

Methodological Naturalism?

Part 2

Alvin Plantinga
Department of Philosophy
Notre Dame University

[This is the second part of a two-part article.] The philosophical doctrine of methodological naturalism is flawed. In many areas, science is not religiously neutral. Furthermore, neither claims about the definition or essential nature of science, nor theological presuppositions (e.g., "functional integrity"), can properly support methodological naturalism. However, one may find stronger support for the doctrine in what might be called "Duhemian science" -- i.e., those empirical inquiries pursued by all parties on common ground, independently of whatever metaphysical assumptions may be held by only some investigators. Duhemian science is thus "maximally inclusive." "Augustinian science," on the other hand, may employ particular theological or philosophical assumptions. The ideal of Duhemian science should not exclude Augustinian science: both are valid forms of inquiry.

Methodological Naturalism is True By Definition

So *why* must a scientist proceed in accordance with methodological naturalism? Michael Ruse suggests that methodological naturalism or at any rate part of it is *true by definition*:

Furthermore, even if Scientific Creationism were totally successful in making its case as science, it would not yield a *scientific* explanation of origins. Rather, at most, it could prove that science shows that there can be no scientific explanation of origins. The Creationists believe that the world started miraculously. But miracles lie outside of science, which by definition deals only with the natural, the repeatable, that which is governed by law.³⁷

By definition of the term 'science' one supposes; Ruse apparently holds there is a correct definition of 'science', such that from the definition it follows that science deals only with what is natural, repeatable, and governed by law. (Note that this claim doesn't bear on the suggestions that a Christian scientist can propose hypotheses involving such 'religious' doctrines as, say, original sin, and can evaluate the epistemic probability of a scientific

hypothesis relative to background belief that includes Christian belief.) Ruse's claim apparently rules out hypotheses that include references to God: God is a supernatural being, hypotheses referring to him therefore deal with something besides the natural -- hence such hypotheses can't be part of science.

Three things are particularly puzzling about Ruse's claim. First, enormous energy has been expended, for at least several centuries, on the demarcation problem: the problem of giving necessary and sufficient conditions for distinguishing science from other human activities.³⁸ This effort has apparently failed; but if in fact there *were* a definition of the sort Ruse is appealing to, then presumably there would be available a set of necessary and sufficient conditions for something's being science. Ruse doesn't address the many and (I think) successful arguments for the conclusion that there is no such set of necessary and sufficient conditions, let alone such a definition of the term 'science'; he simply declares that 'by definition' science has the properties he mentions.

Second, Ruse here proposes three properties that he says are by definition characteristic of any bit of science: that bit deals with things that (a) are repeatable, (b) are merely natural, and (c) are governed by natural law. But take repeatability, and consider this passage from the article by Andrei Linde referred to in footnote 32 (see *O & D* 18:1, p. 27). Speaking of the Big Bang, he says, "One might think it very difficult to extract useful and reliable information from the unique experiment carried out about 10,000,000,000 years ago. According to Linde, the Big Bang is unique and therefore, presumably, unrepeatable --at any rate it *might* turn out to be unrepeatable. If so, would we be obliged to conclude that contemporary cosmological inquiries into the nature of the Big Bang and into the early development of the universe are not really part of science?"

Consider next the property of being governed by law. The first point, here, would be that the very existence of natural law is controversial; Bas van Fraassen, for example, has given an extended and formidable argument for the conclusion that there are no natural laws.³⁹ There are *regularities*, of course, but a regularity is not yet a law; a law is what is supposed to *explain* and *ground* a regularity. Furthermore, a law is supposed to hold with some kind of *necessity*, typically thought to be less stringent than broadly logical necessity, but necessity nonetheless.⁴⁰ This idea of lawfulness, I think, is an inheritance of Enlightenment deism (see below); and perhaps here as elsewhere Enlightenment deism misses the mark. Perhaps the demand for law can't be met. Perhaps there are regularities, but no laws; perhaps there is nothing like the necessity allegedly attaching to laws. Perhaps the best way to think of these alleged laws is as universally or nearly universally quantified counterfactuals of divine freedom.⁴¹ So suppose van Fraassen is right and there are no natural laws: would it follow by definition that there isn't any science? That seems a bit strong. Further, it could be, for all we know, that there are some laws, but not everything is governed by them (or wholly governed by them). Perhaps this is how it is with earthquakes, the weather, and radioactive decay. Would it follow that one couldn't study these things scientifically?

The third puzzling thing about Ruse's claim: it is hard to see how anything like a reasonably serious dispute about what is and isn't science could be settled just by

appealing to a *definition*. One thinks this would work only if the original query were really a verbal question -- a question like: *Is the English word 'science' properly applicable to a hypothesis that makes reference to God?* But that wasn't the question. The question is instead: *Could a hypothesis that makes reference to God be part of science?* That question can't be answered just by citing a definition.

Allow me to belabor this point. A definition of 'science' would be an account of what the term means -- in English or in someone's idiolect. Take the second case: perhaps *Ruse* uses the term 'science' according to some definition under which it does not apply to hypotheses referring to God. But of course that in itself has little bearing on the answer to the question we express by the sentence "Can a scientific hypothesis contain a reference to God?"; unless we use the term in accord with the same or similar definition. But we don't; if we did, the question would be trivial, like the question whether there are married bachelors. On the other hand, perhaps the sentence in question is true by some definition of a term in *English* (not *Ruse's* idiolect). The idea would have to be that the meaning of the term 'science' in English can be given by a definition; and according to this definition, the term 'science' properly applies to a hypothesis only if that hypothesis does not include a reference to God. But can this really be so? Consider those who follow *Kuyper* and *Augustine* in thinking that Christians should take explicit account of what they know by way of faith in doing science; is the idea that they have somehow failed to learn how this term is properly used in English (or its cognates in Latin and Dutch)? That seems improbable.

But even if it were true by definition that a scientific hypothesis could involve no reference to God, nothing of much interest would follow. The *Augustines* and *Kuypers* of this world would then be obliged to concede that they had made a mistake: but the mistake would be no more than a verbal mistake. They would have to concede that they can't properly use the term 'science' in stating their view or asking their question; they would have to use some other term, such as 'sience' (pronounced like 'science'); the definition of 'sience' results from that of 'science' by deleting from the latter the clause proscribing hypotheses that include reference to God (i.e., by removing from the definition of 'science' *Ruse* seems to be endorsing, the clause according to which science deals only with what is natural). Their mistake would not be in what they proposed to say, but rather in how they proposed to say it.

The real question, I think, lies in a quite different direction. The term 'science' denotes an important human activity. It is difficult or impossible to give (informative) necessary and sufficient conditions for this activity; it is not possible to say just where science ends and something else (common-sense knowledge, metaphysics, epistemology, religion) begins. However, we can describe paradigms of science, and we can say informative things about what usually or often characterizes science. Thus, for example, it is characteristic of this activity to involve observation and experiments (sometimes 'thought experiments' as opposed to experiments actually carried out). And often there will be a reference to something described (or named) as a law, although it isn't part of the activity in question to insist that this 'law' is more than a regularity. It is also characteristic of such a paradigm that it makes testable predictions.⁴² This is a feature of a paradigmatic instance

of the beast in question, but of course not necessarily a feature of every example (and elements not displaying this feature -- McMullin's Principle of Indifference, for example - - might be deeply involved in science as a backdrop, a constant contextual background, a constant assumption). Consider, for example, the superstring theory put forth by Schwarz and Green in the early eighties. This theory apparently works only in 10 dimensions; so if it is true, there is a question: what has happened to the other six? "The other dimensions are presumed to be curled up on a scale of the Planck length (10×10^{-33} cm.) -- so small we will never be able to examine them with our microscopes or particle accelerators, no matter how hard we try."⁴³

We can therefore say a good bit by way of description of this human activity; and it is an activity of impressive worth and value. It is of enormous practical worth, resulting in lengthened life spans, relief from illness, increased comfort, and a better quality of life for many. (It has also given us the means to destroy ourselves and our environment.) But its benefits are by no means merely practical; modern science has also enabled us to learn much about ourselves and the world which God has created; it is hard even to conceive what intellectual life was like prior to the rise of science. In addition, parts of science -- theoretical physics, for example -- have an austere splendid intrinsic beauty and power; they represent magnificently impressive intellectual accomplishment; they resemble great poetry and great music; perhaps the most impressive intellectual accomplishment of humankind is, say, theoretical physics from Newton to the present. And now the question is this. Should Christians carry on this enterprise from a Christian perspective? Is this enterprise such that religious or theological perspective is relevant to it? We won't get an answer to this question from a mere definition of the word 'science'; an answer will require familiarity with the activity, and the discernment necessary to seeing what is characteristic of it. So an answer will involve substantive questions about the nature of science, our own nature, and the nature of the world in which we live.

"Functional Integrity" Requires Methodological Naturalism?

Diogenes Allen, John Stek and Howard Van Till give answers of that sort. According to Van Till, God has created a world characterized by "functional integrity":

By this term I mean to denote a created world that has no functional deficiencies, no gaps in its economy of the sort that would require God to act immediately, temporarily assuming the role of creature to perform functions within the economy of the created world that other creatures have not been equipped to perform.⁴⁴

Note first that Van Till seems to be directing his fire at only one of the several ways in which, as it seems to me, Christians might employ what they know by faith in pursuing natural science; he is arguing that a scientific hypothesis cannot properly claim that God does something or other *immediately* or directly. (Note also that the claim here is not that such a hypothesis would not be *scientific*, but that it would be *false*. What he says seems to be consistent, so far as I can tell, with the claim (say) that in doing their psychology

Christian psychologists can properly appeal to the fact that human beings have been created in the image of God, or are subject to original sin.

So suppose we turn to Van Till's proscription of hypotheses to the effect that God has done something or other immediately or directly. This idea of direct action conceals pitfalls and deserves more by way of concentrated attention than I can give it here.⁴⁵ The basic idea, however, is fairly clear. An example of *indirect* divine creation would be my building a house; we may say that *God* creates the house, but does so indirectly, by employing *my* activity as a means. So God acts indirectly if he brings about some effect by employing as a means the activity of something else he has created. God acts directly, then, if and only if he brings about some effect, and does not do so by way of employing as a means the activity of some created being.

Now Van Till suggests that God does nothing at all in the world *directly*; only *creatures* do anything directly. But no doubt Van Till, like any other theist, would agree that God directly conserves the world and all its creatures in being; he is directly active in the Big Bang, but also in the sparrow's fall. Were he to suspend this constant conserving activity, the world would disappear like a dream upon awakening. And no doubt Van Till would also agree (on pain of infinite regress) that if God does anything in the world indirectly, he also does something directly: presumably he can't cause an effect indirectly without also, at some point, acting directly, creating something directly. Van Till must therefore be understood in some other way. Perhaps his idea is that God created the universe at some time in the *past* (acting directly at that time) and never any longer acts directly in the world, except for conserving his creation in being, and miracles connected with salvation history. But why think a thing like that? Consider the fact that Christians as diverse as Pope Pius XII and John Calvin have thought that God created human souls directly; can we simply assume without argument that they are mistaken? What is the warrant for supposing that God no longer acts directly in the world?

Van Till appeals for support, for this theological position, to Allen and Stek; Allen asserts that

God can never properly be used in scientific accounts, which are formulated in terms of the relations between the members of the universe, because that would reduce God to the status of a creature. According to a Christian conception of God as creator of a universe that is rational through and through, there are no missing relations between the members of nature. If in our study of nature, we run into what seems to be an instance of a connection missing between members of nature, the Christian doctrine of creation implies that we should keep looking for one.⁴⁶

Allen's suggestion seems to imply, not just that Christians cannot properly propose, as part of science, that God has done something directly, but also that it would be out of order to appeal, in science, to such ideas as that human beings have been created in God's image. For this idea isn't a matter of saying how things in the world are related to each

other; it is instead a matter of saying how some things in the world -- we human beings -- are related to God. Allen believes that scientific accounts must always be formulated in terms of the relations between members of the created universe (and if that is true, then perhaps, as he says, referring to God in science would be to reduce him to a creature). Taken at face value, however, this seems hasty. A textbook on astronomy may tell you what the diameter of Jupiter is (or how old the earth, or the sun, or the Milky Way is). This doesn't tell you how things in the world stand related to each other, but instead just tells you something about one of those things; it is science nonetheless.

Allen's main point, of course, is that a scientific account can't properly be formulated in terms of the relation of anything to God. But why not? What is the authority for this claim? Doesn't it seem arbitrary? Consider the truth that human beings have been created in the image of God, but have also fallen into sin. This dual truth might turn out to be very useful in giving psychological explanations of various phenomena. If it is, why shouldn't a Christian psychologist employ it? Why wouldn't the result be science? It could be that investigation would suggest that God created life directly; that it didn't arise through the agency of other created things. If that is how things turn out, or how things appear at a given time, why not say so? And why not say so as part of science? As a Christian you believe, of course, that God made the world and could have done so in many different ways; why not employ this knowledge in evaluating the probability of various hypotheses (for example, the Grand Evolutionary Myth)? Christians also have beliefs about what is rational in Simon's sense -- i.e., about what sorts of goals a properly functioning human being will have. Christians also have beliefs about what sorts of actions are in their own or someone else's best interests. Why not employ these beliefs in making a scientific evaluation of the probability of, say, Simon's account of altruism, or in giving her own account of these phenomena?

Finally, consider John Stek:

Since the created realm is replete with its own economy that is neither incomplete (God is not a component within it) nor defective, *in our understanding of the economy of that realm so as to exercise our stewardship over it* -- understanding based on both practical experience and scientific endeavors -- *we must methodologically exclude all notions of immediate divine causality*. As stewards of the creation, we must methodologically honor the principle that creation interprets creation; indeed, we must honor that principle as religiously as the theologian must honor the principle that Scripture interprets Scripture -- or, since Scripture presupposes general revelation, that revelation interprets revelation. In pursuit of a stewardly understanding of the creation, we may not introduce a God of the gaps, not even in the as-yet mysterious realm of subatomic particles. We may not do so (1) because God is not an internal component within the economy of the created realm, and (2) because to do so would be to presume to exercise power over God -- the presumptuous folly of those in many cultures who have claimed to be specialists in the

manipulation of divine powers (e.g., shamans in Russian folk religion and medicine men in primitive cultures). (Stek's emphases)47

Stek insists that "we must methodologically exclude all notions of immediate divine causality" in our understanding of the economy of the created realm. One of his reasons seems to be that to appeal to a notion of immediate divine causality would be to introduce a 'God of the gaps', and to do *that* would be to presume to exercise power over God. But am I really presuming to exercise power over God by (for example) concurring with John Calvin and Pope Pius XII (and many others) that God directly creates human beings? Or in claiming that he created life specially? At best, this requires more argument.

As Stek says, God is not an internal component within the created realm. It hardly follows, however, that he doesn't act immediately or directly in the created realm; like any theist, Stek, too, would agree that God directly and immediately conserves his creation in existence. And wouldn't he also agree that if God creates anything indirectly, then he creates some things directly? So I'm not sure why Stek thinks that we must observe this methodological naturalism. Why think that God doesn't do anything directly or create anything directly? What is the reason for thinking this? Scripture doesn't suggest it; there don't seem to be arguments from any other source; why then accept it?

These reasons, then, for the necessity or advisability of Methodological Naturalism do not seem strong; and since they *are* so weak, it is perhaps reasonable to surmise that they don't really represent what is going on in the minds of those who offer them. I suggest that there is a different and unspoken reason for this obeisance to methodological naturalism: *fear and loathing of God-of-the-gaps theology*. As we saw above, Stek declares that "In pursuit of a stewardly understanding of the creation, we may not introduce a 'God of the gaps'"; he together with the other three authors I have cited in this connection (McMullin, Van Till and Allen) explicitly mention God-of-the-gaps theology and explicitly connect it with methodological naturalism via the suggestion that God has done this or that immediately. The idea seems to be that to hold that God acts directly in creation is to fall into, or anyway lean dangerously close to this sort of theology. But is this true? Precisely what is God-of-the-gaps theology?

There isn't anything that it is *precisely*; it isn't that sort of thing. Somewhat vaguely, however, it can be characterized as follows. The God-of-the-gaps theologian is an enlightenment semi-deist who thinks of the universe as a vast machine working according to a set of necessary and inviolable natural laws. (Perhaps a God has created the universe: but if he did, it is now for the most part self-sufficient and self-contained.) These natural laws, furthermore, have a kind of august majesty; they are necessary in some strong sense; perhaps not even God, if there is such a person, could violate them; but even if he could, he almost certainly wouldn't. (Hence the otherwise inexplicable worry about miracles characteristic of this sort of thought.) Natural science investigates and lays out the structure of this cosmic machine, in particular by trying to discover and lay bare those laws, and to explain the phenomena in terms of them. There seem to be *some* phenomena, however, that resist a naturalistic explanation -- so far, at any rate. We should therefore postulate a deity in terms of whose actions we can explain these things that current

science cannot. Newton's suggestion that God periodically adjusts the orbits of the planets is often cited as just such an example of God-of-the-gaps theology.

The following, therefore, are the essential points of God-of-the-gaps theology. First, the world is a vast machine that is almost entirely self-sufficient; divine activity in nature is limited to those phenomena for which there is no scientific, i.e., mechanical and naturalistic explanation. Second, the existence of God is a kind of large-scale hypothesis postulated to explain what can't be explained otherwise, i.e., naturalistically.⁴⁸

Third, there is the apologetic emphasis: the best or one of the best reasons for believing that there is such a person as God is the fact that there are phenomena that natural science cannot (so far) explain naturalistically.

Now McMullin, Stek, Van Till and Allen all object strenuously to God-of-the-gaps theology: and rightly so. This line of thought is at best a kind of anemic and watered-down semi-deism that inserts God's activity into the gaps in scientific knowledge; it is associated, furthermore, with a weak and pallid apologetics, according to which perhaps the main source or motivation for belief in God is that there are some things science can't presently explain. A far cry indeed from what the Scriptures teach! God-of-the-gaps theology is worlds apart from serious Christian theism. This is evident (at least) at the following points. First and most important, according to serious theism, God is constantly, immediately, intimately and directly active in his creation: he constantly upholds it in existence and providentially governs it. He is immediately and directly active in everything from the Big Bang to the sparrow's fall. Literally nothing happens without his upholding hand.⁴⁹ Second, natural laws are not in any way independent of God, and are perhaps best thought of as regularities in the ways in which he treats the stuff he has made, or perhaps as counterfactuals of divine freedom. (Hence there is nothing in the least untoward in the thought that on some occasions God might do something in a way different from his usual way -- e.g., raise someone from the dead or change water into wine.) Indeed, the whole *interventionist* terminology -- speaking of God as *intervening* in nature, or *intruding* into it, or *interfering* with it, or *violating* natural law -- all this goes with God-of-the-gaps theology, not with serious theism. According to the latter, God is already and always intimately acting in nature, which depends from moment to moment for its existence upon immediate divine activity; there isn't and couldn't be any such thing as his 'intervening' in nature.

These are, broadly speaking, metaphysical differences between Christian theism and God-of-the-gaps thought; but there are equally significant epistemological differences. First, the thought that there is such a person as God is not, according to Christian theism, a hypothesis postulated to *explain* something or other,⁵⁰ nor is the main reason for believing that there is such a person as God the fact that there are phenomena that elude the best efforts of current science.⁵¹ Rather, our knowledge of God comes by way of *general* revelation, which involves something like Aquinas's general knowledge of God or Calvin's *sensus divinitatis*, and also (and more importantly) by way of God's *special* revelation, in the Scriptures and through the church, of his plan for dealing with our fall into sin.

God-of-the-gaps theology, therefore, is every bit as bad as McMullin, Van Till, Stek and Allen think. (Indeed, it may be worse than Van Till and Stek think, since some of the things they think -- in particular their ban on God's acting directly in nature -- seem to me to display a decided list in the direction of such theology.) Serious Christians should indeed resolutely reject this way of thinking. The Christian community knows that God is constantly active in his creation, that natural laws, if there are any, are not independent of God, and that the existence of God is certainly not a hypothesis designed to explain what science can't. Furthermore, the Christian community begins the scientific enterprise already believing in God; it doesn't (or at any rate needn't) engage in it for apologetic reasons, either with respect to itself or with respect to non-Christians. But of course from these things it doesn't follow for an instant that the Christian scientific community should endorse methodological naturalism. The Christian community faces this question: How shall we best understand this creation God has made, and in which he has placed us? What is the best way to proceed? What information can we or shall we use? Well, isn't it clear initially, at any rate, that we should employ whatever is useful and enlightening, including what we know about God and his relation to the world, and including what we know by way of special revelation? Couldn't we sensibly conclude, for example, that God created life, or human life, or something else specially? (I don't say we *should* conclude that: I say only that we *could*, and should if that is what the evidence most strongly suggests.) Shouldn't we use our knowledge of sin and creation in psychology, sociology, and the human sciences in general? Shouldn't we evaluate various scientific theories by way of a background body of belief that includes what we know about God and what we know specifically as Christians? Shouldn't we decide what needs explanation against that same background body of beliefs?

Well, why not? That certainly seems initially to be the rational thing to do (one should make use of all that one knows in trying to come to an understanding of some phenomenon); and it is hard to see anything like strong reasons against it. We certainly don't fall into any of the unhappy ways of thinking characteristic of God-of-the-gaps theology just by doing one of these things. In doing these things, we don't thereby commit ourselves, for example, to the idea that God does almost nothing directly in nature, or that the universe is something like a vast machine in whose workings God could intervene only with some difficulty; nor are we thereby committed to the idea that one of our main reasons for belief in God is just that there are things science can't explain, or that the idea of God is really something like a large-scale hypothesis postulated to explain those things. Not at all. Indeed, the whole God-of-the-gaps issue is nothing but a red herring in the present context.⁵²

Two Stronger Arguments for Methodological Naturalism

These arguments, therefore, are not very convincing; but there are two quite different, and I think, stronger arguments or lines of reasoning for embracing methodological naturalism in the practice of science. The first of these really deserves a paper all to itself; here, unfortunately, I shall have to give it relatively short shrift.

Duhemian Science

We can approach this argument by thinking about some striking passages in Pierre Duhem's *The Aim and Structure of Physical Theory*.⁵³

Duhem was both a serious Catholic and a serious scientist; he was accused (as he thought) by Abel Rey⁵⁴ of allowing his religious and metaphysical views as a Christian to enter his physics in an improper way. Duhem repudiated this suggestion, claiming that his Christianity didn't enter his physics in an improper way, because it didn't enter his physics in any way at all.⁵⁵ Furthermore, he thought the *correct* or *proper* way to pursue physical theory was the way in which he had in fact done it; physical theory should be completely independent of religious or metaphysical views or commitments. Why did he think so?

For two reasons. First, he thought religion bore little relevance to physical theory: "Was it not a glaring fact to us, as to any man of good sense, that the object and nature of physical theory are things foreign to religious doctrines and without any contact with them?" (p. 278).

But there is something else, and something perhaps deeper. Although Duhem may have thought that *religious* doctrines had little to do with physical theory, he didn't at all think the same thing about *metaphysical* doctrines. In fact he believed that metaphysical doctrines had often entered deeply into physical theory. Many theoretical physicists, as he saw it, took it that the principal aim of physics is to *explain* observable phenomena. Explanation is a slippery notion and a complex phenomenon; but here at any rate the relevant variety of explanation involves giving an account of the phenomena, the appearances, in terms of the nature or constitution of the underlying material reality. He goes on (pp. 10-18) to give a striking illustration, recounting how atomists, Aristotelians, Newtonians, and Cartesians differ in the explanations or accounts they give of the phenomena of magnetism: atomists give the requisite explanation, naturally enough, in terms of atoms; Cartesians in terms of pure extensions; and Aristotelians in terms of matter and form. The differences among these explanations, he says, are metaphysical; they pertain to the ultimate nature or constitution of matter. But of course if the aim is to explain the phenomena in terms of the ultimate nature or constitution of matter, then it is crucially important to get the latter right, to get the right answer to the metaphysical question "What is the nature or constitution of matter?" In this way, he says, physical theory is subordinated to metaphysics: "*Therefore, if the aim of physical theories is to explain experimental laws, theoretical physics is not an autonomous science; it is subordinate to metaphysics*" (p. 10 Duhem's emphasis).

Well, what's the matter with that? The problem, says Duhem, is that if you think of physics in this way, then your estimate of the worth of a physical theory will depend upon the metaphysics you adopt. Physical theory depends upon metaphysics in such a way that someone who doesn't accept the metaphysics involved in a given physical theory can't accept the physical theory either. And the problem with *that* is that the disagreements that run riot in metaphysics will ingress into physics, so that the latter cannot be an activity we can all work at together, regardless of our metaphysical views:

Now to make physical theories depend on metaphysics is surely not the way to let them enjoy the privilege of universal consent. If theoretical physics is subordinated to metaphysics, the divisions separating the diverse metaphysical systems will extend into the domain of physics. A physical theory reputed to be satisfactory by the sectarians of one metaphysical school will be rejected by the partisans of another school.

Duhem goes on to quote Christian Huygens, who, as an 'atomist' rejected Newton's idea of action at a distance: "So far as concerns the cause of the tides given by Mr. Newton, I am far from satisfied, nor do I feel happy about any of his other theories built on his principle of attraction, which to me appears absurd."⁵⁶ He also quotes Descartes' comments on a work by Roberval⁵⁷ who put forth a theory of universal gravitation well before Newton:

Nothing is more absurd than the assumption added to the foregoing: the author assumes that a certain property is inherent in each of the parts of the world's matter and that, by the force of this property, the parts are carried toward one another and attract each other. He also assumes that a like property inheres in each part of the earth considered in relation with the other parts of the earth, and that this property does not in any way disturb the preceding one. In order to understand this, we must not only assume that each material particle is animated, and even animated by a large number of diverse souls that do not disturb each other, but also that these souls of material particles are endowed with knowledge of a truly divine sort, so that they may know without any medium what takes place at very great distances and act accordingly.⁵⁸

The point Duhem makes is that if a physical theorist employs metaphysical assumptions and notions that are not accepted by other workers in the fields, and employs them in such a way that those who don't accept them can't accept his physical theory, then to that extent his work cannot be accepted by those others; and to that extent the cooperation important to science will be compromised. He therefore proposes a conception of science (of physics in particular) according to which the latter is independent of metaphysics:

... I have denied metaphysical doctrines the right to testify for or against any physical theory..... Whatever I have said of the method by which physics proceeds, or the nature and scope that we must attribute to the theories it constructs, does not in any way prejudice either the metaphysical doctrines or religious beliefs of anyone who accepts my words. The believer and the nonbeliever may both work in common accord for the progress of physical science such as I have tried to define it (pp. 274-75).

So here we have another argument for methodological naturalism, and a simple, common-sense one at that: it is important that we all -- Christian, naturalist, creative anti-realist, whatever -- be able to work at physics and the other sciences together and

cooperatively; therefore we shouldn't employ, in science, views, commitments and assumptions only some of us accept. That is, we shouldn't employ them in a way that would make the bit of science in question unacceptable or less acceptable to someone who didn't share the commitment or assumption in question.⁵⁹ But then we can't employ (in that way) such ideas as that the world and things therein have been designed and created by God. Proper science, insofar as it is to be common to all of us, will have to eschew any dependence upon metaphysical and religious views held by only some of us; therefore we should endorse methodological naturalism. We do not, of course, have to be metaphysical naturalists in order to pursue Duhemian science; but if science is to be properly universal, it can't employ assumptions or commitments that are not universally shared.

This is an appealing argument for methodological naturalism. It is pragmatic, not principial: it is a good thing to do science together; we should therefore maximize the possibility of cooperation and cooperative inquiry wherever possible; therefore we should not propose, in science, theories essentially involving beliefs that are not common to us all. "When we regard a physical theory as a hypothetical explanation of material reality, we make it dependent on metaphysics. In that way, far from giving it a form to which the greatest number of minds can give their assent, we limit its acceptance to those who acknowledge the philosophy it insists on." So we should adopt a sort of positivist (in the old sense), metaphysically noncommittal, conception of science. Science, properly done, will neither make metaphysical or religious assumptions nor have metaphysical or religious consequences.

This simplicity, to be sure, is a bit deceptive. What is really important for commonality is not the absence, from science, of hypotheses referring to God, or of metaphysics as such, or other philosophical ideas, but rather the absence of views or assumptions that divide us. If there are certain metaphysical views we all share, then there would be no reason, from this point of view, for banning those metaphysical views from science. (Thus Duhem's reason for thinking science should abstain from metaphysics is quite different from Bas van Fraassen's, whose views bear some resemblance to his.) So far as Duhem's suggestion goes, science can employ any universally accepted proposition or assumption whatever, even if in fact it is a piece of metaphysics or theology.⁶⁰ Perhaps it is metaphysics, on some accounts anyway, to suppose that there has really been a past, or really are material objects that exist independently of human thought. If these are assumptions we all or nearly all make, then from this perspective, they can be included in science.

What sorts of propositions are they, that nearly everyone party to the scientific enterprise accepts? Here we see a link between Duhem and van Fraassen -- and also, of course, a connection with the idea that science is *empirical* science; science is in some special way related to the deliverances of experience, in particular the deliverances of sense. And the deliverances of sense are not, for the most part, loci of disagreement among us. In this neighborhood there is much to be said and no space to say it: I shall say just the following. Perhaps observation is, as many have told us, in some sense 'theory-laden'; but it doesn't follow that it is theory-laden in such a way as to destroy commonality. Barring

exceptional circumstances, all will agree, presumably, that the pointer is between the 5 and 6 (rather than, say, the 1 and 2). Further, the theory with which observation is laden needn't in every case be such as to divide us. Still further, even where it does divide us (where, for example, the realist claims to see the trail of the electron in the cloud chamber and the empiricist sees no such thing) attention to the way in which a term like 'see' gets analogically extended can often defuse the alleged disagreement as to what gets seen.

So propositions whose truth can be determined by observation will be among those admissible to science from this perspective. Of course science employs more: it also employs the deliverances of reason, logic and mathematics--where, once more, there is little disagreement. Still other propositions are widely accepted and employed in science, although they aren't determinable by observation and go beyond logic and mathematics. We suppose it reasonable to assume that the regularities that obtain in our cosmic neighborhood also obtain in regions of the universe spatiotemporally more remote from us; we suppose that the future will resemble the past in a way that is extremely hard to state but nonetheless real. (We don't feel obliged to repeat the experiment tomorrow, on the grounds that things might change overnight.) We also assume that various inductive policies are likely to work, that simple explanations (again, in a sense that is extraordinarily hard to explain) are to be preferred to complex ones, and so on.

According to this attractive Duhemian ideal, then, science is to be a common enterprise and is to employ (in the sense mentioned above) only propositions that are common to all or nearly all those party to it. Duhemian science, you might say, would be *public* science; it would be maximally inclusive and wholly neutral with respect to the world-view differences that separate us. And of course there are whole vast stretches of our cognitive economy where these world-view considerations do indeed seem to be wholly irrelevant. Anyone with decent eyesight will see that the pointer points to 7; metaphysical or theological differences have nothing to do with it. The same will hold, presumably, for a measurement of the distance from Earth to Jupiter. Anybody will see that a contradiction can't be true; again, it doesn't matter whether you are theist, or an anti-realist or a naturalist, or whatever. The same will go for a deduction of Cantor's Theorem from the axioms of ordinary set theory. (Of course disagreement may break out about those axioms.)

Duhemian science, obviously enough, would involve methodological naturalism: no hypotheses involving God or sin, or what one knows by special revelation will enter essentially into the constitution of such science. But it is crucially important to see methodological naturalism will be just one small part of a much more inclusive constraint: not only won't science, so conceived, employ hypotheses about *God*, it also won't employ any hypotheses whose cogency involves or presupposes *metaphysical naturalism*. Nor will it employ assumptions like those, for example, that seem to underlie much cognitive science. For example, it couldn't properly assume that mind-body dualism is false, or that human beings are material objects; these are metaphysical assumptions that divide us. Nor could it employ the deterministic assumptions that seem to underlie much social science; these beliefs also relevantly divide us. Further, many assumptions about the proper function of human beings and their faculties would have to

be proscribed: for example, Simonian assumptions about what is and isn't rational, and Piagetian claims about what a properly functioning 12-year-old will or won't believe, and the assumption widely current in scientific study of religion that serious religious belief must be a manifestation of pathology or invincible ignorance. Duhemian science would also proscribe the idea that the Theory of Common Ancestry is certain, as well as the idea, widely expressed by writers on evolution, that the randomness or chance involved in genetic variation is such as to preclude human beings' having been designed - - by God or anyone else. It would also exclude McMullin's Principle of Indifference, and perhaps much more -- perhaps some principles from psychology, from sociology, from economics, and so on. Instead of speaking of 'methodological naturalism', therefore, perhaps we should speak of 'methodological neutralism', or maybe 'metaphysical neutralism'.

Duhemian science, therefore, is maximally inclusive; we can all do it together and agree on its results. But what about those who, like Simon, for example, think it is important also to do a sort of human science which starts, not from methodological neutralism, but from metaphysical naturalism? And what about those who, like the atomists, Cartesians and Aristotelians think it is important to pursue a sort of science in which the aim is successful explanation in terms of underlying unobservable realities? And what about Christians or theists, who propose to investigate human reality employing all that they know, including what they know as Christians or theists? So far as Duhem's claims go, there is nothing improper about any of this. Should we call this kind of activity 'science'; does it deserve that honorific term? There is no reason in Duhem for a negative answer. It is important, to be sure, to see that science of this sort isn't *Duhemian* science and doesn't have the claim to universal assent enjoyed by the latter; but of course that is nothing against it. According to the fuller Duhemian picture, then, we would all work together on Duhemian science; but each of the groups involved -- naturalists and theists, for example, but perhaps others as well -- could then go on to incorporate Duhemian science into a fuller context that includes the metaphysical or religious principles specific to that group. Call this broader science 'Augustinian science'. Of course the motivation for doing this will vary enormously from area to area. Physics and chemistry are overwhelmingly Duhemian⁶¹ (of course the same might not be true for *philosophy* of physics); here perhaps Augustinian science would be for the most part otiose. The same goes for biological sciences; surely much that goes on there could be thought of as Duhemian science. On the other hand, there are also non-Duhemian elements in the neighborhood, such as those declarations of certainty and the claims that evolutionary biology shows that human and other forms of life must be seen as a result of chance (and hence can't be thought of as designed). In the human sciences, however, vast stretches are clearly non-Duhemian; it is in these areas that Augustinian science would be most relevant and important.

So return to our central question: should the Christian scientific community observe the constraints of methodological naturalism? So far as this argument is concerned, the answer seems to be: yes, of course, in those areas where Duhemian science is possible and valuable. But nothing here suggests that the Christian scientific community should

not *also* engage in non-Duhemian Augustinian science where that is relevant. There is nothing here to suggest that if it ain't Duhemian, it ain't science.

Science Stoppers?

There is still another reason for methodological naturalism; this one too is common sense simplicity itself. God has created this whole wonderful and awful (both taken in their etymological senses) world of ours. One of the things we want to do as his creatures is to understand the world he has made, see (to the extent that we can) how it is made, what its structure is, how it works. This is not, of course, the *only* thing God's children must do with the world; we must also appreciate it, care for it, love it, thank the Lord for it, and see his hand in it. But understanding it is valuable, and so is understanding it in a theoretical way. One way of understanding something is to see how it is made, how it is put together, and how it works. That is what goes on in natural science. The object of this science is nature; for Christians, its aim (one of its aims) is to see what the structure of this world is and how it works; this is a way of appreciating God's creation, and part of what it is to exercise the image of God in which we have been created.

But there will be little advance along this front if, in answer to the question, "Why does so and so work the way it does?" or "What is the explanation of so and so?" we regularly and often reply "Because God did it that way" or "Because it pleased God that it should be like that." This will often⁶² be true, but it is not the sort of answer we want at that juncture. It goes without saying that God has in one way or another brought it about that the universe displays the character it does; but what we want to know in science are the answers to questions like "What is this made out of? What is its structure? How does it work? How is it connected with other parts of God's creation?" Claims to the effect that God has done this or that (created life, or created human life) *directly* are in a sense science stoppers. If this claim is true, then presumably we can't go on to learn something further about how it was done or how the phenomenon in question works; if God did it directly, there will be nothing further to find out. How does it happen that there is such a thing as light? Well, God said, "Let there be light" and there was light. This is of course true, and of enormous importance, but taken as science it isn't helpful; it doesn't help us find out more about light, what its physical character is, how it is related to other things, and the like. Ascribing something to the direct action of God tends to cut off further inquiry.

Of course this is a reason for only *part* of methodological naturalism. There are several *different* ways in which Christianity might enter into the texture of science: (1) stating and employing hypotheses according to which God does things directly, of course, but also (2) stating and employing hypotheses according to which he does something indirectly; further, there is (3) evaluating theories with respect to background information that includes Christian theism; still further, there is (4) employing such propositions as *human beings have been created in God's image*, either directly or as background, and (5) doing the same for such doctrines as that of original sin, which don't involve any direct mention of God at all, and (6) deciding what needs explanation by way referring to that

same background. The considerations cited in the last paragraph are at best a reason for a proscription of (1).

But they aren't even much of a reason for that. The claim that God has directly created life (for example) may be a science stopper; it doesn't follow that God *didn't* directly create life. Obviously we have no guarantee that God has done everything by way of employing secondary causes, or in such a way as to encourage further scientific inquiry, or for our convenience as scientists, or for the benefit of the NSF. Clearly we can't sensibly insist in advance that whatever we are confronted with is to be explained in terms of something *else* God did; he must have done *some* things directly. It would be very much worth knowing (if possible) which things he *did* do directly; to know this would be an important part of a serious and profound knowledge of the universe. The fact that such claims are science stoppers means that as a general rule they won't be helpful; it doesn't mean that they are never true, and it doesn't mean that they can never be part of a proper scientific theory. (And of course it doesn't even bear on the other ways in which Christianity or Christian theism can be relevant to science.) It is a giant and unwarranted step from the recognition that claims of direct divine activity are science stoppers to the insistence that science must pretend that the created universe is just there, refusing to recognize that it is indeed *created*.

So there is little to be said for methodological naturalism. Taken at its best, it tells us only that Duhemian science must be metaphysically neutral and that claims of direct divine action will not ordinarily make for good science. And even in these two cases, what we have reason for is not a principled proscription but a general counsel that in some circumstances is quite clearly inapplicable. There is no reason to proscribe questions like: did God create life specially? There is no reason why such a question can't be investigated empirically⁶³; and there is no reason to proscribe in advance an affirmative answer.

Christian thought (particularly since the High Middle Ages) as opposed to Greek (and in particular Aristotelian⁶⁴ thought) contains a strong tendency to see the world as through-and-through *contingent*. The world need not have existed; that is, God need not have created it. The world need not have had just the structure it does have; that is, God could have created it differently. This sense of the contingency of nature has been one important source of the emphasis upon the *empirical* character of modern science. As a sort of rough rule of thumb, we can say that it is by *reason*, by *a priori* thought, that we learn of what cannot be otherwise; it is by the senses, by way of *a posteriori* inquiry that we learn about what is contingent.⁶⁵ But the world as God created it is full of contingencies. Therefore we don't merely think about it in our armchairs, trying to infer from first principles how many teeth there are in a horse's mouth; instead we take a look. The same should go for the question how God acts in the world: here we should rely less upon *a priori* theology and more upon empirical inquiry. We have no good grounds for insisting that God *must* do things one specific way; so far as we can see, he is free to do things in many different ways. So perhaps he did create human life specially; or perhaps he has done other things specially. We can't properly rule this out in advance by way of appeal to speculative theology; we should look and see.

My main point, therefore, can be summarized as follows. According to Augustine, Kuyper, and many others human history is dominated by a battle, a contest between the Civitas Dei and the City of Man. It is part of the task of the Christian academic community is to discern the limits and lineaments of this contest, to see how it plays out in intellectual life generally, and to pursue the various areas of intellectual life as citizens of the Civitas Dei. This naturally suggests pursuing science using all that we know: what we know about God as well as what we know about his creation, and what we know by faith as well as what we know in other ways. That natural suggestion is proscribed by the principle of Methodological Naturalism. Methodological naturalism, however, though widely accepted and indeed exalted, has little to be said for it; when examined coolly in the light of day, the arguments for it seem weak indeed. We should therefore reject it, taken in its full generality. Perhaps we should join others in Duhemian science; but we should also pursue our own Augustinian science.

By way of conclusion, I call attention to something else John Stek has said:

Theology must take account of all that humanity comes to know about the world, and science must equally take account of all that we come to know about God. In fact, we cannot, without denying our being and vocation as stewards, pursue theology without bringing to that study all that we know about the world, nor can we, without denying our being and vocation as stewards, pursue science without bringing to that study all that we know about God.⁶⁶

Just so.

Notes

37. *Darwinism Defended* (Reading, Mass: Addison-Wesley, 1982); p. 322 (my italics).
38. See for example, Larry Laudan's "The Demise of the Demarcation Problem" in *But is it Science?*, ed. Michael Ruse (Buffalo, New York: Prometheus Books, 1988).
39. See his *Laws and Symmetry* (Oxford: Oxford University Press, 1989), chaps. 2-5.
40. See e.g., David Armstrong, *What is a Law of Nature?* (Cambridge: Cambridge University Press, 1983), pp. 39ff.
41. That is, propositions that state how God (freely) treats the things he has made, and how he would have treated them had things been relevantly different. "Nearly universally quantified": if we think of them this way, we can think of miracles as going contrary to law without thinking of them (inconsistently) as exceptions to some universal and necessary proposition.
42. It might be worth noting that many hypotheses mentioning God *are* eminently testable: for example, the hypothesis that God has created rabbits that weigh a ton and a half and live in Cleveland.
43. Marc Davis, "Cosmology: the Modern Creation Myth," *Bulletin of The American Academy of Arts and Sciences* (May 1992), p. 62.

44. "When Faith and Reason Cooperate," *Christian Scholar's Review* (Sept. 1991), p. 42.
45. See, for example, William P. Alston, "Divine and Human Action," in Thomas Morris, *Divine and Human Action: Essays in the Metaphysics of Theism* (Ithaca, NY: Cornell University Press, 1988).
46. *Christian Belief in a Postmodern World* (Louisville: Westminster/John Knox Press, 1989), p. 45.
47. "What says the Scriptures?" in Howard J. Van Till, Robert E. Snow, John H. Stek, and Davis A. Young, *Portraits of Creation: Biblical and Scientific Perspectives on the World's Formation* (Grand Rapids: Eerdmans Publishing Co., 1990) p. 261.
48. I don't mean to suggest that one who espouses or advocates God-of-the-gaps theology herself believes in God only as such a hypothesis: that is quite another question.
49. In addition, most medieval Christian thinkers have also insisted on a separate divine activity of God's; any causal transaction in the world requires his *concurrence*. Problems arise here; to some ears it sounds as if this doctrine is motivated less by the relevant evidence than by a desire to pay metaphysical compliments to God.
50. See my "Is Theism Really a Miracle?," *Faith and Philosophy*, vol. 3, no.2 (1986), p. 132 ff.
51. A further problem with this way of thinking: as science explains more and more, the scope for God's activity is less and less; it is in danger of being squeezed out of the world altogether, thus making more and more tenuous one's reasons (on this way of thinking) for believing that there is such a person as God at all. (Of course it must also be acknowledged on the other side that things sometimes go in the opposite direction; for example, it is much harder now than it was in Darwin's day to see how it could be that life should arise just by way of the regularities recognized in physics and chemistry.)
52. Further, Newton seems to me to have suffered a bum rap. He suggested that God made periodic adjustments in the orbits of the planets; true enough. But he didn't propose this as a reason for believing in God; it is rather that (of course) he already believed in God, and couldn't think of any other explanation for the movements of the planets. He turned out to be wrong; he could have been right, however, and in any event he wasn't endorsing any of the characteristic ideas of God-of-the-gaps thought.
53. Trans. Philip P. Wiener, foreword by Prince Louis de Broglie (Princeton: Princeton University Press, 1954). The book was first published in 1906.
54. La Philosophie scientifique de M. Duhem, *Revue de Metaphysique et de Morale*, XII (July, 1904), 699ff.
55. See the appendix to *The Aim and Structure of Physical Theory*, which is entitled "Physics of a Believer" and is a reprint of Duhem's reply to Rey; it was originally published in the *Annales de Philosophie Chretienne*, Vol. I (Oct. and Nov.) 1905, pp. 44ff. and 133ff.
56. Huygens to G. W. Leibniz, Nov. 18, 1690, *Oeuvres complètes de Huygens*, Correspondence, 10 volumes (The Hague, 1638-1695) ix, 52. Quoted by Duhem.
57. *Aristarchi Samii, De mundi systemate, partibus et motibus ejusdem, liber singularis* (Paris, 1643).
58. Descartes to Mersenne, in *Correspondence*, ed. Tannery and Adam Letter (1893) clxxx p. 396.
59. This wouldn't preclude, of course, employing such ideas in theories proposed, not as true, but only as empirically adequate.

60. It isn't clear to me whether Duhem himself proposes that physics shouldn't involve *any* metaphysics, or whether he thinks only that it shouldn't involve *divisive* metaphysics. He tends to write as if it is the former he has in mind; but his arguments support only the latter.

61. The Principle of Indifference is non-Duhemian, but it isn't easy to find other examples. (I am assuming that *interpretations* of quantum mechanics, as opposed to quantum mechanics itself, belong to philosophy rather than physics.)

62. Though not always: if the question is "Why was there such a thing as WW II?" the answer is not "Because it pleased God to do things that way". God of course *permitted* the Second World War to take place; but it wasn't pleasing to him.

63. Why couldn't a scientist think as follows? God has created the world, and of course has created everything in it directly or indirectly. After a great deal of study, we can't see how he created some phenomenon P (life, for example) indirectly; thus probably he has created it directly.

64. See *Posterior Analytics*, Bk. I, 1-2, 4, where Aristotle declares that *scientia* is a matter of seeing what necessarily follows from what one sees to be necessarily true. (Of course Aristotle's own practice is not always easy to square with this suggestion.)

65. Of course this is at best a rough and general characterization: we can obviously learn of necessities *a posteriori* (for example by using computers to prove complicated theorems) and perhaps also of contingencies *a priori*. This question of the connection between the *a priori* and the necessary, on the one hand, and the contingent and the *a posteriori* on the other (the question of the relation between the *a priori* / *a posteriori* distinction and the necessary/contingent distinction) is as deep as it is fascinating.

66. Loc. Cit., p. 260-261.