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ARTICLE

A puzzle about natural laws and the existence of God

Danny Frederick

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Abstract The existence of natural laws, whether deterministic or indeterministic, and whether exceptionless or ceteris paribus, seems puzzling because it implies that mindless bits of matter behave in a consistent and co-ordinated way. I explain this puzzle by showing that a number of attempted solutions fail. The puzzle could be resolved if it were assumed that natural laws are a manifestation of God's activity. This argument from natural law to God's existence differs from its traditional counterparts in that, whereas the latter seek to explain the *fact* of natural laws, the former seeks to explain their *possibility*. The customary objections to the traditional arguments cannot be successfully adapted to counter this new argument, with one exception which has only limited effect. I rebut four claims that the theistic solution to the puzzle about natural laws is paradoxical, though I concede that one of these claims has merit. I consider four objections to the new argument but find three of them more or less unsatisfactory. The fourth, if successful, would undermine our claims to know the truth about the world.

Keywords Ceteris paribus · Chance · Commands · God · Natural laws · Necessity · Possibility · Science

Introduction

It appears to be the case that the natural world exhibits a law-governed regularity; that is, it appears to be the case that there are natural laws. These natural laws may be ceteris-paribus rather than exceptionless laws, that is, they may be default regularities that hold in the absence of outside interference. A 'natural law,' as I will use the term, is objective, in that it is a regularity that exists in the things themselves, or in the

D. Frederick (✉)
Slate House, Hunstan lane, Old Leake, Boston PE22 9RG, UK
e-mail: dannyfrederick77@gmail.com

world itself. Further, it is not just an accidental regularity exhibited by phenomena but is, rather, in some sense necessary. Thus, a statement that a particular regularity is a natural law entails corresponding subjunctive conditionals (Carroll 1994, pp. 1–21). For example, the statement that it is a law that all freely falling bodies fall to earth with a uniform acceleration, entails the statement that, if my computer were dropped from the roof of my house, it would fall to earth with a uniform acceleration (we will consider the 'ceteris paribus' qualification below). In contrast, an accidental regularity is one which only happens to be the case. For example, consider the moa, an extinct bird which lived in New Zealand. Let us assume that the New Zealand moas were the only ones that ever existed and that, while moas could live to be sixty under favourable circumstances, the environment in New Zealand was unfavourable, so that all of the moas died before they were 50. The regularity that all moas die before the age of 50 is not a natural law because the subjunctive conditional, 'if a moa had lived in a more favourable environment, it would have died before it was fifty,' is false (Popper 1959/2002, pp. 448–449).

Some philosophers deny that there are natural laws in the sense I have explained. These philosophers are anti-realists about natural law (see Carroll 1994, pp. 12–14, 87–102). For these philosophers, no statement of the form 'it is a natural law that *p*' is, strictly speaking, true. This article will proceed on the assumption that natural laws exist; but I will discuss anti-realism briefly at the end of the article. Some anti-realists, and some other philosophers too, use the term 'natural law' to refer to *statements* which describe regularities and which are, in some sense, a central part of accepted, or even previously accepted, scientific theories (whether or not these statements take the form 'it is a natural law that *p*'). In what follows, 'natural law' should always be understood in the objective sense I explained in the previous paragraph. Accordingly, throughout I make it clear when I am talking about *statements* of natural law rather than natural laws.

In the next section, I raise and explain a puzzle about natural laws. In the third section, I consider a theistic solution which I distinguish from traditional design arguments for the existence of God. In the fourth section, I show that this solution is weakened by only one of the usual objections to traditional design arguments. In the fifth section, I discuss four paradoxes that might be alleged against the theistic solution. I reject three of these and suggest a solution to the fourth. The sixth section explains how natural laws can be both necessary and ceteris paribus, thus allowing for miracles and human free will, and how statements of ceteris-paribus laws can be falsifiable. In the seventh section, I raise four more objections to the theistic solution. Three of these objections seem weak. The fourth objection, an evolutionary argument for our cognitive limitations, undermines the theistic solution, but only by affirming that it is natural that we should discover puzzles that we cannot resolve. In the conclusion, I summarise the discussion and argue briefly that anti-realism offers no real escape from the puzzle.

A puzzle

There is something inherently puzzling about the existence of natural laws. How can it be possible that the motions of unthinking, mindless things should accord with natural laws? It seems baffling that unthinking pieces of matter, merely mindless lumps of

stuff, behave in an orderly way. What is to stop some bits of matter moving in ways which are inconsistent with natural laws; or the same piece of matter moving at one time in a way which accords with natural laws but at another time in a way which is inconsistent with them? For example, how can it be that all the different planets orbit the sun in a way which exhibits the laws of motion? How is it *possible* that all these different unthinking clumps of stuff move about in the same orderly way, or even that any one of them behaves in a way that consistently exhibits a natural law?

It might be objected that, in fact, material things do not consistently exhibit natural laws, because many, or all, natural laws hold only ceteris paribus, that is, only so long as there is no interfering factor; and there is often some interfering factor. But this does not avoid the puzzle. For, how can it be that, in the absence of interfering factors, mere mindless lumps of stuff always move about in accord with a natural law? How can mere unthinking things exhibit such consistency or co-ordination? To avoid circumlocution, I will henceforward suppress the qualification 'in the absence of interfering factors,' except in the sixth section.

The answer, it might be said, is *forces*. Matter accords with natural laws because it is operated upon by forces which compel it to act as it does. If this answer were correct, it would not resolve the puzzle. It would merely relocate it, because forces are just as unthinking and mindless as matter. How can 'blind forces' accord with natural laws or behave in an orderly way? For example, how could it be possible that a force of a specified magnitude and direction applied to a body of a specified mass always produces the same acceleration? Why should it not sometimes produce one acceleration, and at other times another or none at all?

However, the claim that forces make matter accord with natural laws is not even correct—at least, if the laws of nature are as described in leading scientific theories. In Newton's theory every bit of matter continues at constant velocity if no forces are acting on it (Newton 1687, p. 83). In general relativity, gravitational force is dispensed with in favour of the law that bodies pursue the easiest course through undulating space-time (Russell 1925/1969, pp. 80–92). In quantum physics the EPR/B experiment appears to describe situations in which separate microphysical particles co-ordinate their motions to accord with a mathematical law even though there can be no forces acting between them to bring about the mutual adjustment (Berkovitz 2008). Mindless matter appears to accord with laws even when no forces are acting on it. How can that be so? Indeed, this question would arise even if matter always did absolutely nothing (whatever that might mean) when no forces were acting on it. For why should all bits of matter do nothing under such circumstances? Why should even one bit always do nothing when no force acts on it? How could it be possible that every, or any, body always accords even with that law?

It is obviously useless to point out that some laws can be explained in terms of other laws, for example, that we may explain why matter accords with Einstein's quantitative law of gravitation (a modification of Newton's inverse-square law) by invoking the law that a body will pursue the easiest course through undulating space-time. That just puts the puzzle back a step. How can it be that every body always pursues the easiest course? The explanation of some laws in terms of others leaves unanswered the question of how mindless matter, or forces, can behave in a way which accords with a law.

It would not help to point out that microphysics shows that the fundamental laws of nature are statistical, being just the sort that would emerge from the laws of chance, as, in dicing, one gets double sixes about once in 36 times (Russell 1927, 16). Indeed, this seems only to accentuate the problem. How can the changes of unthinking, mindless matter or forces so arrange themselves over time as to exhibit a probability distribution? That would take *more* doing than exhibiting a deterministic uniformity. To state it at the macro-level: how can it be that two fair dice turn up a double six about once in 36 times? How can they bring it about that, over the long term, they tend to produce each possible result with a frequency approximately matching its mathematically calculated probability? It is easier to conceive that mere stuff like water will always freeze at zero degrees centigrade than it is to conceive that mere lumps of stuff, like dice, or like microphysical particles, will co-ordinate their motions, not to produce the same result each time, but to produce different results, each result in a predetermined frequency. Matter that accords with the laws of chance is even more baffling than matter that accords with non-probabilistic laws.

It might be suggested that the puzzle arises only if statements of natural law are thought of as normative. For example, some theists may claim that the behaviour of matter accords with natural laws because statements of natural laws express commands of God. This would indeed be puzzling because it would require matter (or forces) to act in a way which conforms to norms (God's commands). But, in fact, statements of natural law are descriptive rather than normative: they are merely descriptions of how things do in fact behave. Thus, material things just do what they do, and there happens to be a discernible order in it. Indeed, whatever they do will exhibit some law or other because, no matter what occurs, everything that happens could be expressed as a complex mathematical function of time (Hempel 1958, pp. 171–173).

However, this suggestion is mistaken. Let us concede that statements of natural law are descriptive rather than normative. But they are *modal* descriptions rather than *mere* descriptions: they describe the *limits* to what can happen. The suggested mathematical function of time would not express a law of nature. This is not because the sheer complexity of the formula would make it undiscoverable by finite minds. It is because such a formula could in principle be ascertained only *after* the events had run their course. Such a formula is made to fit the facts; it is simply a mathematical description of what *has* occurred; it could not be used for prediction. A law of nature, on the other hand, *restricts* what can happen: a true statement of a natural law says *in advance* how things will go in *future*. But this brings us right back to the puzzle: how can unthinking, mindless things exhibit a regularity, whether probabilistic or non-probabilistic, which is fixed prior to their motions?

It might seem that the solution of the puzzle resides in the modality of natural laws. Such laws, whether probabilistic or non-probabilistic, are *necessary*. Therefore, unthinking, mindless things accord with them because it is impossible that anything should *not* accord with them. The necessity hereby attributed to natural laws would, it seems to me, have to be absolute or 'metaphysical' necessity. For if it were mere 'physical necessity,' it would be metaphysically possible for things not to accord with the laws, which would raise the puzzle of how matter, forces and such like could accord with merely physically necessary laws when it is metaphysically possible that they do not. However, even the appeal to metaphysical necessity would leave the puzzle

unresolved. For our question is: *how can it be* that unthinking, mindless things accord with natural laws? How can that be *possible*, let alone necessary? To affirm that it is necessary is to assume that it is possible, but it is precisely its possibility that is in doubt. Indeed, if anything, the puzzle is accentuated. How can it possibly be *necessary* that unthinking, mindless things accord with natural laws, when it seems quite impossible that they should do so?

An argument for God

The theist might see here an argument for the existence of God. What the puzzle shows, she might say, is that it is incoherent to suppose that matter and forces will behave consistently with laws of their own accord, whether the laws are probabilistic or non-probabilistic, and whether the laws are metaphysical necessities or commandments of God. The possibility of order in the world must therefore be explained in another way; in particular, it must be explained by God's direct involvement. The material world exhibits regularities because God moves each piece of matter in Person, as Malebranche seems to have supposed, or because each part of the material world is actually a reflection of God's spiritual nature, somewhat as Spinoza conceived. The order of the world thus depends upon God; but on God's direct spiritual activity, not on commandments.

This is an argument from design. But it is importantly different from traditional design arguments for the existence of God. The traditional arguments invoke God to explain the *fact* of order; but the argument that is our topic invokes God to explain the *possibility* of order. The traditional arguments are made up of two components. One component argues from apparent purpose in nature to the existence of a Designer. The standard contemporary response to this argument is that, at least since Darwin, we have been able to explain away apparent purpose in nature in terms of natural laws. The other component is more fundamental because it argues from the existence of natural laws to the existence of a Designer. However, the existence of God is invoked to explain *why* there are natural laws. The existence of natural laws is therefore taken as a fact, and the reason for their existence is then found by reference to God's nature, plans or decrees. But the argument we are considering impugns the very possibility of matter or forces acting in accordance with natural laws unaided. It therefore attempts to explain not *why* there are natural laws but *how there can be* natural laws.

These two problems are independent of each other. First, an explanation of how natural laws are possible does not by itself explain why laws exist. When God's activity is invoked to explain how natural laws are *possible*, no explanation is thereby offered for *why* God's activity in the world conforms to laws. For example, an atheist could accept the theistic explanation for the *possibility* of natural laws but retain his atheism by turning anti-realist. That is, he could argue that natural laws are possible only if God moves each piece of matter; but God does not exist; therefore, there are no natural laws. He would thus reject all explanations for the *existence* of natural laws. Second, an explanation of why natural laws exist need not offer any illumination as to how natural laws are possible. For example, an explanation of the *existence* of laws in terms of God's plans or commandments does nothing to explain how mindless

stuff can co-ordinate itself in such a way that its motions accord with the natural laws that God put in place. The invocation of God's activity to explain every motion, or non-motion, of matter that exhibits a law would still be needed. The independence of these two problems enables our theistic argument to survive objections to traditional theistic arguments from natural law, as we will see in a moment.

We must first acknowledge, though, that there are intimations of our argument in Aquinas's 'fifth way' (1920, pp. 26–27):

> The fifth way is taken from the governance of the world. We see that things which lack intelligence, such as natural bodies, act for an end, and this is evident from their acting always, or nearly always, in the same way, so as to obtain the best result. Hence it is plain that not fortuitously, but designedly, do they achieve their end. Now whatever lacks intelligence cannot move towards an end, unless it be directed by some being endowed with knowledge and intelligence; as the arrow is shot to its mark by the archer. Therefore some intelligent being exists by whom all natural things are directed to their end; and this being we call God.

This appears to be an argument from the supposed *fact* of purpose ('end,' 'best result'), and perhaps also the *fact* of order ('governance of the world,' 'acting always, or nearly always, in the same way'), to a Designer. However, Aquinas's references to things which 'lack intelligence' suggest that he sees motion in accord with natural law as inherently a kind of goal-directed behaviour, which cannot be performed by mindless things. In that case, attempts (Darwinian or otherwise) to explain away teleology in terms of natural laws cannot be successful. So our argument seems to be implicit in Aquinas. We should perhaps note, however, that behaviour may be goal-directed without being valued or desired; or, to put the point another way, intentional actions may be done without any reason (see my 2010a). So, to see matter's accord with natural laws as goal-directed behaviour is not necessarily to see statements of natural law as normative.

Objections to traditional arguments

When God is invoked to explain the fact (rather than the possibility) of natural laws, it is customary to complain that the existence or activity of God is left unexplained (Hume 1779, IV). This seems a strange complaint. In science, when some natural laws are explained by means of other natural laws this is regarded as a mark of scientific progress, even though it leaves those other natural laws unexplained. Of course, if the theist claims, as theists have been inclined to do, that the explanation in terms of God is an ultimate one, needing no further explanation, then the fact that this explanation *does* call out for further explanation would show it to be unsatisfactory in its own terms. But the theist could, and should, avoid the claim that the explanation in terms of God is an ultimate explanation. There can be no ultimate explanations because we can question anything, even logical laws, as 'deviant' logicians do. The theist could maintain that her explanation for the fact of natural laws goes beyond scientific explanation, not in being ultimate, but in explaining natural laws in terms of something else.

The theist could also maintain that her explanation is more satisfactory than scientific explanations in that it is, at least to most people, readily understandable, whereas the deeper levels of scientific explanation, such as general relativity or quantum mechanics, are beyond the understanding of the vast majority of people (indeed, practitioners of quantum physics are wont to say that they themselves do not understand quantum physics).

If the theistic explanation for the *fact* of natural laws is put in this way, however, it is open to the objection that, while ease of understanding is certainly an advantage of an explanation, the ready comprehensibility of the theistic explanation is just a symptom of its ad hoc nature. A good scientific explanation of some laws in terms of others entails novel falsifiable predictions which survive attempts to falsify them (Popper 1959/2002, pp. 57–67 and passim). A prediction, and an explanation which entails it, is falsifiable if it is inconsistent with a statement that describes an observation we could conceivably make. But the theistic explanation of the existence of the laws of nature explains no more than it is manufactured to explain. It entails no novel falsifiable predictions.

This objection appears to be defused when we switch from the theistic explanation of the *fact* of natural laws to the theistic explanation of their *possibility*. If it seems to be a fact that there are natural laws and it also seems impossible that there should be, then we have a paradox. A satisfactory way of resolving the paradox is an improvement on leaving the paradox unresolved. If the explanation for the possibility of natural laws in terms of God does show how natural laws are possible, and if we have no better way of explaining that possibility, then that is an argument for the existence of God. Of course, a falsifiable resolution of the paradox would be better still; but we do not seem to have one.

It might reasonably be protested that, even in the case of the resolution of a paradox, we should not rest content with an unfalsifiable explanation: we should continue to seek a resolution that entails novel falsifiable predictions that survive testing, even though this may be a long-term project. However, it is not inconceivable that the theistic hypothesis may eventually be made more specific, or conjoined with additional hypotheses, in such a way that it yields surprising falsifiable predictions which survive testing. Successful scientific theories often start out as metaphysical speculations (see Popper 1982b, pp. 160–173 and footnoted references). For example, the lunar theory of the tides, originally a piece of astrology, was incorporated into science as part of Newton's theory; and the hypothesis that matter is composed of miniscule atoms which cannot be detected by the senses was for centuries a piece of unfalsifiable metaphysics, but it was eventually developed into a falsifiable and successful scientific theory (Popper 1983, pp. 190–192). Indeed, even Newton's law of gravity was initially regarded as 'occult' because it posited an invisible, all-pervasive force acting instantaneously between pieces of matter separated by great distances; yet, when combined with Newton's other laws and background knowledge, this law of gravity yielded many surprising predictions which survived empirical testing (Kuhn 1957, pp. 258–259). So, we cannot rule out in principle the possibility that the theistic hypothesis may be developed in such a way as to make it falsifiable; but such development would require that many creative and resourceful people apply themselves to the task.

Another objection to traditional arguments for the existence of God from the *fact* of natural law is that either God's actions are subject to natural law, in which case we are left with an unexplained natural law, or God acts freely, in which case His actions are unexplained (Russell 1927, p. 17). If we translate this into an objection to the argument from the *possibility* of natural law we might get this: when God acts to make matter exhibit natural laws, either He is acting freely or He is acting according to a natural law; but free will is unintelligible and God's action in accord with a natural law is just as puzzling as matter exhibiting natural laws. I think it is clear that this objection falls flat. First, although many philosophers do maintain that the idea of free will is incoherent, many others argue against this; and it is certainly a commonsense view that we act freely (and that God may do so too). Second, there is no puzzle about the possibility of God acting in accord with a law, for He, if He exists, is an intelligent being and, with His immeasurable knowledge and power, it ought to be within His means.

However, the theistic argument we are considering does not entirely escape another objection to traditional theistic arguments, namely, that rival and equally plausible explanations are possible (Hume 1779, VII; Kant 1981, A620–630/B648–658). Thus if, to avoid the apparent impossibility of mere matter exhibiting natural laws, we invoke detailed spiritual control, the spirit need not have the familiar attributes of the Deity, and nor need there be only one spirit involved. Perhaps the existence of one spirit, as opposed to a coterie of them, could be preferred on grounds of simplicity; but although the spirit would have to be immensely powerful, knowledgeable and skilful to produce the order in the world, he need not have those qualities to the superlative extent normally attributed to God, and he need not have created the world and he need not be good. Still, the theist could at least maintain that she appears to have made out a part of her case.

Alleged paradoxes

It would be a serious objection to any proposed resolution of a paradox that it is itself paradoxical or incomprehensible. I said above that the existence of God and His direct involvement in maintaining the order of the world seems readily understandable. But this may be disputed.

Mackie says that the idea of a disembodied being fulfilling intentions immediately, without any physical or causal mediation is incomprehensible (1982, p. 100) and fundamentally mysterious (1982, p. 130). He says (1982, p. 129):

> the alleged naturalness and intelligibility of the connection between an intention and its fulfilment…seems, in some central cases, very natural and direct. I decide to raise my arm, and up it goes. But we know that…[t]here is in fact a complex causal path joining whatever brain event is the correlate of my decision through nerves and muscles to the movement of my arm. We form the picture of the *immediate* – that is, not mediated – fulfilment of an intention only by leaving out, and indeed by being normally unaware of, all the intermediate parts of this causal process…I know that in ordinary circumstances I can raise my arm or even throw a ball. But we have no right to abstract from what is really

> such a complex process the simple relationship that is all that ordinarily interests us, and to use this as a familiar model for an intelligible immediate efficacy of intentions, to be employed in constructing personal explanations elsewhere, in the supposed creative and governing activity of a god.

Mackie seems to contradict himself here. On the one hand he says there are things (such as the causal processes from brain event to arm motion) the thought of which may not be detached from the ordinary concept of action without impairing its intelligibility, while on the other hand he recognises that our normal uses of the concept of action do not include reference to those things. His confusion seems to derive from a failure to distinguish the teleological concept of action from the hypothesised causal processes though which human actions are realised (see Hornsby 1980 for an analysis of human action). A teleologically basic action is one that I can perform without having knowledge of how to do it by doing something else. When I raise my arm 'just like that,' my action is teleologically basic. When I turn on the light, my action is not teleologically basic, because in order to do it I must know how to do it by doing something else (normally by raising my arm): I cannot turn on the light 'just like that.' Through analysis, particularly taking account of abnormal cases like paralysis, we can discover that whenever we act, we exercise a volition; and through empirical investigation we can discover causal processes involving changes in the brain, nerves, muscles, bones, and so on that intervene between volition and outer bodily motion. But I need know nothing of this causal process when I raise my arm; and my understanding of what it means to raise my arm 'just like that' need involve no understanding of that causal process. The story about the causal mechanisms behind teleologically basic actions is not part of our concept of teleologically basic action: it belongs to a body of scientific explanation which is not yet complete and which may be, not only amplified, but *amended* in future. And we can continue to speak intelligibly of teleologically basic actions in ignorance of this body of theory and the changes that may be wrought in it. Thus we can easily understand how actions may be performed by creatures whose bodies work in very different ways to ours; and we can also comprehend such actions being performed without an intervening causal mechanism, with the bodily motion following directly on the volition. It is not far from there to envisage a being whose volitions typically cause motions in bodies which are not parts of his body; and it is not far from there to envisage the being as disembodied. Indeed, people conceive such things routinely.

Some may object that the idea of a spiritual entity causing changes in physical bodies is itself paradoxical, and point out that this was the main difficulty of Descartes' dualist interactionism. However, mind-body interaction was a paradox for Descartes only because he conceived causation as being essentially mechanical-push. Once we admit other modes of causation, as we do both in common sense and in science, the supposed paradox of mind acting on matter disappears (Popper and Eccles 1977, pp. 176–180). Indeed, echoing Hume (1739, Book I, part III, Sect. XV, p. 173), we may affirm that, for all we can know a priori, anything may cause anything: it is only through empirical investigation that that we can discover what causes what.

A better objection—one that might have lain behind Mackie's—would be that, even in the case of a creature for whom a bodily motion, whether her own body or

some other, follows immediately upon her volition, without any intervening causal process, the connection between volition and bodily motion will exhibit a natural law. At least, this will be so if the creature's actions are intentional, that is, if she realises her intentions non-accidentally. Since the possibility of intentional action presupposes natural laws, such action cannot be invoked to explain the possibility of natural laws. However, what this objection shows is that the relation between God's spiritual activity and material motions should not be conceived on analogy with the relationship between a creature's volition and motions of her body (or of other bodies). The material changes that God brings about are not separate from His activity: the material world is not external to Him. It might be objected that this is no more intelligible than material motions exhibiting natural laws, in which case we are merely substituting one paradox for another. This is a strong objection; but it is not quite correct, because we can conceive God's activity in the world on analogy with our mental acts. For, while my *actions*, which involve outer bodily motions, are under my control thanks to the existence of natural laws, my volitions, which are mental *acts*, are under my immediate control (see my 2010b, pp. 29–31), just as many of my thoughts are under my immediate control (for example, when I purposely think about Vienna). I do not do these mental acts *by* doing something else which brings them about according to a natural law; I just *do* them. Thus, motions of matter must be related to God in a way analogous to that in which our volitions or deliberate thoughts are related to us. Of course, since the analogy is not perfect, we must concede that the objector has a point.

It might be worth mentioning a possible objection that is suggested by something Mackie says (1982, p. 131) in connection Swinburne's theism. Thus, it might be objected that, the theory that matter accords with natural laws because God, or some lesser spirit, directly moves it in that way, implies that everything that happens in the world is a miracle. However, it should be clear that this objection is merely rhetorical, since miracles are normally thought to be events which contravene natural law, not events which exhibit it, as Mackie admits (1982, pp. 11–12). It also seems clear that the theistic theory we are considering can make room for miracles, by construing natural laws as default regularities of divine action to which God may make exceptions.

Ceteris-paribus laws

It might be protested that the very idea of a natural law which has exceptions is incoherent, because natural laws are supposed to be necessary. For example, it is inconsistent to affirm *both* 'necessarily, if an *A*, then a *B*' *and* 'sometimes there is an *A* but no *B*.' However, the remedy to this difficulty seems obvious: a 'ceteris paribus' clause is inserted within the scope of the necessity-operator. So, one general form of a statement of natural law becomes: 'necessarily, if there is an *A* and there is no outside interference, then there is a *B*.' In the physical sciences, statements of laws do not usually include an explicit 'ceteris paribus' clause; but such a qualification is implicitly understood. For example, Newton did not show electricity, magnetism or optics to be mechanical, and Maxwell's failure to reduce electricity and magnetism to Newtonian mechanics left mechanical laws open to interference by non-mechanical, electromagnetic processes. Further, electrical laws are similarly open to interference from nuclear

forces (Popper 1982a, pp. 38, 124–27, 130; Popper and Eccles 1977, p. 542; see also Cartwright 2009 for a summary of relevant recent work). It is true that, within science, outside interferences in a particular natural law will be phenomena which are assumed to be themselves subject to a different natural law. But we can also allow that natural laws are open to interferences which need not exhibit any natural law, such as human free will (see my 2010b); and the theist can permit lawless interferences by God, which would be miracles.

It might be demurred that a statement of a natural law that is qualified by a 'ceteris paribus' clause is consistent with every conceivable observation-statement and is thus not falsifiable: finding an *A* without a *B* is not ruled out by the statement because there might have been some interfering factor. This objection does identify a serious issue, but it can be answered. When we test an exceprionless law-statement we try to create an observable situation the description of which (perhaps of the form, 'here is an *A* but no *B*') is inconsistent with the law-statement. We can break this down into two steps. The first step is the construction of the 'initial conditions' (perhaps described by a statement of the form, 'here is an *A*'), which are a particular case of the antecedent of the universal conditional that expresses the law. The second step is the observation of whether or not we also have an instance of the consequent of the universal conditional (described by 'here is a *B*'). To make a statement of a ceteris-paribus law falsifiable, we have to conjoin the description of the initial conditions with a statement to the effect that there are no external interferences in this particular case. Of course, if we then get a negative test result, we can always save the law-statement from falsification by rejecting the statement that there were no external interferences. But this will be unacceptable, because ad hoc, unless we replace the statement that *there were no external interferences* with a falsifiable statement which specifies the external interference and which passes an independent test (Popper 1959/2002, pp. 57–63, 78–79). For example, in the mid-19th century, the observed motions of Uranus conflicted with the predictions of Newton's theory, on the assumption that there were no unknown forces acting on Uranus. Leverrier rejected that assumption. But his response was scientific, rather than ad hoc, because his replacement for the rejected assumption was a hypothesis that there was a previously unknown planet with just the properties necessary to account for Uranus' anomalous motions in terms of Newton's theory. This hypothesis entailed novel falsifiable predictions concerning the times and places in which the hypothesised new planet could be seen. When these predictions were tested, Neptune was discovered (see Kuhn 1957, pp. 261–262).

Four more objections

It seems that the alleged paradoxes of God's action in the world can be overcome and that none of the objections to traditional theistic arguments from natural law can be successfully adapted to provide objections to the argument from our puzzle about natural law to the existence of a spiritual being who 'moves heaven and earth' in ways which accord with natural laws. I can think of four objections that may be made specifically to this argument. The first would be simply to deny that there is any puzzle about mindless matter or blind forces acting in accord with laws of nature. I do not find this objection satisfactory: it seems knee-jerk, dogmatic and ad hoc; though one

would have ultimately to concede that what seems puzzling may vary from person to person.

The second objection would claim that all our (genuine) knowledge is empirical, so that a priori speculations or a priori puzzlement count for nothing. This, however, draws an untenable distinction between the empirical and the a priori. Scientific advance often begins with armchair theorising about abstract puzzles that turns into new theories which are empirically testable. For example, Galileo's development of his hypothesised laws of motion grew out of a paradox he discovered in Aristotelian physics; and Einstein developed relativity theory by pondering abstract puzzles about light (Kuhn 1964). A better statement of the objection would be that, until our philosophical reflections about natural law and God have been developed into a falsifiable form that survives attempted falsification, they are mere speculations that are not to be taken seriously. But this also seems untenable. For, as we saw in the fourth section, some scientific theories are the result of metaphysical speculations being taken seriously. Further, all empirical science makes essential use of logic and mathematics, which are developed and improved by armchair theorising, often in response to puzzles and paradoxes, as Russell's paradox and the Liar paradox spurred developments in logic which produced rival solutions some of which are more elegant than others. Of course, it is important that these bodies of theory are held open to empirical challenge, perhaps in the way that the success of relativity theory has been taken to refute Euclidean geometry. So, any parts of logic or mathematics could in principle be subject to refutation in future, depending upon developments of mathematical and physical theory. Thus our puzzle about natural laws, though at present a purely philosophical one, should be taken seriously; and it might even eventually transpire that rival solutions to it can be tested empirically.

The third objection would note that one approach to the logical paradoxes is to accept them and amend our logical theory accordingly. Thus, dialetheic logicians argue that the available resolutions of the logical paradoxes are ad hoc and otherwise unsatisfactory and that a system of logic that admits the truth of some self-contradictions is simpler and more natural (Priest 2006). Accordingly, it may be said that we should just accept the puzzling nature of natural laws because this gives us a simpler theory of the world than a theory which assumes the existence of an immensely powerful and knowledgeable spiritual being. However, just as relatively few logicians are happy to accept that some self-contradictions are true, I suspect that relatively few people who think about the issue could happily rest content with the proposition that mindless matter acts according to laws unaided.

The fourth objection is a scientific one. Evolutionary theory suggests that our minds, or brains, are adapted for survival and reproduction. As with the lower animals, our brains are problem-solving tools that help us to navigate our way in the world safely. However, for this purpose, a brain that enables the discovery of simple theories which are false but accurate enough for practical purposes is superior to a brain that enables the discovery of true but complex theories in the same domain, because the resources saved by not building more powerful cognitive equipment can then be used instead to build stronger wings, faster legs, and so on (see Dawkins 1989, pp. 99–105, and passim, for examples that seem to illustrate this point). Here is an analogue: scientists at NASA, who are engaged on the engineering problems of space flight, use Newton's

theory rather than Einstein's, because the former, though false, is much simpler, and thus easier and quicker to use, and it gives results that are good enough for practical purposes. Further, the bigger size of human brains compared to other animals need not be connected with a better chance of discovering truth. For, it seems that our bigger brains are a product of sexual selection, their evolutionary purpose being to enable us to entertain the opposite sex, thereby attracting more or better sexual partners, thus enhancing reproductive success (Ridley 1994, pp. 299–333). Thus, science suggests that our brains need not be adapted to discover or understand the truth about the universe; so the fact that something seems impossible to us (such as mindless matter acting in accord with laws unaided) is no guide to whether it really is impossible. It would be hubris to think otherwise. So the puzzle about natural laws may seem a genuine puzzle to us only because of our intellectual limitations. Indeed, what seems an impossibility to us might be seen as an a priori necessity by a God with infinite intelligence, if there were such a thing. Therefore, we should simply accept that mindless matter behaves in accord with laws unaided, however unsatisfactory that may seem to us.

It might be thought that this objection contradicts itself. For, if evolutionary theory implies that our theories are false, even when practically useful, then evolutionary theory is false. However, evolutionary theory does not imply that *all* our theories are false: the implication is only that we have evolved to discover simple but false theories which are good enough for survival *where the discovery of true theories would make unsustainable demands on our resources*. This leaves open the possibility that there are some true theories that are simple enough to fall within the ambit of our meagre mental means. Even if evolutionary theory is not one of these, that is, even if evolutionary theory is false, its consequence, that some (or even most) of our successful theories are false, may still be true. For, it is a simple fact of logic that every false proposition entails some true consequences. The objector could therefore maintain that our best understanding of ourselves is given by evolutionary theory which, though it may be false, entails a consequence which may well be true, namely, that what seems impossible to us may be true.

Of course, the theist could concede this objection and maintain that his theistic solution to the puzzle about natural laws is, for all we know, one of our theories that happens to be true. So we end in stalemate.

Conclusion

The puzzle about how the behaviour of mindless matter, or forces, can accord with natural laws seems to be a serious one and it can be used as (part of) an argument for the existence of God. This argument for God as an explanation of the *possibility* of natural laws evades the objections to arguments for God as an explanation for the *fact* that there are natural laws. There is one exception to this claim: the argument from the possibility of natural laws requires only a very powerful, knowledgeable and skilful spiritual being, rather than a being with the full panoply of divine attributes. Three supposed paradoxes of such a theistic solution of the puzzle are spurious. A serious objection is that if God's activity in the material world is conceived

on analogy with human free will, it presupposes natural law, so it cannot be used to explain the possibility of natural law. This objection can be by-passed if God's activity in the material world is conceived on analogy with human mental activity, provided such a conception of God's immanence is less puzzling than material things acting in accord with natural laws unaided. Three of the other objections we have considered to the theistic argument do not appear to be satisfactory. However, while the fourth objection, from evolutionary theory, does undermine the theistic argument, it also undermines our claims to be able to know the truth about the world, though it leaves intact the utility (so far) of the scientific theories we have managed to develop.

Many people may be far from happy with the choice between:

(i) simply accepting, because our minds are too weak to understand the world, that matter, unaided, exhibits natural laws;
(ii) endorsing a theism according to which everything that happens in the material world is an activity of God which is analogous to those of our mental activities which are under our immediate control.

Since we have come to this pass by assuming that there are natural laws, it may seem that this assumption should be jettisoned in favour of anti-realism about natural laws. I think this would be the strongest argument for such anti-realism; but I think it is a weak argument for it, for two reasons.

First, anti-realism about natural laws is an extreme anti-realism because all, or at least the vast majority, of our general concepts involve law-like behaviour. For example, something exemplifies the concept of *water* only if behaves in a law-like way, only if there are things it *would* do *if* certain conditions obtained, and so on; and something is a table only if it *would* support some things *if* they were put on it. So, if there are no natural laws, there is no water, no tables, nor many, if any, of the other things that we usually take to exist (Carroll 1994, pp. 3–16; Popper 1959/2002, pp. 440–446). Such a bold idealism (which need not dispense with 'the thing in itself') is a respectable view, but it is doubtful that many philosophers nowadays, especially 'naturalist' ones, would willingly embrace it.

Second, anti-realism about natural laws does not quite eradicate the problem. For, scientific theories must invoke natural laws, either explicitly by positing non-accidental regularities, or implicitly by referring to dispositions or mechanisms which operate in a regular and non-accidental way. Without such law-like behaviour, proposed non-teleological explanations of natural phenomena will fail to explain or predict. So it remains a puzzle that scientific theories have a paradox at their heart: they require mindless stuff to act in such a way as to exhibit natural laws. The anti-realist will say that all these explanations are, strictly speaking, false, at least to the extent that they involve statements of natural law. He might even say that the reason they are false is because the notion of a natural law is paradoxical. But compare his position with that of the realist who accepts (i), above. That realist says that we cannot understand the world because it contains natural laws which are paradoxical. The anti-realist says that we cannot understand the world because our only way of doing so is by means of theories which are false because they posit natural laws, which are paradoxical. Is that really an advance?

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