

Methodological naturalism and its misconceptions

Tiddy Smith¹ 

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Abstract Methodological naturalism has been defended on both intrinsic and pragmatic grounds. Both of these defenses agree that methodological naturalism is a principle of science according to which the scientist ought to eschew talk of causally efficacious disembodied minds. I argue that this is the wrong interpretation of methodological naturalism. Methodological naturalism does not constrain the theories that scientists may conjecture, but how those theories may be justified. On this view, methodological naturalism is a principle of science according to which supernatural methods of justification, such as faith, are eschewed.

Keywords Methodological naturalism · Empiricism · Faith · Creationism

Introduction

In the battle over the scientific respectability of creationism, there is perhaps no greater point of contention than the matter of whether or not scientists should accept methodological naturalism. Intelligent design proponent Michael Behe writes, for example:

It is often said that science must avoid any conclusions which smack of the supernatural. But this seems to me to be both bad logic and bad science. Science is not a game in which arbitrary rules are used to decide what explanations are to be permitted. Rather, it is an effort to make true statements about physical reality. (Behe 2001, 255)

✉ Tiddy Smith
smithtidy@gmail.com

¹ Department of Philosophy, University of Otago, PO Box 56, Dunedin 9054, New Zealand

Behe's allies in battle, Alvin Plantinga and Phillip Johnson, have also argued in a variety of places¹ that methodological naturalism is an arbitrary demarcation criterion that places an unreasonable prohibition on supernatural creation theories in science. If creationism is rejected a priori, then of course something like naturalistic Darwinism will be accepted, they say. But for what reason, they ask, should we accept methodological naturalism in the first place? A variety of philosophers have sought to address the creationists' collective grievance. They have sought to explain why science accepts the naturalistic constraints that it does. I argue that most of these explanations have misconceived methodological naturalism. There is a general tendency in the literature to locate the naturalism of science in the metaphysical commitments of its explanations. I argue that this is misplaced. Methodological naturalism prohibits scientists, not from making appeals to certain kinds of entities, but from making appeals to supernatural methods of justification.

The most popular interpretation of methodological naturalism, simply put, is that it is a principle of science according to which supernatural entities are barred from entry. I define supernatural entities, in line with definitions given by Flanagan (2006) and Fales (2013), as causally efficacious disembodied minds or immaterial agents such as ghosts, gods, demons, and hobgoblins. Entities such as these should not, according to this interpretation of methodological naturalism, take up any explanatory role in any respectable scientific theory. To do so would be to break some rule, or some rule of thumb, of respectable science. So then, how is this anti-supernatural principle defended? After all, if there are demons and hobgoblins hiding in the laboratory, one would think that the scientist, nobly pursuing truth, would be the first to want to know.

At present, two conflicting defenses of methodological naturalism are usually put on offer, leading to two very different concepts of what methodological naturalism is. The first has been called, by Maarten Boudry, the *intrinsic defense* of methodological naturalism. The second is called the *pragmatic defense*. The former charges that science simply can't deal in supernatural explanations. The latter charges that science does deal in, and has done away with, supernatural explanations. Neither of these approaches, as I aim to show, is quite right, however, since methodological naturalism does not consist in the rejection of supernatural explanations, but in the rejection of supernatural *methods of justification*.

In this paper, I will present the intrinsic and pragmatic defenses of methodological naturalism, before rejecting both of them. In their place, I'll be putting forward a picture of methodological naturalism as a principle of science according to which supernatural sources of evidence, such as faith and divine revelation, are eschewed. Since I believe that this particular concept of methodological naturalism was first clearly enunciated as a demarcation criterion between natural philosophy and theology in the Middle Ages, I'll be drawing on some historical examples of medieval natural philosophy to support my case. In short, my case is just that methodological naturalism does not obligate science to reject supernatural entities, but to reject supernatural methods of acquiring evidence.

¹ Several of these articles have been collected in Robert Pennock's (2001a, b) *Intelligent Design Creationism and Its Critics*. Cambridge, MA. MIT Press.

Intrinsic methodological naturalism

The most popular defense of methodological naturalism is the intrinsic defense. This runs that science, by its very nature, cannot appraise supernatural theories. On this view, methodological naturalism is a ground rule, without which science ceases to be. It is a demarcation criterion, separating true science from pseudoscience and non-science. To give an example that puts the principle to work, when Newton famously suggested that God might have to tweak planetary orbits from time to time, the argument goes, he was no longer actually doing science. He was doing something else, like theology or storytelling. This intrinsic view has been defended by several philosophers of science such as Michael Ruse, Robert Pennock, and Eugenie Scott.

Ruse (2001, 377) has argued that supernatural explanations are “*science-stoppers*”. They are dead-end explanations; nothing more than tourniquets for doubt. We may *feel* as though we have explained the problem of, say, the origin of life by appealing to a miracle from God, but in reality, we have merely given ourselves an excuse to stop looking for better, naturalistic explanations that generate further testable predictions. The idea is that supernatural explanations are not really explanations at all, since they offer no predictions over and above the fact to be explained. They are simply, to use Darwin’s phrase, restating the fact in dignified language.

Pennock (2001a, b, 89) argues that supernatural explanations are unfalsifiable since any observation can be said to be compatible with the existence of supernatural agents unconstrained by natural law. No possible observation, he says, is incompatible with the existence of an omnipotent god whose will is inscrutable. He writes that such a being ‘*may be called upon to explain any event in any situation, and this is one reason for the methodological prohibition against such appeals in science.*’ (93) Pennock further argues that this prohibition applies not only to theories containing *omnipotent* and *inscrutable* supernatural entities, but also to such lesser beings as demons and angels, as well as to gods with well-defined desires and capacities (2011, 189–190). So, since falsifiability is a hallmark of the scientific, and since supernatural explanations are not falsifiable, Pennock argues that supernatural explanations are not scientific. To use Popper’s terminology, such explanations have zero empirical content.

Eugenie Scott, former executive director of the National Center for Science Education, is also a defender of the intrinsic defense. She argues that ‘*one cannot use natural processes to hold constant the actions of supernatural forces; hence it is impossible to test... supernatural explanations.*’ (2001, 39) Furthermore, belief in supernatural beings is a matter of faith, not science. Science doesn’t have the right tools to investigate the supernatural. So, if you want answers to those kinds of questions, you’ve got to find your local priest, mystic or necromancer.

The above writers agree that supernatural theories must be rejected because such theories are not amenable to scientific investigation. Specifically, there are certain logico-epistemological features of supernatural explanations that put them beyond the purview of science. And to emphasize, according to the intrinsic view, scientists have not judged supernatural explanations to be false or unlikely or bad explanations. Scientists just can’t judge supernatural explanations. ‘*Science is a*

limited way of knowing.' Says Scott; limited insofar as it is unable to reject the possibility of the supernatural (Scott 1996, 519).

The claim that supernatural theories are unfalsifiable science-stoppers has been convincingly dealt with by Boudry et al. (2010), and I direct the reader to that paper for a detailed rebuttal. I will only briefly go over the obvious problems with these claims. Firstly, one can invent all manner of supernatural theories that produce falsifiable, independently testable predictions. Elliott Sober asks us to consider the hypothesis that an omnipotent supernatural being wanted everything to be purple, and had this as a major priority (2007, 4). Purple ID is a supernatural theory that generates independently testable and falsifiable predictions. Beside me, as I write, there is a green handkerchief draped over the edge of the nearby table. Therefore, purple ID is false. To be sure, most theistic explanations are nothing like purple ID, but some will be more so than others. The claim that God created the world *in 6 days and less than 10,000 years ago* generates, in conjunction with our background knowledge, a greater number of testable predictions than the bare claim that God created the world. In any case, Sober's example shows that supernatural theories are not *necessarily* unfalsifiable, or *necessarily* science stoppers, and so such theories cannot be excluded from science for those reasons.

Smith (2001, 707) has argued that the testability of any theistic explanation depends on the degree of *reasonableness* of the will of the posited god. 'Reasonableness' here refers just to the degree to which God's will resembles others with which we are familiar. The more mysterious and inscrutable his will, the less predictable his behavior, and so, the less testable any theory incorporating such a God. Smith's argument applies well to Eugenie Scott's claim that one cannot hold other variables constant to test for an omnipotent God. It seems that we can hold other variables constant so long as the posited omnipotent God is a reasonable and reliable one, who only interferes in the workings of creation under very particular circumstances. If this reliable God, for example, did nothing other than unflinchingly cure cancer patients each and every time a patient was prayed for, such a God would not, it seems, be so difficult to control for.

So, these arguments seem to bleed support from intrinsic methodological naturalism, since supernatural claims can be made falsifiable, can be made predictively potent and can be investigated under constrained conditions.

There is another reason to reject intrinsic methodological naturalism that Theodore Schick (2000) has argued previously. Science is ultimately silent on the metaphysical commitments of new theories. No rule of science should prohibit, a priori, particular *kinds* of objects from inclusion into the body of scientific knowledge for the rather obvious reason that this may prematurely close off fertile avenues of investigation. Whether some theoretical entity is of any explanatory use should not be decided before viewing the evidence. Of course, there are plenty of other spooky concepts and entities in modern science, such as wave-particle duality, point particles and quantum entanglement, which would all be excluded from science if metaphysical constraints on spookiness were taken seriously. In other words, it is very difficult to understand why we should eschew causally efficacious disembodied minds a priori, but not objects that take up no space!

The important point, I think, is that the methodology of science may be able to tell us whether *this* claim is better than *that* claim, but not *what we should claim in the first place*.

Pragmatic methodological naturalism

Let us turn now to the pragmatic defense. The pragmatic defense of methodological naturalism charges that science *does* have something to say about the supernatural, and that so far, the verdict has been pretty negative. Scientists, then, are reasonable when they reject the supernatural, since the track record of supernatural explanations is so ghastly. Maarten Boudry and colleagues at the University of Ghent (2010) have argued that the preference for naturalistic explanations in science is a sensible rule of thumb that has been arrived at after the consistent failure of so many supernatural explanations in the history of science. Pragmatic methodological naturalism has also been defended elsewhere by Dawes (2011).

According to Boudry et al., methodological naturalism is ‘*an empirically grounded commitment to naturalistic causes and explanations, which in principle is revocable by extraordinary empirical evidence.*’ (2010, 229) The decision to eschew the supernatural ‘*did not drop from thin air,*’ they say ‘*but is just the best methodological guideline that emerged from the history of science, in particular the pattern of consistent success of naturalistic explanations.*’ (2010, 229–230) And Greg Dawes similarly argues that the preference for naturalistic explanations ‘*should be regarded as nothing more than a provisional commitment, justified by reference to the history of these disciplines.*’ (2011, 7) This leaves us to wonder: by reference to *what* in their histories exactly? The implication is that the history of science has witnessed a dwindling of the sphere of supernatural explanations, as they are slowly discarded and replaced by superior naturalistic ones. As Boudry puts it “*as a result of centuries of scientific investigation, earlier animistic, anthropomorphic, and teleological views have gradually been superseded by more parsimonious, impersonal explanations.*” (2015, 3.3).

On the pragmatic defense, methodological naturalism is not an a priori dogma. It is no demarcation criterion. After all, we could give up on this naturalism caper at any time given compelling enough evidence. Maybe next week on an overcast morning, the clouds will part and celestial trumpets will shake the Earth and L. Ron Hubbard will descend bodily from the heavens, and if that happens, we needn’t scratch our heads wondering what natural law accounts for this very extraordinary event. We can simply abandon our naturalistic bias.

Since the claim is that supernatural explanations have consistently *failed*, it follows that science *can* judge the supernatural. The idea is that throughout history, scientists have learnt that supernatural explanations are predictive failures. And indeed, just as the pragmatic defense alleges, scientific investigations into intercessory prayer, telepathy, special creation, intelligent design and other alleged

supernatural phenomena *have* occurred.² Furthermore, just as the pragmatic defense argues, such research has usually failed to confirm any of these phenomena. This seems to be pretty compelling evidence for pragmatic methodological naturalism. The pragmatic defense coheres better with the observation that supernatural claims *have* been tested, and appear to have been largely discredited.

However, the claim that science has, over the centuries, *eventually* adopted methodological naturalism in reaction to the failure of supernatural theories is a claim with virtually no historical support and much evidence against. Naturalistic theories did not gradually *supersede* supernatural ones in the history of science. From its very inception, science, or natural philosophy, was a discipline that necessarily subscribed to naturalism in some sense.

Lindberg (1992) and Grant (1996) have traced the naturalism of modern science to a rebirth of classical, pagan learning as early as the middle half of the twelfth century. Importantly, medieval philosophers such as Duns Scotus, Adelard of Bath, William of Ockham, Thomas Aquinas, Siger of Brabant, Nicole Oresme, Boethius of Dacia and John Buridan all explicitly repudiated supernatural epistemic methods, such as faith, in natural philosophy. However, this repudiation of supernatural methods was not due to a general *disappointment* with supernatural explanations. The medieval idea that natural philosophy was limited to the study of the “common course of nature” (*communis cursus naturae*) by appeal to reason and sense experience was not an idea born as a reaction to the uninspiring track-record of supernatural explanations.

Indeed, the idea that supernatural explanations were eventually superseded by superior naturalistic explanations is belied by the fact that medieval philosophers were able to hold both natural and supernatural knowledge side by side. When the two ways of knowing stood in conflict, supernatural knowledge was usually given priority. In the 14th century, for example, John Buridan wrote that ‘*we must hold on the basis of faith that the heavens are supernaturally created... but it must also be said that the heavens are not naturally able to be generated or destroyed.*’ (Buridan in Biard 2001, 79) This complementarity of natural and supernatural explanations is an important feature of medieval natural philosophy that should give us pause for thought about the nature of methodological naturalism. It should, in particular, give us reason to doubt the supersessionist historical narrative given to us by Boudry. For it is not the case that methodological naturalism eventually flourished within some pre-existing science; methodological naturalism demarcated the particular kind of knowledge that was the object of natural philosophy from the very beginning.

As noted already, the pragmatic defense does not claim that supernatural explanations are totally prohibited from science, but only that scientists act sensibly when they avoid them. On this point, I admit that I share some common ground with Boudry and Dawes. We agree that so far, almost all proposed supernatural explanations that have been seriously considered by scientists have proven to be failures. Nevertheless, it is a misleading construal of the nature of methodological

² An overview of the scientific research of the alleged supernatural effects of prayer can be found in Dein and Littlewood (2008). For an overview of telepathy studies between the mid-nineteenth and late twentieth centuries, see Alvarado (1998).

naturalism to say that it is entirely accounted for by the failure of previous supernatural explanations. This is not only historically inaccurate, but it also locates naturalism in the wrong context. Methodological naturalism is not a constraint on the subject matter of science, but, as the name would indicate, a constraint on the method of science. It is, I urge, an epistemological principle. To reiterate, I agree that entities that have repeatedly proven to be predictive failures should, *ceteris paribus*, be eschewed, but this eschewal does not account for the naturalism of science. Science *does* have intrinsic anti-supernatural commitments.

To recap, the pragmatic defense is correct that supernatural explanations are testable, have been tested and have often failed in the scientific arena. Yet on the other hand, the pragmatic defense gets wrong the historical claim that methodological naturalism was eventually adopted as a rule of thumb. The intrinsic defense also gets something right, insofar as science is a discipline with an explicit, a priori, anti-supernatural bias. But, the intrinsic defense doesn't square with the observation that science apparently can test and has tested supernatural explanations. Thus, science is not a '*limited way of knowing*' in the sense that Scott alleges. Given these shortcomings, neither view can be the right way to understand methodological naturalism. I believe there is another way.

The intrinsic and pragmatic defenses defend the wrong thing

Methodological naturalism is not a thesis about what may or may not be conjectured by scientists, but about how scientists may or may not *justify* their theories. Scientific justifications eschew appeals to supernatural methods of knowing, such as faith, revelation or spirit mediumship. Such justifications make an appeal to the authority of the testimony of some disembodied mind said to be providing testimonial evidence. Methodological naturalism is a restriction on *ways of knowing*, not on the metaphysical commitments of theories. For the scientist, only natural cognitive faculties may be used to collect evidence that may justify theories.

To be clear, it is important to draw the well-worn distinction between the *context of discovery* and the *context of justification*. The context of discovery is the context in which new theories are developed. The context of justification is the context in which theories, once developed, are appraised. There is no naturalistic methodological constraint in the context of discovery, and there are numerous examples in the history of science of theories dreamt up from the wildest of inspirations. Perhaps Kekulé's half-waking vision of a fiery ouroboros, which inspired his theory of the molecular structure of benzene, is among the wildest. That a theory had an odd inspiration, however, is no blight on that theory. It is only with respect to our *appraisals* of new theories that science accepts a methodological naturalism. Kekulé's theory is only as good as the evidence that can be summoned for it *by a natural method*.

Given this understanding of methodological naturalism, Buridan's claim that we must hold that the universe was created *on faith* can be better understood. Although the medieval philosopher held as a matter of faith that the heavens were created by God, the natural tools of reason and sense experience indicated that the heavens

were eternal and incorruptible. This clear distinction between natural and supernatural ways of knowing is a ubiquitous one in medieval natural philosophy. The important point, however, is that the medieval natural philosopher institutionalized this separation of natural and supernatural knowledge in natural philosophy. Methodological naturalism was cemented in the Middle Ages as an injunction on appeals to faith in natural philosophy. The two most commonly appealed to naturalistic principles of medieval natural philosophy were the principle of the common course of nature and another principle that I call the principle of empiricism.

The principle of the common course of nature stated that natural philosophers should proceed *as though* nature always operated with the kind of regularity commonly observed in day to day life. Such a principle happened to exclude unpredictable miracles from the realm of science, but its epistemological effect was greater than just that. Biard (2001) has argued, following Grant (1978) and Thijssen (1987), that the principle of the common course of nature is a medieval principle of induction, that allows that our never faltering *experiences* of such things as hot fires may justify knowledge claims of general theories, such as that all fire is hot (Biard 2001, 91). Without such a principle, sense experience could not be taken to justify knowledge claims of universal theories. To establish the characteristic nature of fires, we conjoin our experience of all observed fires with an ampliative principle of the common course of nature. Knowledge of a scientific theory is then justified on the grounds that the theory's predictions have been '*observed to be true in many instances and to be false in none.*' (Buridan in Grant 1978, 109) It is, then, an epistemic, not metaphysical, principle. There are metaphysical implications of the principle of the common course of nature, e.g. unpredictable or irregular miracles are rejected. As Adelard of Bath wrote in his *Quaestiones Naturales*, miracles should be posited only when reason has been absolutely exhausted (Adelard 1920, 96). Nevertheless, predictable, or controllable, supernatural entities are not excluded by such a principle. Such a principle does not constitute a blanket prohibition on causally efficacious supernatural entities.

The principle of empiricism was another foundational principle of medieval natural philosophy. One can characterize this principle negatively as the view that knowledge claims or evidence allegedly derived from some divine authority, such as faith or scripture, may not be appealed to in the appraisal of theories within natural philosophy. Natural philosophers of the Middle Ages, as Edward Grant says, '*took as their primary mission, the explanation of the structure and operation of the world in purely rational and secular terms.*' (Grant 2010, 11) This secularization of the methods of natural philosophy is almost certainly due to the rediscovery of Aristotle's empirical method in the twelfth century. The translation of the Aristotelian corpus between circa. 1125–1200 brought forth a wave of optimism concerning natural human cognitive faculties. No divine illumination was needed for man to have certitude with regard to matters outside of the realm of faith. Our natural cognitive faculties were sufficient for the acquisition of a particular kind of knowledge, and it is this *natural* knowledge that was the aim of *natural* philosophy.

For a positive account of the principle of empiricism, Duns Scotus made the following list of the ways in which we may naturally acquire knowledge: a

proposition may be self-evident, or we may know it from induction of particular cases, or by introspection, or we may know it directly from experience (Pasnau 2015). Such natural methods of knowing were kept strictly isolated from supernatural methods in the medieval university. One could apply the method of faith in the theology faculty, but in the faculty of arts, reason and sense experience were the only legitimate tools. This distinction between knowing by faith and knowing by reason becomes so well established that it later becomes common for natural philosophers of the period to preface their scientific theories with the phrases *loquendo naturaliter* and *loquendo supernaturaliter*, that is, speaking naturally and speaking supernaturally. Buridan uses this distinction, as does his predecessor Siger of Brabant and his successor Nicole Oresme. Regarding the origin of the universe, these philosophers write that *speaking naturally*, it is known that the universe can be neither created nor destroyed, yet *speaking supernaturally*, it is known that it has been created by God. Natural reason alone tells us that the world is not capable of being created or destroyed, but faith tells us that there is a God who is capable of doing what is naturally impossible.

This distinction between knowing by faith and knowing by reason was cited in the Condemnation of 1277, which attempted to outlaw certain Aristotelian teachings from the University of Paris. In the preamble to the condemnation, Bishop Tempier writes that the dangerous doctrine shared by all these troublesome natural philosophers is that they ‘*state things to be true according to philosophy, but not according to the Catholic faith, as if there are two contrary truths.*’ (Tempier in Dodd 1998, 133) But few of the philosophers of the day accepted the Averroist doctrine of double-truth that Bishop Tempier is getting at. Few genuinely believed that there were two truths that could be known by different methods. There was only one truth, and indeed, when pushed to make a decision about the eternity of the world, medieval philosophers on the whole *agreed* that the Earth must have had a beginning. The idea was that although the light of our natural faculties established that the world was eternal, we nevertheless should accept by faith that it had a beginning when it was created by God. Ultimately, faith trumped reason. It just so happened that in natural philosophy, appeals to faith could not be made. Faith—*qua* appeal to supernatural authority—was off-limits. Tempier includes this anti-supernatural principle among his condemnations. Specifically, he condemns those natural philosophers who claim ‘*that man should not be content with authority to have certitude about any question*’. (Klima 2006, 181).

This abrupt shift towards a natural method was not the result of the chronic failure of supernatural hypotheses, but was a definitive methodological feature of medieval natural philosophy. Crucially, medieval natural philosophers rejected supernatural testimony and adopted a natural concept of justification. Thus science was born. Therefore, when the pragmatic defense argues that methodological naturalism *consists in nothing more than a scientific rejection of failed supernatural explanations*, this is simply not true. It does. Science, as a matter of principle, eschews justificatory appeals to such things as divine revelation and faith. This naturalistic method of justification has been an intrinsic part of natural science since its establishment in the Middle Ages as a demarcation criterion between science and theology. The intrinsic defense, as presented by Pennock, Ruse and Scott, simply

locates naturalism in the wrong context. Science is not necessarily naturalistic with regard to its explanations, but with regard to its method of justification.

Methodological naturalism is largely, though I am timid to say ‘entirely’, an epistemological thesis. It is the thesis that in science, appeals to the authority of divine or supernatural testimony are eschewed. This eschewal can be clearly seen in the work of medieval natural philosophers as science is becoming institutionalized, and it is only with this concept of methodological naturalism in hand that we can make sense of the medieval distinction between natural and supernatural knowledge. Locating the naturalism of science in the metaphysical commitments of scientific theories is a mistake—a mistake that adds fuel to the collective grievance of creationists, who feel that their theories are rejected out of hand. Indeed, it is not their theories that are rejected, it is their method. This recharacterization of methodological naturalism is sorely needed.

Problems for methodological naturalism as an epistemological principle

To this point, I have argued that methodological naturalism is an epistemological principle of science: a principle that eschews the use of putatively supernatural methods to justify theories. I have said, in a nutshell, that methodological naturalism does not tell us what we may conjecture. But an objection might be made that this epistemological principle amounts to the denial of a certain metaphysical picture of the world; specifically one in which there are disembodied minds who come into causal contact with human beings. If there were disembodied minds floating about and revealing knowledge to human beings willy-nilly, then this is a fact about the world which scientists would wish to know. It is a conjecture about the causal structure of the world which, by my thesis, ought to be open to scientific investigation. So why are scientists justified in eschewing the claim that there exist disembodied minds that sometimes impart knowledge to the faithful, but not the claim that there exist disembodied minds?

Certainly, I do not wish to argue that *the hypothesis* that there may exist knowledge-imparting disembodied minds should be eschewed. Indeed, this is the very thesis I have been rallying against. Instead, I claim only that in order to justify any hypothesis, including the one just now mentioned, science may make no use of evidence drawn by supernatural methods. How am I able to make this distinction without falling into a metaphysical trap? Like so: methodological naturalism, construed as an epistemological thesis, is a commitment to *public* methods, and this commitment is no kind of metaphysical prejudice. Publicity is an epistemological characteristic of scientific methods.

Since supernatural methods are private, they fail to generate scientific evidence. Only evidence collected by public methods counts as scientific evidence. After all, science is a communal activity that ought to be maximally inclusive, open to all rational and capable human beings. This inclusivity requires that the methods used be public. But just what counts as a public method? One of the more promising accounts comes from Alvin Goldman, who defines a method of evidence collection *M* as public *iff* (A) two or more investigators can severally apply *M* to the same

questions, and (B) if different investigators were to apply M to the same questions, M would always (or usually) generate the same answers (induce the same beliefs) in those investigators (1997, 534). Thus, the tendency to generate intersubjective agreement is the hallmark of scientific methods. Private methods simply are not like this. Such methods generate intersubjective disagreement and conflict, not consensus. To be clear, there does exist *some* intersubjective agreement within particular religious communities with regards to the deliverances of *some* methods, but this intersubjective agreement is not in any way *surprising*. That is to say, this intersubjective agreement does not tend to come about independent of a locally shared historical or cultural source. Methods that invoke the authoritative testimony of some immaterial spirit (faith, prophetic dreams, spirit possession etc.) have been used by many historically isolated religious cultures, and yet these methods do not generate the kind of surprising cross-cultural agreement that is required to admit such methods as scientific ones.

Contrast the persistent disagreement generated by supernatural methods with the agreement that is generated by the use of our natural cognitive faculties. Even historically isolated, preliterate, tribal societies have bodies of practical knowledge (concerning such activities as agriculture, fishing, and navigation) that share in common a surprising amount of theoretical detail. There is surprising cross-cultural agreement in the key principles of these “proto-sciences”, despite these cultures having long been isolated from each other. What makes this kind of agreement surprising? The agreement is surprising because the hypotheses underwriting this practical knowledge have not come from a common cultural source. Instead, this knowledge has been drawn from (and tested against) experience by each community separately. Our natural cognitive faculties and a process of trial and error generate surprising intersubjective agreement. In the sorts of cases mentioned above, historically and culturally isolated investigators, using the same methods of evidence collection, are led to the same conclusions. The methods they used, then, are demonstrably public.

But, one might think, surely that’s not so. Surely there are extensive differences in the theoretical beliefs of these historically isolated communities, even with regards to these bodies of apparently successful practical knowledge. If that’s the case, then the criterion of publicity given here may be susceptible to the charge that *no* methods are capable of inducing the same beliefs in different investigators. After all, and as is well known, for any given body of evidence there exists an infinite number of theories that are logically compatible with that evidence. If that’s so, then Goldman’s criterion of publicity may be too strong, since investigators are, it seems, not only *very often* led to disagreement in practice, but probably inevitably led to disagree because of the problem of underdetermination of theory by evidence. As Piccinini (2003, 604) has noted, however, the practical impact of this underdetermination is mitigated once we are clear on what Goldman means by the phrase “induce the same beliefs”. If we understand “beliefs” in the broadest sense, to include all our most general scientific theories and abstruse metaphysical beliefs, then this criterion of publicity would indeed judge no method to be public. Instead, “beliefs” should be taken to mean *beliefs about what the results are*. It is this narrower kind of agreement that many methods do, in practice, happen to generate.

While this answer fails to solve the *logical* problem of underdetermination (no surprises there), it nevertheless answers the sceptic who charges that *in practice* this intersubjective agreement cannot be found.

It ought to be emphasized, as well, that not all the methods used within religion are private. Deductive arguments for God's existence, for example, are public insofar as they generate the kind of agreement described above. That is to say, given a certain set of premises as inputs, independent agreement is generated about what conclusions follow. Nevertheless, *supernatural* methods are, it seems, private. There is little, if any, surprising independent agreement to be found. Thus, allowing supernatural methods to count as scientific methods would generate widespread intersubjective disagreement that was *in principle* irreconcilable. Keep in mind the variety of religious traditions with their distinct supernatural authorities. Not only could the Bible be brought to bear on scientific questions, but the Qur'an and the Granth Sahib and *Dianetics* also. Scientific inquiry would be irreconcilably divided along religious lines if any investigator could bring forward private evidence in the appraisal of theories. Without a common set of justificatory tools, scientists would be led to a dangerous stalemate, a stalemate that Piccinini has appropriately termed *epistemic divergence*. There is no escaping this divergence without agreeing on a *public* set of epistemic tools: a set that tends to generate agreement. My thesis is, then, that the anti-supernatural commitments of the scientist are subsumed under the more general preference for public evidence.

Indeed, this growing preference within natural philosophy for justificatory methods that tend to generate agreement was discussed by Aquinas, insofar as it appears to have implications for the status of faith as a *bona fide* kind of knowledge. He considers, but of course rejects, the argument that sacred doctrine is a poor or lowly form of knowledge, since not all men find its deliverances compelling or self-evident. The following argument is presented in the *Summa Theologiae*:

It seems that sacred doctrine is not nobler than other sciences; for the nobility of a science depends on the certitude it establishes. But other sciences, the principles of which cannot be doubted, seem to be more certain than sacred doctrine; for its principles—namely, articles of faith—can be doubted. (Aquinas 1920, 1.1.5)

The problem is just that articles of faith do not command the assent of all people. They are often doubted. This is a feature of faith that makes it unlike other forms of demonstrated knowledge. Indeed, Aquinas goes further, and considers the more radical sceptical argument that since it fails to appear self-evident to all people, sacred doctrine should not be considered any sort of knowledge at all. He writes: '*It seems that sacred doctrine is not a science. For every science proceeds from self-evident principles. But sacred doctrine proceeds from articles of faith which are not self-evident, since their truth is not admitted by all: "For all men have not faith".*' (1.1.2) Predictably, Aquinas rejects these arguments, concluding that faith remains not only a legitimate form of knowledge, but one having the highest order of certainty. Yet while he concludes that faith remains a legitimate way of knowing, he nevertheless argues that it is not a way of knowing that should be considered as justificatory within natural philosophy (1.1.6.ad.2).

The notion that publicity is a virtue of scientific methods can be traced to Aristotle. In the *Metaphysics*, he writes:

...the same thing never appears sweet to some and the contrary of sweet to others, unless in one case the sense organ which discriminates the aforesaid flavours has been perverted and injured. And if this is so the one party must be taken as the measure, and the other must not. (Aristotle 1928, Met. 1063a 1–5)

Aristotle is closely followed by Aquinas, who also argues that the first principles of rational demonstration are those which are ‘*common things that no one is ignorant of*’ (Aquinas 1920, 1.2.ad.1). These common principles account for Aquinas’ commitment to *the autonomy of rational investigation* (De Ceglie 2016). Like Aristotle, Aquinas takes up the example of taste in his *Summa Contra Gentiles*:

That which is asserted universally, by everyone, cannot possibly be totally false. For a false opinion is a kind of infirmity of the understanding, just as a false judgment concerning a proper sensible happens as the result of a weakness of the sense power involved. But defects, being outside the intention of nature, are accidental. And nothing accidental can be always and in all things; the judgment about savors given by every tasting cannot be false. (Aquinas 1957, 2.34)

As noted by both Aquinas and Aristotle, when investigators disagree about what the results are while using sense perception (a method that is assumed to be otherwise public), this disagreement may be traceable to a *weakness of the sense power* or an *injured sense organ*. Thus, the reason for an unusual disagreement between parties can be traced to a dysfunction or weakness of a cognitive mechanism. This is a claim that can be independently corroborated by the application of other methods that are themselves public. By such a procedure of cross-checking, public methods can be calibrated and the conditions under which any particular method is considered public is adjusted in turn. The scientist then comes to depend not only on surprising intersubjective agreement, but on surprising *intermodal* agreement, when faced with a conflict between competing methods.

Before finally concluding, I would like to briefly consider an objection that might be levelled at the general approach of this paper. It might be argued that my decision to locate the emergence of methodological naturalism in Europe in the Middle Ages is fundamentally misguided. After all, the ancient Greeks seem to have been doing pretty good naturalistic science before then, and Muslim philosophers picked up where the Greeks left off. So why not locate the emergence of methodological naturalism in those contexts? Moreover, it is added, even if the medievals did eschew supernatural methods, so what? This does not seem to tell us anything interesting about how *we* should understand methodological naturalism today.

In response, I say two things. First, I do not dispute that the ancient Greeks appear to have been doing pretty successful naturalistic science. However, the contemporary sources relating exactly *why* this Greek naturalism flourished are few and obscure. In contrast, the medieval era is virtually teeming with contemporary critical commentary that grapples at length with the tension between faith and reason. Aristotle was reintroduced into the hostile atmosphere of medieval Christian

Europe so abruptly that an epistemological crisis ensued and a wealth of literature was spawned. What is clear is that methodological naturalism was *self-consciously* established in the Middle Ages as part of an intellectual tradition having clear roots in Aristotle. Thus, I have sought a conception of methodological naturalism in medieval natural philosophy for the same reason that a man seeks his keys under the streetlight. It is not more likely to be there, but if it is there, there is a better chance of finding it.

Second, I do not wish to argue that because this epistemological conception of methodological naturalism emerged at the birth (or rather, *rebirth*) of science, it is the right conception for modern science. This would be to commit a kind of genetic fallacy. Instead, however, I argue that *there simply is no science* without this conception of methodological naturalism. Once medieval philosophers adopted this naturalistic epistemology, they were doing science. The relevance of medieval natural philosophy is, therefore, not that it witnessed the genesis of methodological naturalism *within an existing science*, so much as it witnessed the genesis of science.

Back to the battleground

So where does this leave us in the battle over the scientific respectability of creationism? I think it goes like this. Creationism is not prejudicially locked out of science because the theory posits some supernatural agent, but because creationism is usually justified by appeal to a divine revelation whose authority can only be recognized by an act of faith. *Divine revelation* justifies the claim that there was a global flood. *Divine revelation* justifies the claim that the Earth is less than 10,000 years old. But when the Bible is put back on the bookshelf, and these creationist claims are put under *scientific* scrutiny, the theories almost all fail under the light of reason and observation.

To be clear, I am not alleging that creationism is defended *solely* by appeal to revelation, but that revelation is consistently introduced *alongside* more familiar, natural methods to justify creationist theories. For example, in their old Earth creationist manifesto *Who Was Adam?*, Fazale Rana and Hugh Ross speculate that ‘*attempts to identify evolutionary pathways to modern humans will ultimately prove unfruitful*’ given the present state of the available evidence, which includes both ‘*the fossil record*’ and ‘*Genesis 1 and 2 as well as Mark 10:6 and Matthew 19:4*’ (Rana and Ross 2015, 48). Creationist theories are consistently supported by appeal to supernatural methods in conjunction with natural methods. The prominent young Earth creationist organization *Creation Research Society*, infamously demands that its members accept a statement of belief, the first principle of which is that ‘*the Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.*’ (C.R.S. 2016) Thus, creationism is not scientifically respectable because its proponents explicitly rely on private, supernatural methods alongside more familiar, natural methods.

In contrast, some versions of Intelligent Design theory, or ID, present a unique problem. Insofar as it is publicly defended by appeal to public methods, ID may count as a scientific research program; a *failed* one, to be sure, but scientific nonetheless. Proponents of ID can join the ranks of proponents of other failed research programs, such as animal magnetism and phrenology. Given the present state of the evidence, it is clear enough that few scientists would take ID to be deserving of, say, equal time in the classroom or substantial research grants from public bodies. Yet in the minimal sense of being publicly justified only by appeal to public methods, ID is, by the lights of the thesis argued here, scientific. Is there any way to avoid this conclusion? Perhaps one could argue that since ID proponents are almost always believing Christians, who *privately* justify ID to themselves (and within the greater Christian community) by appeal to revelation, ID is not *honest* science. After all, it is an open secret that revelation ultimately drives the ID research program, yet these supernatural justifications are censored from official ID literature. However, if we are to arbitrate between honest and dishonest science according to the private justifications of its practitioners, we may be led to the conclusion that almost no science is honest. In any case, while the motivation for defending ID is almost always religious in nature, this does not entail that the defenses of the theory must themselves be.

What these considerations show is that in the battle over the scientific respectability of creationism, methodological naturalism is not the silver bullet that it is commonly taken to be. Methodological naturalism was institutionalized in the Middle Ages as an injunction on appeals to supernatural methods in natural philosophy. Thus, science has intrinsic anti-supernatural epistemological commitments. The philosophers of science who try to demarcate their way to victory in this battle, by way of an injunction on supernatural *metaphysics* should, I think, desist. Nothing is gained except the growing suspicion among creationists that there exists a conspiracy to keep their theories outside of science. No great wall is needed to prevent incursions of undesirable metaphysical elements into the fortress of naturalistic science. There are other ways to treat supernatural entities that need not be so hostile or defensive. Indeed, an empirical outlook and an appeal to public methods does most of the work in keeping gods, ghosts and goblins at bay.

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