriented ecology as the primary road to improve the human condition (Huxley 1963). Indeed, Weindling goes as far as to give the following characterization:

> Taking up the mantle from his crusading grandfather, T. H. Huxley, his public role was an apostle for evolutionary eugenics. This was in keeping with British middle class interests, as Huxley shaped an agenda of issues regarding the state of the nation's physical and mental health from the pioneering welfare legislation of the Edwardian period to the reformist and welfare oriented 1960s. His role in organizations like the British Social Hygiene Council, Political and Economic Planning (PEP), and the British Population Society . . . reflects this. He was an outstanding advocate of what Paul Mazundar calls "the scientific intelligentsia" and seeking to shape what historian Harold Perkins has called the rise of professional society. . . . As a public intellectual, he deployed his promotional talents in order to direct the current public discourse on birth control and welfare, by setting it within a biologically conceived framework. (Weindling 2012, 481)

Huxley's technoscientism was accompanied by an elitist perception of the relations between scientific experts and the public, and his primary *modus operandi* was top down, calling for (and participating in) the formation of committees and other official organs that were able to convert his visions into action. As an ideology, it was an elitist tool of control rather than an egalitarian tool of dissent and critical inquiry. This idea of a society based on expert rule (an expertocracy) made it an obvious target for the anti-authoritarian science critique that emerged from the New Left toward the end of the 1960s, where it fused with the general skepticism toward authorities that developed in the United States and Western Europe with the rise of feminism and various counter-cultural movements. (See Weindling 2012 for remarks on the antagonism between Huxley's visions and what he denotes "libertarian" counter-culture, and Hall 2010 for an introduction to the origin and political aspirations of the New Left). An important focal point of this critique was a rather pronounced disenchantment with the "positivist" notion of the scientist as being "objective" and "unhinged from special interests" that was an underlying presumption in much of Huxley's thinking. Inspired by post-Marxist thinkers such as Herbert Marcuse and the Frankfurt School, as well as by newer historians and philosophers of science such as Thomas Kuhn, Norman Hanson, and Paul Feyerabend, a new generation of scholars and scientists took it upon themselves to dismantle the purported ideological neutrality of technoscientism in all its historical manifestations (see, e.g., Kamin 1974; Gould 1981; Lewontin et al. 1984; Segerstråle 2000). While tending perhaps sometimes to create straw men out of their opponents (for instance, with the sociobiology controversy surrounding Wilson 1975, see Segerstråle 2000), this body of scholarship has also been very effective in debunking the older confidences in scientific neutrality which are embraced in Huxley's work. Perhaps, as I will discuss below, it has been too effective. But for now, let us make one more observation concerning the possible biases in this instance of technoscientism—apart from that it may be vulnerable to the biases of class (and other) interests. It may be that Huxley's vision for technoscientism deviates from the

epistemic reductionism that is otherwise considered as an integral part of a positivist conception of science as promoted in disparate periods by Auguste Comte or the Vienna circle. But he does share its strong claim of the *epistemic certainty* of scientific knowledge claims that must be a necessary condition, if his visions for a science-based society are to work at all. As an ideology, this instance of technoscientism is therefore not very resilient regarding the possibility that (some of) its claims may actually be empirically unfounded or wrong.

The Resurrection of Scientism: Sustainable Scientism in the Shade of a Rising Anti-Intellectualism

Picking up from the previous section, we might argue that the emerging ecological crisis of the 1960s and 1970s was a forewarning of the biggest current problem of the engineering ideal of control that permeates technoscientism. I am of course here talking about the "complexity revolution" that has pervaded a number of areas of inquiry in the natural sciences, ranging from nonlinear thermodynamics and the study of dissipative structures and self-organizing systems (see, e.g., Prigogine and Stengers 1984, 1997; Kauffmann 1993) to ecology and systems biology (e.g., Gallopin et al. 2001).

It may be that the epistemic and sociopolitical implications of this development are sometimes overstated (as perhaps they are in Kelly 1994). But in the context of this article, I believe it is fair to conclude that they do pose a serious challenge to the underlying notion of epistemic certainty that permeates Huxley's technoscientism. The appearance of epistemic uncertainty as a major parameter in scientific discourse effectively undermines the intellectual legitimacy of Huxley's visions of a top-down eugenics program controlled by scientific experts. But it also poses a problem for his more general visions of state-controlled planning as such. Perhaps the clearest example is found in the ecological crisis that the later Huxley tried to hijack as an argument for his "ecological eugenics." The problem here, as it turns out, is not only that the classical technical solutions of industrial society (which served to raise food production, as well as productivity in many other areas) seem unable to cope with unforeseen environmental problems. As we now know, many of these environmental problems are in fact *caused* by these technical "solutions" in the first place. Beck ([1986] 1992) described this development in industrialized societies as a transformation from societies of scarcity to risk societies. According to Beck, this transformation is accompanied by a change in political focus from a logic of wealth distribution to a logic of risk distribution. In such a setting, the unforeseen side effects of technology (e.g., concerning environmental and health issues) become of central importance in politics and policy making. However, since these side effects are also tainted with uncertainty (as they

are often somewhat unpredictable), politicians are increasingly dependent on scientific advising in order to assess potential hazards as well as the need for urgent action.

According to Beck, these important changes in the political domain are accompanied by equally important changes in the scientific domain itself. As policy making becomes increasingly dependent on scientific advising, science also becomes a political battlefield, where apparent "scientific" controversies over the nature and magnitude of potential hazards may serve as proxies for conflicts between different vested interests. Indeed (if one is not careful), it may even be tempting to try to *reduce* these scientific debates to "mere" politics, devoid of any scientific content. The reflective reader of this article would probably find this to be intellectually dissatisfying. But, given Beck's analysis, it is perhaps not so surprising to find that the transition from a society of scarcity to a risk society has spawned a growing political anti-intellectualism that often flatly denies scientific evidence in favor of "gut feeling" and claims of moral integrity as opposed to the alleged corruption of science. The most prominent example of this is of course the high proportion of self-professed "climate skeptics" in the U.S. Congress, which (as of 2016) amounts to more than one-third despite the fact the scientific consensus concerning both the reality and seriousness of anthropogenic climate change is now almost unequivocal (Herzog 2016).

There are probably many reasons for this development that are beyond the scope of this article—ranging, for instance, from the crisis of techno-scientism and its problems of public legitimacy (as described above) to the appearance of scientific "merchants of doubt" that make a living of acting as experts for stakeholders (such as tobacco or oil companies) that may profit from attempts to undermine otherwise well-founded scientific consensus (Oreskes and Conway 2010). But in any case, this highlights that the question of what role science is to play in politics and policy making is still very much a political issue.

So we return to Britain, and to its current most prominent living champion of science, Richard Dawkins, as our starting point for a discussion of what a viable and sustainable ideology of scientism should look like, if it is to be able to navigate between the contemporary pitfalls of genuine epistemic uncertainties and outright relativist anti-intellectualism. With bestselling books such as *The Selfish Gene* ([1976] 2006), *The Blind Watchmaker* (1982), and *The God Delusion* (2006), Dawkins has emerged as perhaps the most prominent contemporary proponent of a secular worldview that is professed atheist and materialist. Hence, Dawkins argues for a gene selectionist version of Darwinism, where genes are the primary causal agents in biological evolution (reducing organisms to "passive" survival machines) and that these genetic "replicators" are complemented by another set of memory-based replicators—called "memes"—that spread themselves through (human)minds and are accountable for the propagation

of our belief systems. However, whereas the meme theory does have some bearing on the arguments presented in *The God Delusion* (which will be the focal point of our discussion here), the gene selectionist theory does not. The arguments presented in this book work equally well with a more emergentist (but equally materialist) view of evolution such as the one that is presented by, for example, Stanley Salthe (1985) or Stephen Jay Gould (2002).

Upon reading *The God Delusion,* it quickly becomes clear that Dawkins has not "merely" set out to debunk a religious worldview. Indeed, the motivation for writing this book is first and foremost *political.* This becomes especially apparent in the introduction to the second edition, where Dawkins walks us through various kinds of polemics directed toward the book. Discussing the claim that he always attacks the most rabble-rousing chancers (like Ted Haggard, Jerry Falwell, Pat Robertson, Osama bin Laden, or Ayatollah Khomeini), ignoring more sophisticated theologians, Dawkins states the following:

> If only such subtle nuanced religion predominated, the world would surely be a better place, and I would have written a different book. The melancholy truth is that this kind of understated, decent, revisionist religion is numerically negligible. To the vast majority of believers around the world, religion all too closely resembles what you hear from the likes of Robertson, Falwell or Haggard, Osama bin Laden or the Ayatollah Khomeini. These are not straw men, they are all too influential, and everybody in the modern world has to deal with them. (Dawkins 2006, 15)

Although one may take issue with Dawkins's numerical claim (which is presented without any empirical support), it is clear that he attempts to engage with religion as a tool for *power interests* rather than for a wish for intellectual satisfaction per se. The prime target of Dawkins's polemics is the perceived *dogmatic nature* of religion, which Dawkins regards as a hindrance to free thought and critical inquiry. In Dawkins's view, both of these are central to democratic empowerment, and he considers science (in the form of systemic inquiry) to be a central toolkit in this empowerment. Describing the aim of the book as four "consciousness-raisers" that may collectively be regarded as a program for atheist activism, the primary concerns of Dawkins include not only *what* we believe, but also *how* we come to those beliefs. And here, the role of evidence plays a crucial part:

> Fundamentalists know what they believe and they know that nothing will change their minds. . . . The true scientist, however passionately he believes in evolution, knows exactly what it would take to change his mind: Evidence. . . . If all the evidence in the world turned in favor of creationism, I would be the first to admit it and I would immediately change my mind. As things stand, however, all available evidence (and there is a vast amount of it) favors evolution. It is for this reason alone that I argue for evolution with a passion that matches the passion of those who argue against it. My passion is based on evidence. (Dawkins 2006, 19)

Thus, the scientism embraced by Dawkins is Popperian in the sense that any current held belief should be abandoned if overturned by new evidence. Given the discussion above on Huxley's perception of social science, it deserves mentioning that Dawkins makes no commitment to a specific notion of evidence here other than the rather broad presumption that claims must be corroborated (and at the very least not directly falsified) by independent observations coming from as many quarters as possible. More specifically, Dawkins (like Huxley) does not seem to adhere to any "positivist" conception that evidence is a concept exclusively reserved to quantitative or statistical reasoning. In the context of the topic of this article, this point is important as it is a classical charge against scientism that it narrows down our notion of evidence and explanation into a straightjacket of quantification and mathematical generalizations (e.g., Robinson 2015). But given the disciplinary backgrounds of anti-scientism proponents, their position is not surprising. As evolutionary biologists, they must be well aware that much of the most compelling evidence of evolution is comparative and qualitative in kind, and that it would be folly to restrict themselves to a purely physicalist understanding of these elements.

At times, however, Dawkins does talk quite literally about "scientific truths" in a more classical positivist sense (i.e., as claims corresponding to empirical reality—see the introduction in Dawkins 2009). Perhaps this is what led Alistair McGrath to state the following: "It is perfectly correct to say that 'evolutionary biologists currently believe that Darwinism is the best theoretical explanation of earth's present life-forms.' But this does not mean that future evolutionary biologists will share this judgment. We may *believe* that Darwinism is right, but we do not *know* that it is so" (McGrath 2010, 337).

I believe McGrath is formally correct here. But I also believe he is missing an important point, precisely because he fails to recognize the inherent political nature of this dispute. It may be that *science* should be reluctant to speak about epistemic truths per se. However, when it comes to *scientifically based policy advising*, we are very much in need of some pragmatic notion of epistemic truths. It may be that the topic of evolution is "merely" of academic interest to McGrath. But for people who have to deal with practical problems related to plant and animal breeding, the use of antibiotics and pesticide resistance development, or even the spread and development of epidemic diseases, acknowledging the empirical fact of evolution is a vital precondition for making capable interventions into these ever-changing biological systems.

In the latter cases, such interventions may be a matter of life and death. This illustrates a point made by Hans Jonas (1979) long ago that in modern societies (or, as we might say with the hindsight of Beck, in societies that have made the transition from societies of scarcity to risk societies), the acquisition of knowledge (concerning the possible outcomes of technological

interventions) becomes a moral imperative—while recognizing at the same time that absolute and certain knowledge (in the sense of Julian Huxley) is an impossibility.

Hence, a sustainable and democratically transparent ideology of scientism (capable of dealing with the complex politico-scientific problems of the twenty-first century) must be able to deal with epistemic uncertainty in situations where "facts are uncertain, stakes high; values in dispute and decisions urgent" (Funtowicz and Ravetz 1993). There are, to paraphrase the poetry of former U.S. Secretary of Defense Donald Rumsfeld (Seely 2009), the things that we know that we know (empirically supported truths—such as the facts of evolution and anthropogenic carbon-induced climate change); then, there are the things we know that we do not know—such as, for instance, the specific impacts of anthropogenic climate change on the arctic population of polar bears or the extent of the mental capacities of rabbits. Some of these "known unknowns" may be transformed into "known knowns" by scientific investigations. Others may not. Finally, of course, there are the things we do not know that we do not know—the "unknown unknowns." These are the unforeseen contingencies that we cannot conceive, but for which we have to be prepared anyway—such as the eventualities for which rocket scientists add extra fuel or oxygen for the crew in the event that something goes wrong.

So Do We Need an Ideology of Scientism? And if so, What Kind of Scientism?

Picking up, once again, from the previous section, it seems clear that neither politics nor ethics is quite what it used to be, in the wake of the ecological crisis. Although Huxley's technoscientism was aimed at gaining control, science's primary political function today seems to have shifted toward risk and chaos management. Understanding the complexity of human intervention into natural systems, including uncertainties, hazards, and things that may go wrong, lies at the heart of urgent political problems such as those concerned with anthropogenic climate change.

This development means that "getting the science right" is now more important than ever before in politics. In a risk society–based democracy, everyone may be entitled to his or her own opinion. But that does not mean that people are also entitled to their own facts. Following Jonas's argument that the acquisition of knowledge about the possible outcomes of technological interventions is a moral imperative (and this I believe to be an absolute necessity, if we are to be able to handle environmental problems of various kinds at all), then we must also regard breaches of this conduct to be morally condemnable. Politicians who deliberately and repeatedly ignore solid scientific warnings about important policy issues fail both morally and politically. Morally, because they are unable to convey a

credible analysis of the problem to the public. And politically, because they equally are unable to produce a viable solution, having failed to understand the issue in the first place.

Does this justify the need for an ideology of scientism? I believe the answer is yes, albeit with certain qualifications. The most important of these is the need to overcome the democratic deficiencies that are inherent in the expertocratic aspirations of technoscientism. Henceforth, a sustainable ideology of scientism must be *democratically transparent and inclusive.* As such it must build on the vision that science and critical inquiry, in general, are endeavors that should ideally be made in the interest of the people rather than to serve certain privileged classes or interests.

Fortunately, we do not have to invent this ideology, as it already exists. The most prominent setting for this discussion is the United States, where the current Trump administration has reversed policies intended to fight global warming and even gone so far as to attempt to shut and silence national organizations that track the effects of climate change. This, in conjunction with Trump's initial denial of the reality of anthropogenic climate change, led thousands of people to march for science in a global demonstration across six continents (Achenbach et al. 2017). Given the analysis above, I think it is fair to diagnose this political movement as fueled by an ideology of activist scientism in accord with Young's (1971) definition. A visit to the homepage of March for Science reveals the movement's goals to amplify the role of science in policy, empower public engagement with science, foster a diverse and inclusive scientific community, and build a global community of science advocates (March for Science 2018). As testified by some supporters, it is also fueled by the concern that politicians who devalue expertise risk making decisions that do not reflect reality—and by the demand that they are held accountable for this line of action (Griffin 2017). The values of the activist scientism presented here may seem to be a long way from the elitist technoscientism discussed above. It is more aligned with the thinking of Hans Jonas than with that of Julian Huxley, and aims at sustainability and transparency rather than progress. But it is also clearly a *political* defense of science in the sense that it designates science as having a vital role in policy making.

By accepting that the March of Science manifests a new development of twenty-first century activist scientism, we may find ourselves in the paradoxical situation that scholars who formerly perceived themselves to be staunch critics of (techno-)scientism turn out to be proponents of a *different* ideology of scientism. I believe this to be the case when Richard Williams states in his introduction to *Scientism: The New Orthodoxy* that to resist the hostile takeover of scientism is to defend science. Noting once again Williams's own remark that proponents of scientism rarely identify as such—preferring instead to portray themselves as defenders of science—I propose a different reading of Williams and most of the other contributions

in his edited volume. In this perspective, the volume contains contributions from several eminent scholars who seek to replace a scientism, which they deem to be dangerous, with another scientism which they regard to be healthier for democracy.

Notes

1. "Democracy" and, certainly, "democratization" are of course themselves contested concepts, as there are conflicting visions as to what democratic government actually entails (for instance, direct vs. representative democracy, or consensus vs. majority rule). I do believe, however, that there is at least one objectifiable measure of how democratic a government is—the percentage of people who have access to vote and run for governmental offices. In that sense, one may certainly regard the electoral system of, say, Great Britain in the 1950s as more democratic than its Victorian counterpart in the beginning of the 1830s because the former, unlike the latter, included voting rights for women and for a large number of men who were not owners of freehold property or land. Likewise, one may regard the South African government of today as being more democratic than during the apartheid era, as its (black) majority is given the same voting rights that were formerly restricted to the white minority alone. Various political ideologies may, depending on content and context, be either beneficial or detrimental to this process.

2. I am for the time being ignoring the rather complicated problem of what, exactly, places or constitutes a field or discipline within the domain of the natural sciences here. I will, however, shortly point to a couple of common conceptions that I believe should be regarded as misunderstandings. One of them is the distinction made by Wilhelm Dilthey ([1883]1988) between the nomothetic *Naturwissenschafften* (oriented toward understanding general laws and principles) and the idiographic *Geisteswissenshafften.* (oriented toward understanding specific events or developments). As noted by Wilhelm Windelband (1998), the reservation of certain types of questions to this domain falls flat in the face of complexity of the questioning within the natural sciences. Another misconception is the notion that the natural sciences are (or should be) based on what has been termed "the experimental method." This misconception is built on a positivistic vision of the natural sciences that has long been considered outdated in the history and philosophy of science. See, for instance, Robert Frodeman (1995), for an argument that geology is best conceived as a discipline with a strong presence of hermeneutical approaches.

3. Stenmark states that while comprehensive scientism encompasses all of the earlier versions of scientism mentioned in his analysis, redemptive scientism encompasses none of them. As noted, for the purpose of this analysis, I do not agree with his argument that this is a necessary component of any version of academic-internal scientism.

4. The campaign against the rotten boroughs was part of a larger reaction to demographic development that had resulted in a significant decrease in the amount of democratic representation within Great Britain. In 1751, the population size in the United Kingdom was about 7,250,000 people; in 1801, it reached 10,943,000; in 1821, it reached 14,392,000; and in 1831, it reached 16,539,000. Compared to this, voting rights were limited to (male) owners of freehold property or land, which meant that, in 1831, less than 300,000 people were eligible to vote. Access to a seat at Parliament was further restricted by the fact that there was no parliamentary income. Any potential member of Parliament had to be rich enough to support his own living without working (A. N. Wilson 2003, 10ff).

5. I would like to state my reasons for *why* I believe this narrative is tentative. First of all, the construction of Francis Bacon as a sort of founding father of modern technoscientism ignores that the stage of technology and infrastructure—and by implication the material conditions for doing science at all—was vastly different in Bacon's time than what has been the case since industrialization. As described by Lorraine Daston (1994, 1995), Baconian science was a practice in a world without standardized instruments. This meant that it was difficult to establish the credibility of factual claims at all, and that the usual method to do this was in the form of reliable witnesses. The experiments in Baconian science were conducted in order to create unusual facts that might be used as a tool for creating a reformed natural philosophy that could replace its Aristotelian predecessor and not as a tool for testing hypotheses. The whole idea of

the experiment as a tool for prediction, replication, and control (which is a basic requirement for the development of technoscientism) is an intellectual child of an industrial standardized mass production that arose more than a hundred years after Bacon's death. It is, in my view, at best a tentative conclusion to argue that this development is envisioned in Bacon's *New Atlantis* or any other of his writings. See also Peter Harrison (2007).

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