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The fine-tuning argument: the Bayesian version

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Abstract: **This paper considers the Bayesian form of the fine-tuning argument as advanced by Richard Swinburne. An expository section aims to identify the precise character of the argument, and three lines of objection are then advanced. The first of these holds that there is an inconsistency in Swinburne's procedure, the second that his argument has an unacceptable dependence on an objectivist theory of value, the third that his method is powerless to single out traditional theism from a vast number of competitors. In the final section of the paper the fine-tuning argument is considered, not now as self-standing, but as one of a number of theistic arguments taken together and applied in the manner of the final chapter of Swinburne's *The Existence of God*. It is argued that points already made also block the way for this line of thought.**

In an earlier paper[1] (hereafter referred to as FTA) I have discussed what I called 'the common form' of the fine-tuning argument. This is the form usually met with; it appeals directly to the sheer improbability of various conditions of life in just the way that the traditional design argument appeals to the improbability of eyes and brains, and concludes similarly that a theistic explanation is called for. At the end of FTA I distinguished the common form of the argument from approaches to the same topic which make an explicit appeal to Bayes' Theorem. I argued that such approaches involve further questions that go beyond the points made in FTA about the common form. The present paper offers an examination of these further questions arising in the Bayesian fine-tuning argument as it is presented by Richard Swinburne. Swinburne's exposition, taken as he intends it should be against the background of the Bayesian approach in *The Existence of God*, constitutes a particularly rich and detailed account of the matter, and one which is well worth the attention of anyone who regards the fine tuning as evidence for theism. Since the present paper is intended to be self-contained, some repetition of points already made in FTA is unavoidable, but this will be kept to a minimum.

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Exposition of Swinburne's argument

I begin by providing a fairly detailed summary of the argument as given in Swinburne's fullest account, his paper 'Argument from the fine tuning of the universe' (hereafter referred to as 'Argument').[2] Swinburne takes Bayes' Theorem in a form I label BT-1 to distinguish it from another form introduced below:

$$\text{BT-1} \quad P(h/e\&k) = \frac{P(e/h\&k)}{P(e/k)} \times P(h/k)$$

where h is the hypothesis of traditional theism, e the evidence of the fine tuning, and k the background knowledge. A principle P which follows at once from BT-1 is that:

$$\text{P} \quad P(h/e\&k) > P(h/k) \quad \text{if and only if } P(e/h\&k) > P(e/k)$$

The left-hand side of this biconditional says that the probability of h given both e and k (its posterior probability) is greater than its probability on k alone (its prior probability); and P says that it is necessary and sufficient for this increase in probability that the probability of e given h and k is greater than its probability on k alone. Swinburne will argue that 'intelligent life is something which a creator God would have the power and abundant reason to bring about, and so a phenomenon which, if he exists, would be quite likely to occur', so that $P(e/h\&k)$ is quite high; but intelligent life is 'something not in the least likely to occur except as a result of God's agency', so that $P(e/k)$ is very low.[3] Thus, since $P(e/h\&k) > P(e/k)$, the left-hand side of P also holds, i.e. the evidence of the fine tuning raises the probability of theism above its value on background knowledge alone, and thus confirms theism. The style of argument will be familiar from Swinburne's notable study *The Existence of God*, where it is extensively used, and I will draw on that book at a number of places below. His recent discussion of natural theology in *Is There a God?* contains a more or less parallel though simpler account, and I will make some reference to it too.

First, then, returning to 'Argument', we meet Swinburne's claim about $P(e/h\&k)$. What reason, Swinburne asks, would a deity – understood in the traditional manner – have for establishing a universe so organized as to produce intelligent life? His answer is that the 'supremely valuable thing about intelligent life is that it is a mental life'.[4] Sensation, thought, purpose, desire, belief, and knowledge are cited as instances of mental states possessed of high value. Indeterministic free will (if it exists) is also cited as a good. It is good also that intelligent beings have a character, and are able, at least in part, to form that character for themselves. 'So a God, who is by definition good, has abundant reason for bringing about human beings and other beings who have some kind of mental life.'[5]

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But human life is not just mental life; mental life is *embodied*. What reason would God have for *that*? Swinburne's answer to this question is that embodiment 'allows us to learn … to control our mental life and to grow in power over and knowledge of the world'.[6] Swinburne next refers to his view that 'there cannot be a scientific explanation for the occurrence of consciousness', and to his previous use of this thesis as the source of a theistic proof.[7] But here, he says, he will set aside that line of argument and merely take as his 'datum that there exist bodies which are suitable vehicles for the embodiment of conscious beings'.[8]

The next paragraph makes two further points. One is that 'if the production of intelligent organisms is to have value, the world has to be governed … by simple scientific laws (which the conscious beings could come to understand and manipulate)'.[9] The simplicity of natural laws thus becomes something further which the theistic hypothesis can be regarded as predicting. The other point is that God would have yet another reason for creating an orderly universe (of the sort already deduced to be necessary for intelligent life), namely the beauty of orderliness.[10]

Swinburne now moves to this question: 'what features does a body have to have to be a vehicle of the kind described for the expression of consciousness?'[11] His answer, developed in section 3 of the paper, is that for the production of sensations and complex beliefs and the realization of purposes a complex brain and various other organs are required. Carbon-based life, Swinburne argues, can reasonably be assumed to be the only way in which the required organs could be produced. But 'the present consensus of evidence is that certain a priori very unlikely features of laws are necessary for the occurrence of carbon-based life'.[12] Section 4 of the paper explains why this is so. (None of the detail of this will be reported here since, as will emerge, it is irrelevant to the philosophical problem set by the fine-tuning argument.) The upshot of section 4 is the point on which the fine-tuning argument turns, namely the very great improbability of a number of the necessary conditions of life. Since each of a number of conditions is claimed to be very improbable, the joint occurrence of all of these is even more improbable. Section 5 gives further clarification of the cosmological detail, and concludes with the application of BT-1. Swinburne will take as k, the background knowledge,[13] 'that the Universe began from an initial singularity and that laws have the form of our four-force laws', and e will be that 'the initial conditions and constants of laws had just those values which allowed life to evolve';[14] h is to be traditional theism, not elaborated upon in this paper, but very fully set out in other writings of Swinburne's.[15] The argument is then simple and apparently compelling. The evidence e is a priori very unlikely, that is, $P(e/k)$ is very low (according to the cosmological information). However, for the reasons given earlier (the goodness of mental life, etc.), e is much to be expected if there is a God, so $P(e/h\&k)$ is quite high. Hence, since $P(e/h\&k)$ is greater than $P(e/k)$, indeed is much greater, it follows that $P(h/e\&k)$ is greater, and indeed much greater than $P(h/k)$. (It follows from BT-1, not only that P holds, but also that the ratio of $P(h/e\&k)$ to $P(h/k)$ is equal to the ratio

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of P($e/h\&k$) to P(e/k).) Thus the evidence *e* 'has significant confirming value for the hypothesis that there is a God'.[16]

Sections 6 and 7 of 'Argument' consider two possible escape routes from the theistic conclusion that are to be found in the current literature (Swinburne plainly regards these as the only such routes). One of them is the use of some form of the anthropic principle. Swinburne (quite correctly in my view) regards anthropic principles, even where their meaning is clear (which is not often), as providing no way of avoiding the force of the fine-tuning argument. The other is the much discussed many-worlds hypothesis. This, too, Swinburne regards as an ineffective way of avoiding the theistic conclusion. Nothing in my subsequent discussion turns on either anthropic principles or the many-worlds hypothesis, and Swinburne's account of them will not be further considered here.

A point of great importance now arises. In the final paragraph of 'Argument', Swinburne states that 'the existence of our world with its power to produce intelligent life … is … confirming evidence of the existence of God'.[17] Now this does not mean that the fine tuning makes the existence of God more probable than not, but only that the probability of the existence of God on the evidence of both the fine tuning and the background knowledge is greater than its probability on the background knowledge alone. Hence, this conclusion from the discussion in 'Argument' is precisely on a par with the conclusions reached by Swinburne in relation to each of a number of different theistic proofs discussed by him in *The Existence of God*. There, for example, the cosmological and teleological arguments and the argument from consciousness are held, at the end of the discussion of each, to be good C-inductive arguments.[18] Returning to 'Argument', we find that the sentence immediately following that last quoted above says this: 'Together with other evidence not discussed here it [the fine-tuning argument] does, I believe (as I have argued elsewhere with respect to the other evidence alone) render the existence of God significantly more probable than not'.[19] This confirms (and adds to) my gloss on the preceding sentence; the fine-tuning argument by itself is still not claimed to show the existence of God to be more likely than not, but rather is to be taken as an appendage to the array of arguments given in *The Existence of God*. More exactly, since the arguments in *The Existence of God* already *by themselves* are held to make theism more likely than not, the fine-tuning argument is being claimed to enhance the good P-inductive argument already provided.[20] This sentence of 'Argument' is then of a piece with the preceding one in *not* claiming for the fine-tuning argument, *taken by itself*, the ability to make the existence of God more likely than not.

Now the importance of making these points clear becomes apparent when we consider the following fact. It is quite possible for P($h/e\&k$) to be greater – much greater – than P(h/k) while both nevertheless are so small as to be nugatory; that will be so if P(h/k) itself is small enough. Yet it is very unlikely that Swinburne believes that *that* is the situation. The words 'significant confirming value' quoted

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earlier[21] (used in relation to the fine-tuning argument alone) already carry the suggestion (though not indeed the explicit assertion) that P(*h*&*k*) is not to be regarded as trifling, and the point becomes quite explicit when Swinburne now says that 'the peculiar values of the constants of laws and variables of initial conditions are *substantial evidence* [my emphasis] for the existence of God'.[22] Substantial evidence as commonly understood is evidence constituting a justification for believing the proposition in question, or at least evidence which approaches being such a justification. We will see near the end of this paper that elsewhere Swinburne has referred to evidence as 'substantial' while meaning only that it is not too close to zero. But there is no hint here that the word is to be taken in such an etiolated sense, and it is beyond doubt that readers of 'Argument' would naturally suppose him to be holding that the fine-tuning argument either *justifies* theism, or, at the least, *approaches* doing so – that it *gives a good reason* for theism. (Epistemologists will hardly wish to conflate these various things; but nor do I – the point is merely to indicate a certain *band* or *range* of epistemic assessment.) Here then is a distinction of the greatest importance. One can argue that the evidence of the fine tuning confirms theism, in the sense that the latter's posterior probability given the fine tuning is raised above its prior probability, without making any claim whatever that that increase in probability is of any consequence. Or one can advance to the further claim that that posterior probability is such as to constitute a *good reason* for theism.[23] Swinburne does the first of these. I have just argued that due attention to what he says shows him *also* doing the second. Let us consider the point a little more fully.

I have noted above that in *The Existence of God* Swinburne is careful to maintain, in the case of each of the theistic arguments that he considers, only that it is a good C-inductive argument (i.e. has true premises and raises the probability of the theistic hypothesis). Whether there is any good P-inductive argument for theism (i.e. any argument from true premises which makes theism more likely than not) is a question which he leaves to the final chapter of the book, where he develops another, further line of argument (summarized below under **Final points**). In the shortened account of the fine-tuning argument in *The Existence of God*, he starts out along a similar line by saying that he is considering whether we are dealing with a good C-inductive argument,[24] and this, we saw above, is a point that is also clear in the last paragraph of 'Argument'. But there are other aspects of Swinburne's discussion which clearly reveal the more ambitious aim. I have already noted as decisive his description of the fine-tuning argument (both in 'Argument' and *The Existence of God*) as constituting 'substantial evidence' for theism. Further evidence of the same thing, I suggest, is the character of the paper 'Argument' as a whole. Its very *title* implies that it presents a ponderable argument for theism; and one has to ask what its *point* would be if all it aspired to show was that the posterior probability of theism on the evidence of the fine tuning is greater than its prior probability, while leaving completely open, and taking no stance on,

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the possibility that both probabilities are utterly nugatory. In his recent book, *Is There a God?*, Swinburne has used terms which further imply the more ambitious position. Thus, referring to the fine-tuning argument (combined with considerations of orderliness), he says that it constitutes 'strong grounds for believing it [theism] to be true' and the phrase 'strong grounds' is then repeated in a slightly different context.[25] It should be noticed that other arguments as well are portrayed in the recent book in the more ambitious way. Thus in *The Existence of God*, as we saw, the teleological argument from the regularity of Nature is regarded merely as good C-inductive; but here, in *Is There a God?*, it is described as providing (by itself) 'good evidence for the existence of God',[26] an upgrading to P-inductive status, or something close to it. Again, the argument from consciousness, merely a good C-inductive argument in *The Existence of God*, is now described in *Is There a God?* in terms suggestive rather of endorsement as a *good* argument.[27]

I conclude that there is clear evidence for attributing to Swinburne the more ambitious view that the fine-tuning argument (and indeed each of several other arguments) is a good P-inductive argument for theism, or, at the least, that it is close to being so; the view that (in more familiar epistemological terms) it justifies an acceptance of theism, or at least comes near to doing so.

If we attribute this view to Swinburne – and we must – then we also *must* suppose that he thinks that P(h/k) is not trifling. Now in considering this, one must first be clear what exactly k is taken to be in the case of the fine-tuning argument. In doing this it is best to take a general approach at the outset. The general question of what k is in the case of a particular theistic argument is something that we must have recourse to *The Existence of God* to explain properly. The relevant points made there are as follows. Firstly, looking back over the sequence of theistic arguments which he has given in that book, Swinburne says this: 'For each of these phenomena e …, k are the phenomena previously taken into account (i.e. tautological evidence where e is the existence of the universe; the existence of the universe where e is its conformity to order, and so on).'[28] Of special importance is the first case just mentioned, where k is tautological, so that P(h/k), the prior probability of h, is also the *intrinsic* probability of h, and I will return to this presently.

Now what must be recognized first is that in the fine-tuning argument k is *not* tautological. We have already seen this explicitly and it is further borne out by two statements made in Appendix B of *The Existence of God* (where Swinburne is presenting his shortened version of 'Argument'.) The first such statement is that the fine-tuning argument is 'an argument lying between [on the one hand] the arguments from the existence of the universe and from its conformity to laws of nature … and [on the other hand] the argument from consciousness'.[29] Applying the passage quoted a few lines back we infer that k in the case of the fine-tuning argument is therefore the set of phenomena already taken into account as evidence e by the cosmological and teleological arguments, and that means the

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existence of the universe and its conformity to natural laws. This inference is fully confirmed by the second relevant statement, namely that *k* is 'the existence of a universe governed by some laws of nature or other'.[30] It is quite clear then that *k* in the case of the fine-tuning argument is *not* tautological, but consists rather of two highly general contingent propositions, viz. that there is a universe, and that the universe is subject to natural laws. (Those laws are also remarkably *simple*, as Swinburne and many other writers have observed and, indeed, appealed to as a basis for a theistic proof, but such simplicity constitutes no part of *k* in the case of Swinburne's fine-tuning argument. We saw earlier, however, that Swinburne does include the simplicity under *e*, though it is not at all prominent in his argument.)

With the content of *k* clarified, I return to the question of the magnitude of P(*h*/*k*) in the fine-tuning argument. What reason is given for thinking that it is not trifling? There is no discussion of this question in either 'Argument' or Appendix B of *The Existence of God*.[31] If we look further afield in the latter work for discussions of the assessment of P(*h*/*k*) in the case of other comparable theistic proofs (apart from the cosmological proof, where *k* is tautological, this case being discussed in detail), we will, I believe, not find much to go on. What is abundantly clear, however, is the importance of *simplicity* in Swinburne's account; *The Existence of God* treats this as alone relevant where *k* is tautological (apart from some minor influence on the part of scope), and as still of major consequence even when *k* is contingent. But the problem of explaining exactly how to combine simplicity considerations with the bearing of contingent evidence is a matter that Swinburne has left undeveloped.[32] Since, however, in his discussions of P(*h*/*k*) in *The Existence of God* and *Is There a God?* he has concentrated almost exclusively on the a priori matter of the simplicity of theism, I will assume that his view is that traditional theism outscores all other forms of theism on the simplicity criterion, *and that that is all we need to show that P*(h/k) *is not nugatory* (*even where* k *is not tautological*). I return to this question below (**Third objection**).

This concludes the exposition of Swinburne's fine-tuning argument. The next three sections develop objections to the argument.

First objection: an inconsistency in the argument

I begin my critical discussion of Swinburne's fine-tuning argument by repeating a point already made in FTA. As can be seen from the summary of his argument given above, Swinburne takes 'as his datum that there exist bodies which are suitable vehicles for the embodiment of conscious beings',[33] and then asks the question what features a body needs to have in order to be such a vehicle. He argues that for the production of sensations and complex beliefs and for the implementation of purposes a complex brain and other designated organs are required.[34] I proposed in FTA[35] that there is nothing in what Swinburne takes as his datum to warrant the deduction of a brain for the purposes of embodiment,

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since he, like Descartes and Locke when they address the same question, holds that the psycho-physical correlations are incapable of scientific explanation, and constitute brute correlations, opaque to science.[36] (Swinburne, again like Descartes and Locke, in fact regards the correlations as inscrutable divine fiats, but that is the conclusion of another argument, and is of course not assumed in the fine-tuning argument.) The objection made in FTA was then that, on Swinburne's view of the correlations, any stick or stone would do as well as a brain for embodiment, so that there can be no *deduction* of the sort he advances. This objection, however, will not be further developed here. It is of considerable consequence in relation to Swinburne's account, but depends on features of that account which could probably be avoided. I proceed at once to a second objection where this is much less obviously the case.

Second objection: the dependence on objective value

I come now to a second difficulty in the argument. In FTA I took as a running example the (classical) probability of what I called 'the perfect hand', i.e. the probability of being dealt the cards from a standard pack in numerical order, and in a designated order of suits (which I assumed to be the conventional way of ordering the suits). This probability is very small indeed; it is $1/52!$, and $52!$ is about 8066×10^{64}. I then argued as follows. If you were dealt the perfect hand you would certainly think that things had been *arranged* that way (that it was a put-up job, in the phrase applied by Hoyle to the fine tuning itself.) If, on the other hand, you were dealt one of the less than perfect hands you would not suppose this. (A small qualification to this is made in the discussion in FTA, but it does not affect the ensuing argument.) However, the (classical) probability of being dealt any given one of the 8066×10^{64} odd imperfect hands is just the same as that of the perfect hand, viz. $1/52!$. Why, then, if the probability of the perfect hand is the same as that of any of the imperfect hands, would we regard the perfect hand as signifying the presence of design (as we certainly would) but the imperfect hands as not? Evidently there must be some *differentia*; what is it?

In FTA I held that there is no great mystery attaching to this question. The presence of design is inferred from the perfect hand because there is a known *conventional* ordering of the cards. Within suits the ordering is numerical, and that is what minds favour in ordering objects when such order is salient or easily applied. The ordering of the suits is (we are supposing) a conventional order favoured in card circles (followed by the manufacturers in packing cards, etc.). This, or some small variant on it, is surely the basis of the *differentia*; this is how minds (tend to) go on in relation to ordering cards (and analogously with other objects). We infer the intervention of mind if we are dealt the perfect hand because of what we know about the way minds go on. This, we argue, is just what a prankster would arrange if the intention was to amaze us because the perfect hand

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stands out from all the others as being the one favoured by conventional ordering practices. None of the imperfect hands signifies design because none of them is singled out in the way the perfect hand is.

Let us now put this case in terms of Bayes' Theorem. Let k be the information that a well-shuffled pack is to be dealt out from left to right, let e be, for each permutation, a specification of the order of the cards when dealt out, let h be in each case the hypothesis that a mind (and not chance) is responsible for the ensuing arrangement of the cards. Then, for each of the different hands, $P(e/k)$ is the same, and $P(h/k)$ is the same. But $P(e/h\&k)$ is not the same for the various cases of e. The perfect hand is just what you would expect if a prankster were at work, so here $P(e/h\&k)$ is very high; but it is very low for all the other cases of e, i.e. for all the imperfect hands. (And, since nothing distinguishes the various imperfect hands from each other, $P(e/h\&k)$ is presumably the same for each of those hands.) Thus Bayes' Theorem singles out the posterior probability of the design hypothesis $P(h/e\&k)$ in the case of the perfect hand from its posterior probability in the case of all the imperfect hands. The reason why $P(h/e\&k)$ is thus singled out in the case of the perfect hand lies ultimately in our knowledge of the particular order a whimsical mind would aim at if it was deliberately intervening.

We can now consider the Bayesian fine-tuning argument in a parallel way. Here we need to consider the alternative sets of conditions which might have prevailed instead of those actual necessary conditions of life which are cited by the fine-tuning argument (the various other possible values for the gravitational constant, for example). In FTA I sought to give a precise characterization of these alternatives, and an argument to show that these alternative sets of conditions have the same (classical) probability as that of the actual conditions. I will assume those points here. Now let k be what it is in Swinburne's fine-tuning argument (approximately, the existence of a world subject to natural law), let e be, for each of the alternative sets of conditions, a specification of the values of the various constants, and let h be the hypothesis of design, i.e. the hypothesis of an intervening mind. (To avoid complications, h is tacitly allowed to be further interpreted below so as to be the traditional design hypothesis, or other forms of it.) The points here parallel those in the case of the cards as described in the previous paragraph. For each of the possible sets of conditions (i.e. the actual set and the huge number of alternatives) $P(e/k)$ is the same, and $P(h/k)$ is the same. But $P(e/h\&k)$ is not everywhere the same according to the proponent of the fine-tuning argument. It is necessary for the Bayesian fine-tuning argument to claim an asymmetry here; it would of course subvert the argument if the design hypothesis made all of the possible sets of conditions equally likely, i.e. those which permit life, and those which permit only various forms of non-life.

Why then should we accept $P(e/h\&k)$ as being high when e is the evidence of the actual fine-tuning of the constants, but low for all the other possible cases of e? With the cards we saw that $P(e/h\&k)$ is high in the case of the perfect hand,

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but low in all the other cases, and we easily saw a reason for that; what is the corresponding reason in the case of the Bayesian fine-tuning argument? Swinburne's answer can be found in 'Argument' but the point is perhaps most explicit in *Is There a God?*

> **True, every draw [or hand of cards], every arrangement of matter, is equally improbable a priori – that is, if chance alone dictates what is drawn [or dealt]. But if a person is arranging things, he has reason to produce some arrangements rather than others ([e.g. the perfect hand] ..., a world fine-tuned to produce humans and animals). And if we find such arrangements, that is reason for supposing that a person is doing the arranging.**[37]

That is, a designer – at any rate the designer of traditional theism – would have a reason to create the world (and thus its necessary conditions) because that world, *qua* locus of consciousness, is *good*. But a designer would have no (or very much less) reason to create any of the various lifeless worlds (or their necessary conditions), so that P($e/h\&k$) is high for the actual world but low for the other possible worlds. Accordingly, as required, the posterior probability of design is high for the actual world, but low in the alternative worlds.

But there is now a point of considerable importance to be made. Someone who accepts the Bayesian fine-tuning argument as it has just been glossed is accepting more than may be immediately evident; he is accepting an objectivist theory of value. A sceptical or subjectivist account,[38] on which the only facts of the matter are facts about human mentality, such as Swinburne's feelings of admiration and approval in relation to conscious life, could not possibly serve to carry the argument through. Swinburne's claim that conscious life (and so forth) is good must be taken in an objectivist sense in view of his many statements about the nature of value,[39] and his claim that the traditional designer would have a reason to create the world therefore refers to the designer's recognition of objective goodness. *That* is what makes P($e/h\&k$) high in the actual case and low in the unrealized alternatives. The price of Swinburne's fine-tuning argument is, accordingly, much greater than it may seem. You must first subscribe to the objectivity of value before you can even enter the Bayesian maze. Here then, I propose, is a substantial reason for doubt about the argument as a whole. It could not get off the ground for someone, for example, who holds the sort of sophisticated sceptical view elaborated by Mackie. Moreover, this dependence on objective value is no mere optional extra; it is, as argued above, the crux of the argument given to show that P($e/h\&k$) is high in the actual case but low elsewhere.

It may be thought that a small amendment to Swinburne's argument is possible which sidesteps the objection just made. For, even if the argument as Swinburne puts it does involve an objectivist view, and even if that is allowed to be objectionable, still, it might be said, his argument could be restated so as to depend not on the supposed objective goodness of consciousness, etc. but merely on the fact that the traditional deity will value consciousness, and, other things being equal,

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can be expected to act to produce it (and therefore its necessary conditions). What matters, that is, is that *God values certain states*; it may also be true that God values them because they are objectively valuable, but that – even if true – need not be asserted. All that the argument need *assert* is that God will value the states and can therefore be expected to produce them.

But this defence will not work. Bayes' Theorem fits very well with a hypothetico-deductive view of science and theory making in general because it imposes no restrictions whatever on either the content or the origin of hypotheses. No *reason* for any hypothesis requires to be cited; hypotheses can be plucked from the air at will. The only questions are whether given evidence raises their probability, and, if so, how large such posterior probability is. Now it is just this strength of Bayes' Theorem which blocks the proposed amendment to Swinburne's fine-tuning argument. For if we make the defence turn on the assumption that a traditional deity will value certain things in the world as it is, then for each of the possible worlds that ensue on the various alternative sets of conditions a non-traditional deity can readily be hypothesized which would value *that* world. But then we would no longer be able to hold as required that P(e/h&k) is high where e relates to the actual world, but low in all the thought-experiment worlds. It would be pointless to object to the funny theistic hypotheses which would be involved here that they invoke absurd deities which value this or that kind of chaotic, lifeless world. For, as we just saw, an hypothesis *needs no justification in advance of being introduced* according to the Bayesian methodology. *Any* hypothesis can be introduced; how else, indeed, could the quite extraordinary hypothesis of traditional theism have entered the picture in the first place?

I conclude then that Swinburne's Bayesian fine-tuning argument has a highly objectionable dependence on objectivist value theory.[40]

Third objection: too many theistic hypotheses

The nature of the objection

The third objection to Swinburne's fine-tuning argument to be developed is that there are indefinitely many other theistic hypotheses dividing the probability (both prior and posterior) equally among them, so that even if the posterior probability of traditional theism is raised over its prior probability by the evidence of the fine tuning, nevertheless both are nugatory. (The general character of the problem here was set out in the expository section above.) The bearing of alternative hypotheses on the question is most easily seen if we now take a more general form of Bayes' Theorem:

BT-2 Suppose that h_1, h_2, …, h_n are n mutually exclusive and jointly exhaustive hypotheses; then the probability of any one of these hypotheses h_i on the evidence e and the background knowledge k is given by:

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$$P(h_i/e\&k) = \frac{P(h_i/k) \times P(e/h_i\&k)}{[P(h_1/k) \times P(e/h_1\&k)] + [P(h_2/k) \times P(e/h_2\&k)] + \ldots + [P(h_n/k) \times P(e/h_n\&k)]}$$

What I shall argue is this. First, I assume the availability of a very large set S of theistic hypotheses. I further assume that S includes traditional theism (call it h_1) and that the other theistic hypotheses in S differ from traditional theism by one or another restriction on power or knowledge or freedom or moral perfection (or in some other way or ways). Suppose that there are m members of S all told, and that they are enumerated in some way so that we can speak of the ith hypothesis, h_i; m is exceedingly large. (I assume this without further argument. I will allow in a moment that it may in fact be too large for comfort, but for the present I am assuming that S is finite, though enormous.)

Suppose now, with e as the evidence of the fine tuning, and k as the datum that there is a universe subject to natural laws, that the following hold:

(1) The value of $P(h_i/k)$ is the same for all h_i.
(2) The value of $P(e/h_i\&k)$ is the same for all h_i.

It would then follow that:

(3) The value of $P(h_i/e\&k)$ is the same for all h_i.

From (1) and (3) it follows that:

(4) The prior probability of traditional theism is very small; and the posterior probability of traditional theism, though greater than its prior probability, is also very small. That is, the prior probability of traditional theism, and its posterior probability on the evidence of the fine tuning, though different, are both nugatory.

First, then, for (1). This will be argued at length below by means of an extended critique of Swinburne's case for preferring traditional theism over every other form of theism on the basis of the simplicity criterion. It will be argued that standard simplicity or Ockhamistic considerations do *not* serve to distinguish traditional theism from other forms of theism in the desired way. The case for (2) is that we are free to choose for membership in S only those theistic hypotheses h_i for which the predictive power $P(e/h_i\&k)$ is the same as that of traditional theism. This is not such a difficult restriction to meet; just ensure that whatever features of traditional theism it may be that lead one to assign it a certain predictive power – intentions, powers, etc. – are *also* present in the other h_i.[41] We exclude those forms of theism in which the deity would not be powerful enough, or would have no reason to create, for example. Thus (2) can be secured by appropriate choices. (The detail of the next three paragraphs can be passed over if the reader is prepared to accept that (3) follows from (1) and (2), and that (4) follows from (1) and (3).)

I come now to (3). Now (3) does not follow at once from (1) and (2) via BT-2

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because the m members of S are not mutually exclusive and jointly exhaustive, yet this is a condition on the application of BT-2. The justification given above for (2) makes it clear that there are bound to be theistic hypotheses which are not in S yet are possible alternatives to the members of S. That is, there will be theistic hypotheses which do *not* have as much predictive power as traditional theism because, for example, their deities are supposed averse to creation, or whatever. There is in addition the non-theistic hypothesis of chance which requires to be present if we are to have an exhaustive and exclusive set. (That hypothesis may in turn be required to be further divided into the various forms that chance might take, just as we are dividing theism into various forms, but that is a complication we need not follow up, since it is irrelevant to the point being argued.) Let us picture all those hypotheses which are not members of S but which need to be taken into account, to complete a set of n mutually exclusive and jointly exhaustive hypotheses, as constituting a set C. Then the union of S and C, i.e. the set containing all members of both S and C, constitutes a set of n mutually exclusive and jointly exhaustive hypotheses. Having thus established the condition for the application of BT-2, we can in practice ignore the internal complexities of C and confine our attention to S.

(3) now follows readily. The total posterior probability is divided between S and C. Let the posterior probability that one or other of the hypotheses in S is true be p/q. Each of the m hypotheses h_i in S has the same prior probability and the same predictive power as each other (by (1) and (2)). Each therefore has the same posterior probability as each other, the posterior probability being the same function of equal probabilities according to BT-2. Thus the posterior probability of each h_i, and, in particular, of h_1, is p/mq. This establishes (3). Further, as a corollary, since m is a huge number (by the earlier assumption), p/mq is exceedingly small, no matter what share of the total probability may belong to the members of S, i.e. no matter how large p/q may be.

(4) now follows from (1) and (3). The total prior probability is divided between S and C. Let the prior probability that one of the hypotheses in S is true be r/s. Each of the m hypotheses h_i has the same prior probability (by (1)). Each therefore has a prior probability of r/ms; m is a huge number, so the prior probability of the h_i, and in particular of h_1, is very small – nugatory. This establishes the claim of (4) about the prior probability of traditional theism; (4)'s claim that the posterior probability is small follows from the corollary of (3) in the preceding paragraph. Finally, that the posterior probability exceeds the prior probability for each h_i follows by P (see **Exposition** above) if we assume with fine-tuners that the fine-tuning is more probable on a theistic hypothesis than on k alone.

Everything then depends on (1), which I will proceed to in a moment. But there is a complication here which we cannot avoid taking some notice of. It is that the set S as described above threatens to be infinite (denumerably so, if we assume a finitary language such as English). One reason is that there appear to be infinitely

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many different degrees of power or knowledge (etc.) which could be attributed to a deity. Another reason is that, since, as I will argue below, polytheism cannot be excluded by Swinburne's methods, and since each finite cardinal is a possible number of deities, then the possible forms of polytheism are infinite. (Similar considerations apply of course to C.) But if that is so, what are we to say about $P(h_i/k)$ and $P(h_i/e\&k)$? Infinitesimal probabilities, if they can be tolerated at all, would require amendments to standard probability theory, yet to make $P(h_i/k) = 0$ for each h_i is to give $P(h_i/k)$ the same probability as it would have if h_i were incompatible with k. We happen to know Swinburne's attitude on this question because elsewhere (though in a different context) he discusses it in some detail.[42] He there accepts that the adoption of infinitesimal probabilities is the view 'most consonant with our ordinary thinking about probability', but because of the practical difficulties he settles for the alternative view that each of infinitely many equiprobable hypotheses is to be regarded as having a probability of 0.[43] Applying this to the members of S, we find that we cannot now appeal to BT-2, since that assumes finitely many hypotheses. But BT-1 can be used again, by applying it in turn to each h_i. We can conclude by BT-1 that since, by the present assumption, $P(h_i/k) = 0$ for each h_i in S, it follows that $P(h_i/e\&k) = 0$ as well. Thus there is no help here for the Bayesian fine-tuning argument, since in this case the evidence of the fine-tuning does not even *confirm* traditional theism. I will, however, set this complication to one side, and assume, in accordance with (4), and favourably to Swinburne's fine-tuning argument, that the prior and posterior probabilities of traditional theism are non-zero and different.

The simplicity criterion

We can now proceed to consider the argument for (1), the claim that traditional theism has the same prior probability as a very large number of other forms of theism. In 'Argument' Swinburne considers only one alternative to traditional theism, namely the many-worlds hypothesis, and makes no reference to the problem of alternative forms of theism. This, however, is a problem to which he has given detailed attention in *The Existence of God*, and more recently in *Is There a God?*.[44] The crux of his treatment of the question is *simplicity*; briefly put, Swinburne argues that on the criterion of simplicity traditional theism far outstrips all its theistic competitors, and that this is reflected in the prior probabilities of the various theories. (Recall that we are assuming, favourably to Swinburne, that though k is not tautological in the fine-tuning argument, simplicity is nonetheless the only criterion of any consequence.) Now simplicity is a property of the greatest importance in the comparison of hypotheses, and it is no part of the intention of the present paper to call into question what Swinburne says about its significance.[45] What is not at all so clear, however, is Swinburne's claim that traditional theism *does* excel in simplicity. This, I will now argue, is the point where his fine-tuning argument breaks down most decisively.

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The first point concerns the choice between polytheism and monotheism. Hume notoriously suggested that there is no good ground in natural theology for preferring the latter to the former, even that there may be a ground for preferring the former to the latter: 'A great number of men join in building a house or a ship, in rearing a city, in framing a commonwealth; why may not several deities combine in contriving and framing a world?'[46] Swinburne quotes this passage and begins by observing that Hume himself was 'aware of the obvious counter-objection to his suggestion', namely that polytheism multiplies causes beyond necessity.[47] But – contrary to both Hume and Swinburne – there is no such line of argument to be had. D. C. Williams long since pointed out that the actual *number* of entities postulated by a theory, what he calls its 'gross tonnage', is irrelevant to the question of simplicity.[48] What *is* relevant is the number of *kinds* of entity; thus, other things being equal, a theory postulating Cartesian minds and physical objects is less simple than one postulating just physical objects, and a theory postulating properties and sets is less simple than one postulating just sets. But a theory postulating bodies and m minds is not (thereby) simpler than one postulating bodies and $m+n$ minds ($n = 1, 2, 3, \ldots$), and a theory postulating sets and m properties is not (thereby) simpler than one postulating sets and $m+n$ properties.

An illustration of the general point is Russell's celebrated argument against a resemblance theory of universals. Russell argued that resemblance itself must be regarded as a universal, and that if we have this one universal we may as well have the lot.[49] (Here the choice is between a theory containing both universals and particulars, and a theory containing just particulars.) Russell evidently saw no gain in simplicity in confining the richer theory (i.e. the postulation of both universals and particulars) to just one universal, and the literature shows that later writers on the subject have been very willing to follow him in this. There may of course be some reason in a given case for preferring one number to another. One clear case in point is Armstrong's a posteriori form of immanent realism, according to which the genuine universals are to be determined by science, not by counting the number of semantically distinct general terms or predicates, as has commonly been done.[50] On this basis, Armstrong expects that there would turn out to be a mere handful of universals, whereas on the traditional reckoning there would be a very large number indeed. But this preference of Armstrong's is quite unrelated to the question of simplicity, and arises rather from a particular view about what evidence is relevant in ontology. Further examples of a less abstract sort may easily be cited. If the signs of a burglary are equally consistent with the presence of one or two or three malefactors then there is no presumption in favour of one over two or three, or of two over three. A theory that postulates a hundred more stars in the Milky Way than another is no worse than that other, assuming both are equally consistent with the evidence and otherwise indistinguishable.

Now Hume held that though polytheism is exposed in principle to the parsimony objection the latter does not actually operate because other things are not

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equal, that is, because polytheism is preferable on other grounds, so that we are not comparing, in respect of simplicity, theories which are otherwise indistinguishable. The other grounds that Hume has in mind have to do with a better fit with our experience of human contrivance – as before, many people are involved in constructing a ship or a building.[51] Swinburne objects to this that:

> **Hume's hypothesis is very complicated – we want to ask about it such questions as why are there just 333 deities (or whatever the number is), why do they have powers of just the strength which they do have, and what moves them to co-operate as closely as they obviously do; questions of a kind which obtrude far less with the far simpler and so less arbitrary theistic hypothesis.**[52]

The complaint that Hume's hypothesis offends in principle by its complexity is, I have argued, not tenable; there is no simplicity rule which favours one over other cardinals. But Swinburne (in the passage just quoted) adds further points. The first is that with polytheism we would want to ask why there is the particular number of deities involved, a question which, he holds, obtrudes itself far less with traditional theism, since that is 'simpler and so less arbitrary'. But it is *not* simpler *qua* involving a smaller number, I have argued, so the inference to lesser arbitrariness is not forthcoming. Against the suggestion of lesser arbitrariness there is also an *ad hominem* which is not just a debating point but a serious criticism: one may indeed feel moved to ask why there should be 333 deities (as against some other number), but *to just the same extent* one might be moved to ask why there should be one (as against some other number). We might wonder why the several deities have precisely the powers they are credited with, just as Swinburne says; but so equally we might wonder precisely that about the one deity of monotheism. We might also wonder, Swinburne says, why the several deities co-operate so closely. Here, in the nature of the case, the *ad hominem* does not apply, since it takes more than one to co-operate; but Swinburne's argument is blunted when we recall that historically polytheism has often been associated with a *lack* of co-operation. This is clear in the case, say, of Manicheism.

Swinburne has a further objection: even if Hume were right in supposing that the better fit of polytheism with experience cancelled out the (supposedly) greater simplicity of monotheism, the latter still has greater explanatory power:

> **For theism leads us to expect that we will find throughout nature one pattern of order. But if there were more than one deity responsible for the order of the universe, we would expect to see … marks of the handiwork of different deities in different parts of the universe … . We would expect to find an inverse square law of gravitation obeyed in one part of the universe, and in another part a law which was just short of being an inverse square law … . It is enough to draw this absurd conclusion to see how wrong the Humean objection is.**[53]

But this is not at all compelling. Manicheism and its kin held precisely that we *do* see 'marks of the handiwork of different deities in different parts of the universe'. As to our expectations in the way of natural laws, it is quite obscure to me *what* we

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would or should expect to see; but one might think, in a Humean way, that the human analogy could just as well suggest *agreement* about the basics of how the world should be run, not disagreement. (Nor is this inconsistent with the preceding reference to Manicheism; mighty opposites in Parliament, for example, nevertheless agree, and that in detail, about how the place should be run.)

It is therefore not clear to me that Swinburne can even make an Ockhamistic case for preferring monotheism to polytheism, and since polytheism has come in very many forms, and could come in many more, we already have a reason to doubt whether the prior probability of traditional theism could be other than trifling.[54] But, I will argue next, even if this point about polytheism were not available, the manifold possible forms of monotheism are quite sufficient to establish the criticism of Swinburne. I will approach this question by considering first the arguments on the point given by Swinburne in *Is There a God?*. In this book Swinburne has two lines of argument for saying that traditional theism is simpler than the indefinitely many other forms of monotheism.[55] One is that zero and infinite degrees of a quality or magnitude are simpler than any finite degree. The second is that any of the alternative theisms would involve defects in the deity which would at once call for further explanation.

Zero and infinite degrees

The first of the arguments consists in three historical cases.

(1) In Newtonian science, Swinburne claims, gravitational action was supposed to be instantaneous, even though some finite rate of propagation was consistent with all the observational evidence.[56] But the situation was much less straightforward than that. Newton himself was averse to regarding gravity as an ultimate intrinsic property of matter, and described two or three mechanical explanations for it,[57] and on any of those the rate would be finite. D'Abro suggests, however, that, because of the objectionably hypothetical character of these mechanical ether explanations (and the unavailability of a field theory) the 'net result was that Newton's theory of gravitation, in its actual application assumed action at a distance [understood as involving instantaneous propagation]'.[58] But, even so, I suggest, there are at least two ways of viewing this which do not accord with Swinburne's interpretation. One is that mathematical simplicity, in a sense unrelated to truth, could just as well have been involved. This possibility is described more fully below. The other possibility is suggested by the wording of Newton's famous letter to Bentley, in which he rejects as absurd the view that gravity might be 'innate inherent and essential to matter' and act at a distance without intermediary. Newton goes on to say that, 'Gravity must be caused by an agent acting constantly … but whether this agent be material or immaterial is a question I have left to ye consideration of my readers'.[59] This last sentence makes it clear, I suggest, that a distinct possibility in Newton's mind, alternative to a mechanical explanation, was the theistic one (an immaterial agent). In Newton's

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rather unorthodox theology God is spatial, being present at every point of infinite space. If gravity was ultimately due to the divine action of moving bodies then gravity would naturally – perhaps inevitably – be thought of by Newton as instantaneous; God being co-present with both sun and planet would move both simultaneously – only finite agents would be limited by a time-lag.[60] Thus, I suggest, if Newton's actual practice involved the de facto acceptance of instantaneous propagation this would not *have* to be put down to the simplicity criterion assumed by Swinburne to have been operative.

Laplace is commonly regarded as the chief Newtonian after Newton, and he certainly did not assume – as Swinburne's claim would imply he did – that gravitational propagation was instantaneous. On the contrary, Laplace devised an experimental test to apply to the question, though nothing came of it.[61] He concluded 'that the force of gravitation was transmitted instantaneously *or* [my emphasis], at any rate, with a velocity far greater than that of light'.[62] Thus, on *this* description of his procedure, Laplace did not even conclude, upon the failure of his test, that instantaneous propagation was involved. However, the fact remains that he and those coming after him did in practice assume action at a distance:[63] does this not after all secure the point which Swinburne wishes to make? I suggest that it does not, and that for the following reason.

Treating the propagation time as zero is explicable by reference to another sense of 'mathematical simplicity', in which no-one would suppose it was a mark of truth, contrary to what Swinburne's overall argument asserts simplicity to be. (That the simple is a sign of the true is, Swinburne rightly says, 'a dominant theme of this book'.[64]) Now mathematical simplicity as usually understood is something that proved to be very difficult to define.[65] But even supposing it to be definable in some satisfactory way, and supposing further that there is reason to think that so defined it really is a sign of truth (which Swinburne himself actually queries),[66] we still do not reach the end of the matter. This is because there is this other sense in which the presence of such simplicity could not seriously be taken as a sign of truth, yet which can just as well be taken as the reason why instantaneous gravitational attraction was accepted. The sense in question relates merely to *ease of computation*. It is simpler – easier – to add and multiply in a decimal currency than in pounds, shillings, and pence, and simpler to add and multiply in the metric than in the imperial system. In the same way then it will be simpler – easier – to calculate the movements of a system of bodies acting under gravity if propagation is instantaneous than if it is not, since in the former case questions need not be taken into account which in the latter case must be. (It would be beside the point to object that *ex hypothesi* the two cases are not observationally distinguishable; the point being made is that observationally indistinguishable theories can nevertheless be distinguished by their computational convenience.)

(2) Swinburne's second historical case is the speed of light. Of this he says that 'in the Middle Ages people believed that light travelled with an infinite velocity

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rather than with some large finite velocity equally compatible with observations'.[67] As with the case of gravity, however, there is considerable doubt about the historical claim itself. Alhazen, Crombie says, 'held that the transmission of light was not instantaneous [and so, equivalently, that its velocity was not infinite]'; yet Alhazen's 'work became the main source for physical and physiological optics in the medieval West'.[68] Swinburne's intention, however, may have been to refer to the opinion of philosophers following Aristotle rather than to that of experimentalists following Alhazen, and in that case his quoted claim would be correct. Aristotle's theory of light treats it as the actualization of the otherwise merely potential transparency of air, water, and other bodies. 'The state of actual transparency in such a body is light. Light is thus not a movement but an actuality or state; and it is produced not by a movement but by an instantaneous qualitative change effected in some potentially transparent medium'.[69] This conception of light is not indeed well described by Swinburne's words quoted above, but his point would nevertheless be secured if we take him to be referring to the Aristotelian view that the change in which light consists is an instantaneous one.

But what need is there to suppose that the instantaneous character of the change in Aristotle's theory was suggested to him (or his medieval followers) by considerations of simplicity, as Swinburne's position requires us to suppose? It would seem no less likely, indeed more likely, that it was suggested to him by *experience* – the flash of lightning, or the act of uncovering the lantern are, so far as any ordinary experience goes, simultaneous with the appearance to sight of the illuminated surroundings. In the *Discourses Concerning Two New Sciences*, Galileo has his disputants discuss the speed of light. His Aristotelian Simplicio says this: 'Daily experience shows the expansion of light to be instantaneous. When we see artillery fired far away, the brightness of the flames reaches our eyes without lapse of time, but the sound comes to our ears only after a noticeable interval of time'.[70] No doubt the argument is a terrible one (as Simplicio's interlocutor Sagrado is not slow to point out); but it does strongly suggest that, even in the Aristotelianism of the seventeenth century, when the spread of Ockhamism must have made the idea of a simplicity criterion much more familiar to philosophers, the appeal is nevertheless to *experience*, without any hint whatever of a simplicity argument.

(3) The third of the historical cases is the mass of the photon. Swinburne argues that physicists have preferred to assign zero rest mass to the photon rather than some very small non-zero mass 'when either hypothesis was equally compatible with anything which could have been observed'.[71] According to a recent authoritative account of the matter the situation is as follows.[72] It is a fundamental requirement of Special Relativity that the speed of light *in vacuo* should be the same for all inertial frames. It follows that photons – light in its corpuscular aspect – should have the same speed in all inertial frames. Now in Special Relativity the motion of an ordinary particle such as an electron with respect to an inertial frame can always be referred to another inertial frame in which it becomes zero. What

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then prevents a photon from being similarly referred to an inertial frame in which its speed becomes zero, contrary to the above fundamental requirement of the theory? The answer is that in such a frame the momentum components of the energy-momentum vector for the photon would all be zero, and a necessary and sufficient condition for the impossibility of this is that the rest mass of the photon should be zero. Thus a zero rest mass for the photon, and a zero mass alone, prevents an inconsistency in the theory.

There is no question here of some other mass for the photon doing as well, so as long as we remain within the range of experimental error. Zero mass alone, according to the above explanation, will do the trick. A preference for zero on simplicity grounds does not enter into the matter.

Defects call for explanation

We now reach the second type of argument for claiming superior simplicity for traditional theism: granted that any theistic explanation will have to make its deity very powerful, it is

> **… a simpler hypothesis to postulate that his power is infinite rather than just very large. If we said that he was powerful enough to make a universe of such and such mass but not powerful enough to make a more massive one, the question would arise as to why there was just that rather than any other limit to his power.**[73]

I suggest that this argument is not compelling, and that for three main reasons.

(1) The fact that some feature of a theory may or would raise some question in someone's mind (or even most minds) is by itself neither here nor there. Fundamental scientific theories assign numerical values to velocities (e.g. of light *in vacuo*) and forces (e.g. the gravitational force); inevitably some people will wonder why these should be just what they are, not more or less. Sometimes this may be explained by a more fundamental theory, sometimes not. That the question arises in someone's mind seems to be of no particular epistemic consequence. It might be replied that this is not a proper analogy; in the theistic case one is comparing theories one of which raises a query (some limited theism), the other of which does not (traditional theism), and this feature is not reproduced in the scientific analogy. This reply will be covered under point (3) below.

(2) The second reason why the argument is not compelling is this: even if the tendency of limited non-traditional theisms to raise questions were a defect in them, this would have no obvious bearing on their relative *simplicity*, which is the only theoretical virtue with which we are concerned. Simplicity as a virtue of theories has to do with fewness of kinds of entity postulated, fewness of assumptions and, where relevant, mathematical simplicity (in some suitable sense). A theory might score well on simplicity thus understood but raise queries about why things are so in everyone's mind, or it might for some reason not raise such queries but score badly on a simplicity rating. Thus the point appears to be irrelevant to simplicity.

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(3) The third reason why the argument is not compelling is an *ad hominem*. Swinburne holds that limited power would raise the question why there is just this degree of power (and that this fact is to the detriment of the theory's simplicity). But unlimited power surely raises an exactly parallel question, namely why there should exist this unlimited degree of power, in a word, this omnipotence. This argument unfortunately has the appearance of a mere sophism or debating point, but it is, in my view, a serious objection to Swinburne's procedure. There is nothing self-explanatory about omnipotence; if one holds that omnipotence is exemplified it is exactly as much an intellectual puzzle as would be the existence of some limited degree of power. The Leibnizian version of traditional theism could no doubt make some headway with this problem by claiming the logical necessity of divine existence, thus perhaps conferring a logical necessity and thus self-explanatoriness upon omnipotence. But this route, even if it exists, is not open to Swinburne, who holds that divine existence is logically contingent.[74] In *The Christian God* Swinburne incorporates omnipotence in the property of *pure limitless intentional power*, and the other attributes are deduced from that,[75] but the existence of a being with that property is not self-explanatory either. As Swinburne himself says elsewhere, the existence of such a deity would be 'the ultimate brute fact which explains everything else'.[76]

Interlude: types of simplicity

Before continuing further it will be useful to note a general problem which I believe exists here and which will begin to obtrude itself in the next part of the discussion. In the course of his discussion Swinburne applies the term 'simple' and its cognates to a wide variety of things, and these applications need to be distinguished if we are to reach a proper assessment of the argument. Thus, he says that traditional theism 'postulates God as a being with intentions, beliefs and capacities, but ones of a very simple kind, so simple that it postulates the simplest kind of person that there could be'.[77] Later, the term is also applied to entities in general: 'given that there does exist something, the simple is more likely to exist that the complex'.[78] Alongside these uses Swinburne frequently speaks, as we know, of the simplicity of theories, in particular of theism. But simplicity of intentions, beliefs, capacities, persons, or entities, whatever exactly it may be, is not simplicity of theory, whatever exactly that is. The primary traditional metaphysical sense, at any rate, of the simple–complex distinction lies in the distinction between that which does not have parts or composition and that which does. This sense is visible in, say, the Thomist doctrine of the simplicity of God and the Leibnizian doctrine of the simplicity of the monads. Swinburne evidently does not dissent from the Thomist view just mentioned, and it is at least possible that it is in this sense that he speaks of simplicity in the two preceding quotations.

Yet it is clear that simplicity in this metaphysical sense is not at all the same thing as the simplicity of a theory (call this latter thing 'Ockhamistic simplicity').

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Ockhamistic simplicity – a property of theories – has nothing to do with the absence of parts or composition – a property of entities. A straightforward equation of metaphysical and Ockhamistic simplicity is therefore definitely to be ruled out. Nor, I suggest, is there a plausible way of linking them, though the details here would take us too far afield. Swinburne may, however, be working with a sense of 'simple' which departs from the primary traditional sense. This thought, which may well occur already to the reader of *The Existence of God*, is confirmed by various remarks in the more recent work *The Christian God*. There the concept of *pure limitless intentional power* is central to the exposition, and, having explained it, Swinburne says that 'intuitively … this notion … is a very simple one', and his claims for the simplicity of the theory which is based on the notion appear to trace back to this claim about intuitive simplicity.[79] Now simplicity of a *notion* is, on the face of it, a third thing, something logical or semantical, in addition to metaphysical and Ockhamistic simplicity. But Swinburne also speaks of pure limitless intentional power as a *property*,[80] thus evidently reverting to a metaphysical sense, though possibly (or probably?) not the primary traditional one. The issues here are much too involved to be discussed further now, but the overall point is clear – the content of any further sense of 'simple' beyond the Ockhamistic one, and its relation to the latter, must be fully explained if one is looking to extract the Ockhamistic simplicity of theism from such a further sense. This is my minimum objection; I would also argue, if space permitted, that the prospects of success are not good.

Other arguments for simplicity

Having indicated some reasons for doubt about Swinburne's arguments in *Is There a God?*, I now proceed to the arguments for the simplicity of traditional theism given in *The Existence of God*. Swinburne begins his exposition in this book by saying that he proposes to show that theism 'is a very simple hypothesis indeed … by *showing how the divine properties … fit together*' [my emphasis].[81] The first step in implementing this is to hold that theism postulates:

> **… the simplest kind of person that there could be. … theism postulates a God with capacities as great as they logically can be. He is infinitely powerful, omnipotent. That there is an omnipotent God is a simpler hypothesis than the hypothesis that there is a God who has such-and-such limited power.**[82]

The first reason given for this is that a finite limitation calls for explanation in a way that limitlessness does not.[83] This has already been covered in earlier discussion. The second reason consists in three cases from the history of science. Two of these have already been covered above (zero mass and infinite velocity), but the third is different. This third case claims that the theistic hypothesis is simpler in the way that Newton's hypothesis that the gravitational force is inversely proportional to the square of the distance is simpler than the hypothesis that it is inversely proportional to some non-integral power of the distance (say 2.000142), differing

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from the square by little enough to escape detection. This case is rather different from the Newtonian case referred to in the previous discussion (the speed of gravitational propagation) and requires some separate discussion. Swinburne says here that the inverse square law 'has about it a naturalness' and refers the reader back to a case discussed earlier in his book. The point made in that earlier discussion[84] is that if and only if the inverse square law holds will the total force exerted by a body on a hollow sphere of given uniform thickness and density centred on the body remain the same whatever the inner radius of the sphere. This has the consequence that the inverse square law, and it alone, enables us to regard the gravitational force exerted by the central body on the surface of the sphere as a kind of bubble spreading out from the body and getting thinner as it grows in size. Thus the inverse square law is claimed to be marked off from all the observationally indistinguishable alternatives by the property of naturalness. In that earlier discussion *naturalness* is not defined, but it is illustrated by what is evidently (though not quite explicitly) a reference to the reduction of phenomenological thermodynamics to statistical mechanics; a natural theory might be one which postulates 'that there exist very small particles, atoms, which interact by bouncing off each other in the way that billiard balls do'.[85]

But Swinburne's argument appears to have gone astray here. Naturalness of postulation is no doubt an important criterion in relation to theory choice, and no doubt too the inverse square law is favoured by the criterion. But we are no longer talking about *simplicity*. In the earlier discussion *naturalness* was equated with *intelligibility*, and the latter figured in the definition given there of 'simplicity': 'a theory is simple in so far as it postulates few mathematically simple laws holding between entities of an intelligible kind'.[86] It is at once evident from this that *naturalness* is not at all the same thing as *simplicity*. Naturalness is in fact hardly distinguishable from another virtue which Swinburne goes on to describe. This is the virtue which many philosophers will think of under the Quinean rubric 'conservatism';[87] it lies in a theory's fitting with our general background knowledge. Whatever the precise details here one can see that the naturalness of the inverse square law is not to be regarded as a matter of simplicity, but as a matter of some distinct virtue. No doubt, of course, the inverse square law is *mathematically* simpler than the various alternatives to it, but that is not the point here (and has anyway been covered already in earlier discussion). The point here is rather that the naturalness of the inverse square law is not automatically – even by Swinburne's own definitions – a matter of *simplicity*, and so will not serve to advance the claim which he is making in relation to the simplicity of theism.[88]

Another reason is now adduced by Swinburne for regarding traditional theism as simpler than the alternatives. 'There is a neatness about zero and infinity which particular finite numbers lack'.[89] This needs little special comment. To the extent that it is more than neo-Pythagoreanism we can as well interpret neatness as referring to the *computational* simplicity of assuming zero (or infinite) values of a

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magnitude, and it has already been argued that this is irrelevant to Ockhamist simplicity.

So far we have considered some arguments for regarding infinite degrees of divine attributes – specifically omnipotence, but more generally too – as the simplest hypothesis. But the points considered so far do not seem to bear on the thesis that the divine attributes *fit together*, though, as we saw, that was the announced line of argument for holding that traditional theism fares best by the simplicity criterion. The paragraphs that now follow in Swinburne's discussion[90] do take up the idea that the (traditional) divine attributes fit together, but the argument which is developed does not obviously constitute an argument for simplicity. First, omniscience is introduced:

> **It would seem most consonant with … omnipotence [taken now as a given] that an omnipotent being have beliefs which amount to knowledge. … The simplest such supposition is to postulate that the omnipotent being is limited in his knowledge, as in his power, only by logic … , i.e. he would be omniscient.**[91]

Now it can no doubt be argued that omniscience is highly, or perhaps most consonant with omnipotence, but *that* is not in itself an argument for the *simplicity* of the theistic hypothesis, but only for the (partial) consonance or coherence of its content. How is the attribute of omniscience shown by Swinburne to contribute to the (Ockhamistic) simplicity of theism? It is *not* shown to do so; that is merely *asserted* in the second sentence of the above quotation (and there is nothing more said on the point). Swinburne may be implicitly relying here on earlier points (the analogy with science, naturalness, etc.) but those arguments will serve no better in relation to omniscience than they did with omnipotence, and would anyway not constitute the argument from the fitting together of the attributes that we are still looking for. Freedom is the subject of the next piece of argument, and here Swinburne argues that it is most consonant with the attribute of omnipotence that God be perfectly free.[92] But here again we do not have an argument for the simplicity of theism from consonance, but only an argument for the coherence of its content. Theories which score poorly on a simplicity test may yet have a high degree of internal coherence, so again the consonance argument fails to lead where it should.

Swinburne concludes the paragraph which has just been discussed as follows: 'Theism thus postulates a person of an incredibly simple kind – one with such capacities, beliefs, and intentions, that there are no limits (apart from those of logic) to his capacities, to the extent of his justified true belief, and to his choice of intention.'[93] If we set aside the conflation of metaphysical with Ockhamistic simplicity inherent in the above, we can, I believe, see Swinburne harking back to the argument that limitlessness in a quality or magnitude makes for simplicity of hypothesis because of the scientific analogies, naturalness and the like. Here then the argument from fit has been shelved altogether. The subsequent discussion of the divine attributes, to the end of the chapter, adds no further argument for

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simplicity. We can only conclude that Swinburne's arguments for the simplicity of theism in *The Existence of God* are no more successful that those previously considered from *Is There a God?*

Final points, and the wider bearing of the preceding discussion

I have argued that there is solid reason for the view that Swinburne thinks of the fine-tuning argument as, by itself, a good P-inductive argument, and it is past doubt that his readers have thought that that was what he aimed to show in his discussion in 'Argument' and its later versions. In this paper I have given a number of reasons against regarding the argument as good P-inductive. However, as pointed out under **Exposition** above, there is also a further, different strategy involved in Swinburne's discussion. This strategy is just visible in 'Argument' but clearer in Appendix B of *The Existence of God*. It is to merge the fine-tuning argument into the already large corpus of arguments given in that book, and then treat it as serving to add further weight in the final synoptic assessment of the theistic hypothesis.

It will be recalled that the various arguments which Swinburne endorses in *The Existence of God* (the cosmological, teleological, etc.) are endorsed by him as good C-inductive arguments, not (or not necessarily) as good P-inductive. Then, in the final chapter, he merges those arguments (with the exception of the argument from religious experience) into a single corpus of evidence e and argues that, with k now as tautological, the posterior probability of theism (on that e) is 'none too close to … o'.[94] Then, with the aid of an epistemic principle described below, he is enabled to conclude that the balance of probability is in favour of theism. Here, then, is a proper function for the fine-tuning argument which has not so far been considered; it is to be regarded not as good P-inductive (the approach criticized in earlier sections) but rather as one of a number of good C-inductive arguments woven together in this final assessment.

Having set out this point I must go on to say that the present paper cannot undertake a systematic discussion of Swinburne's closely argued final assessment. To that extent, then, the value of the fine-tuning argument must be left open. One point, however, has emerged in the previous discussion which has a bearing also on Swinburne's final assessment and which can be put briefly here. If the argument of **Third objection** above is correct, then traditional theism must be regarded as just one of a huge number of alternative theistic hypotheses dividing the prior probability among them, where k is taken as the proposition that there is a universe subject to natural laws. Now here, in Swinburne's final assessment, it is true that k is once again tautological. But it will be seen that the argument given above under **Third objection** nevertheless carries over so as to apply also in the present case of the final assessment to give the point that $P(h/k)$ is trifling where h is traditional theism and k is tautological. (The reason briefly stated: both under

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Third objection and equally here in the final assessment the only question is the simplicity of h. Thus, whatever was established under **Third objection** about P(h/k) applies equally here.) Now, if P(h/k) is trifling here, so is P($h/e\&k$) with e now as the corpus of evidence as considered by Swinburne (excluding religious experience), for just the same sort of reason as was developed under **Third objection** on the basis of BT-2. (Here the reader is invited to rerun the argument of **Third objection** in application to the present case.)

In some very close and ingenious argument (which need not be summarized here) Swinburne seeks to secure the conclusion that the posterior probability of traditional theism is 'none too close to 1 or 0 on the evidence so far considered [i.e. the totality of the evidence brought to bear in *The Existence of God*, including, we are now assuming, the fine-tuning argument, but excluding any argument from religious experience]'.[95] That established, he moves to the last phase of the argument, the application of an epistemic principle reached in the discussion of religious experience. This principle, in its application to the present case, leads to the position that 'unless the [posterior] probability of theism on other evidence is very low indeed, the testimony of many witnesses to experience apparently of God suffices to make many of those experiences probably veridical'.[96] Since the (posterior) probability of theism (on the stated e) is not (according to his argument) 'too close to 0' the evidence of religious experience implies that theism is 'over all probable'; that an 'argument now from all the evidence considered in this book [i.e. now including religious experience] to the existence of God is a good P-inductive argument'.[97]

It is clear then that Swinburne's final synoptic assessment of the total argument for traditional theism is adversely affected by the points made under **Third objection** above. Since those points transfer to this final argument of Swinburne's it seems that we must reject his claim that the posterior probability of traditional theism (on e but without religious experience) has been shown not to be close to 0, a necessary condition for the application of the epistemic principle. It is, on the contrary, a nugatory quantity, on an equal footing with that of all the huge number of alternative versions of theism discussed earlier. The argument from religious experience cannot therefore find a foothold, and the synoptic theistic argument (including in its evidential corpus our concern, the fine-tuning argument) is not shown to be a good P-inductive argument.

Notes

1. M. C. Bradley 'The fine-tuning argument' [hereafter FTA], *Religious Studies*, **37** (2001), 451–466.
2. Richard Swinburne 'Argument from the fine-tuning of the universe' in J. Leslie (ed.) *Physical Cosmology and Philosophy* (New York: Macmillan, 1990), 154–173. A shortened version of this paper is given by Swinburne as Appendix B of *The Existence of God* (Oxford: Clarendon Press, revised edn 1991). A still shorter version is given by Swinburne in *Is There a God?* (Oxford: Oxford University Press, 1996), ch. 4. For other Bayesian approaches see n. 20 of FTA.
3. *Ibid*., 154.

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4. *Ibid*., 155.
5. *Ibid*., 155–156.
6. *Ibid*., 156.
7. Swinburne *Existence*, ch. 9.
8. *Idem* 'Argument', 157.
9. *Ibid*., 157.
10. *Ibid*., 157.
11. *Ibid*., 158.
12. *Ibid*., 159.
13. What k is taken to be in this or that context proves to be a matter of some importance, returned to several times below.
14. Swinburne 'Argument', 164. This formulation of k is held by Swinburne to depend on a certain assumption; an alternative assumption would yield a simpler version on which k is merely the proposition that there is a universe subject to natural laws (*Ibid*., 164; *Idem Existence*, 311–312). This simpler version is the one I use below, since nothing in my discussion turns on the difference between the versions.
15. *Idem The Coherence of Theism* (Oxford: Clarendon Press, 1977); *idem Existence*, ch. 5; more recently, *idem The Christian God* (Oxford: Clarendon Press, 1994).
16. *Idem* 'Argument', 164.
17. *Ibid*., 172.
18. A *correct* C-inductive argument is one in which the premises increase the probability of the conclusion. A *good* C-inductive argument is a correct one whose premises are known to be true (Swinburne *Existence*, 7–8).
19. *Idem* 'Argument', 172.
20. A *correct* P-inductive argument is one in which the premises make the conclusion more probable than not. A *good* P-inductive argument is a correct one whose premises are known to be true (*idem Existence*, 5, 7–8).
21. *Idem* 'Argument', 164.
22. *Ibid*., 164, also 165; also in *idem Existence*, 312 (twice).
23. A related distinction was made by Graham Priest 'The argument from design', *Australasian Journal of Philosophy*, **59** (1981), 422–431 in the discussion of an early form of the Bayesian fine-tuning argument due to Schlesinger. Schlesinger has replied to Priest in George N. Schlesinger *New Perspectives on Old-time Religion* (Oxford: Clarendon Press, 1988), 137–144.
24. Swinburne *Existence*, 300.
25. *Idem Is There a God?*, 68.
26. *Ibid*., 55.
27. *Ibid*., 93–94.
28. *Idem Existence*, 277.
29. *Ibid*., 300.
30. *Ibid*., 303.
31. There is a discussion that *looks* as though it is relevant (Swinburne 'Argument', 171–172), but closer attention will show that it is not; in the special context here k has reverted to being tautological.
32. The most explicit statements I know of in *Existence* about how to combine simplicity (and scope) considerations with the bearing of contingent evidence are on 52, 53, 65, 169, and 282, and they do not tell us exactly how to effect the combination. Chapter 7 of Swinburne's *Introduction to Confirmation Theory* (London: Methuen, 1973) gives a detailed discussion of simplicity in its relation to intrinsic probability, but does not address the question raised here about non-intrinsic prior probability. Robert Prevost *Probability and Theistic Explanation* (Oxford: Clarendon Press, 1990), 15–16, raises the point but does not offer a more definite account than Swinburne does. (Prevost's chapters 1 and 2, however, contain a good discussion of Swinburne's arguments in *Existence of God* and an account of some objections to them.) However, the discussion in Swinburne's recent *Simplicity as Evidence of Truth* (Milwaukee, WI: Marquette University Press, 1997), 36–41, 55, seems to mean that simplicity is the *sole* determinant (apart from scope) of $P(h/k)$. I do not take the question further in view of the assumption stated in the next sentence of the text – the assumption that simplicity is all we need consider.
33. Swinburne 'Argument', 157.

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34. *Ibid*., 158.
35. FTA, 456–457.
36. Swinburne 'Argument', 157; *idem Existence*, ch. 9. Further references on the topic are given in FTA, n. 16.
37. *Idem Is There a God?*, 67.
38. The best account of what is involved here is still, in my view, J. L. Mackie *Ethics: Inventing Right and Wrong* (Harmondsworth: Penguin, 1977). 'Scepticism' and 'subjectivism', though far from being synonymous, are both used by Mackie to designate his anti-objectivist view.
39. Swinburne *Coherence*, ch. 11; *idem Existence*, 97–102, 130–131; *idem Christian God*, 65–71, 134–137; *idem Is There a God?*, 12–18. Much of what Swinburne says in these places refers of course to *moral* goodness, but it is quite clear that he is also, in part, talking about intrinsic non-moral goodness, such as that of conscious life. A further examination of these texts is not possible here however.
40. Mark Wynn *God and Goodness* (London: Routledge, 1999) should be mentioned as a recent general discussion of the relevance of beliefs about value in natural theology.
41. As Hume made very clear once and for all, omnipotence, omniscience, moral perfection, and so forth are *not* required for the purpose of accounting for (or predicting) the world as we find it. Statements such as Swinburne's surprising claim (in relation to the orderliness of the world) that no other hypothesis than traditional theism would lead us to expect the evidence (*Is There a God?*, 55) are plainly untenable.
42. Swinburne *Introduction*, 69–81.
43. *Ibid*., 71.
44. Not everyone is so cautious. Charles E. Gutenson 'What Swinburne should have concluded', *Religious Studies*, **33** (1997), 243–247 has argued that Swinburne's several theistic arguments (in *Existence*) can be promoted from good C-inductive to good P-inductive status using only Swinburne's own apparatus. An assumption which Gutenson depends on, and acknowledges (245–246), is that there are just two hypotheses to consider, viz. (1) traditional theism (2) treating the world as a brute fact. This assumption is unsupported; yet it is exposed to obvious counter-examples from comparative religion, let alone from the Humean range of thought-experiments. Mark Wynn 'Some reflections on Richard Swinburne's argument from design', *Religious Studies*, **29** (1993), 325–335, does consider the problem of singling out traditional theism from its many alternatives, though in a different context from the present – and rather more irenically.
45. Useful short accounts of simplicity with bibliographies are given by Mary Hesse 'Simplicity' in Paul Edwards (ed.) *The Encyclopaedia of Philosophy* (New York NY: Macmillan, 1967), and Elliott Sober 'Simplicity' in Jonathan Dancy and Ernest Sosa (eds) *A Companion to Epistemology* (Oxford: Basil Blackwell, 1993). See too Swinburne *Simplicity as Evidence*.
46. David Hume *Dialogues Concerning Natural Religion* Henry D. Aiken (ed.) (New York NY: Hafner, 1962), part 5, 39.
47. Swinburne *Existence*, 141. Hume's concession is in *Dialogues*, 40. In *The Natural History of Religion*, section 2, Hume begins by taking a considerably stronger line against polytheism as an explanation of nature than he does in the *Dialogues* (though, in the ensuing discussion in section 2, he moves just about as far in the opposite direction when considering polytheism as an explanation of the vicissitudes of human life). He says that a plurality of deities would be 'a merely arbitrary supposition' (Richard Wollheim (ed.) *Hume on Religion* (London: Collins, 1971), 37); but, I go on to argue below, other things being equal, three is not more arbitrary than two, nor two than one.
48. D. C. Williams *Principles of Empirical Realism* (Springfield, IL: Charles C. Thomas, 1966), 133.
49. Bertrand Russell *The Problems of Philosophy* (London: Oxford University Press, 1968), ch. 9. Another notable example is in the *Analogy* where Butler holds, with reference to the New Testament miracles, that there is no ground for preferring a smaller to a larger number (J. M. Bernard (ed.) *The Works of Bishop Butler* (London: Macmillan 1900), vol. 2 *The Analogy of Religion*, part 2, ch. 2, section 8, 158).
50. D. M. Armstrong *Universals: An Opinionated Introduction* (Boulder, CO: Westview Press, 1989), 87.
51. Hume *Dialogues*, 40.
52. Swinburne *Existence*, 141.
53. *Ibid*., 142.
54. Gary Doore 'The argument from design: some better reasons for agreeing with Hume' *Religious Studies*, **16** (1980), 145–161, is one of the few writers to recognize the difficulty which natural theology

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must encounter with polytheism, though his approach to the question (157–160) is rather different from that taken here. It is worth recalling that the founders of natural theology did not themselves draw a monotheistic conclusion from their principal arguments. Plato, in the tenth book of the *Laws*, explicitly concludes to a plurality of deities (896E) and Aristotle, in book 12, chapter 8 of the *Metaphysics*, concludes that there are either forty-nine or fifty-five unmoved movers, and that is in addition to the first mover and the heavenly bodies themselves, which he also regards as divine.

55. Swinburne *Is There a God?*, 43–47.
56. *Ibid*., 44.
57. Details can be found in Derek Gjertsen *The Newton Handbook* (London: Routledge, 1986), 190–192, 239–241.
58. A. d'Abro *The Rise of the New Physics* (New York NY: Dover Publications, 1952), vol. 1, 75. For action at a distance see Mary Hesse 'Action at a distance and field theories' in Edwards (ed.) *Encyclopaedia*. This article contains a substantial bibliography.
59. Gjertsen *Newton*, 219 provides the source.
60. This reading of Newton's letter is supported by A. Koyré *Newtonian Studies* (Chicago IL: University of Chicago Press, 1968), 149, 156. Koyré (156, 171) also cites Clarke as explicitly making the point.
61. d'Abro *Rise of the New Physics*, vol. 1, 75.
62. *Ibid*.
63. *Ibid*.
64. Swinburne *Existence*, 56. The reference of 'this book' is of course to *Existence*, but holds equally for *Is There a God?*.
65. The discussion is summarized in Hesse 'Simplicity', and Swinburne *Introduction*, 110–113.
66. Swinburne *Introduction*, 112.
67. *Idem Is There a God?*, 44.
68. A. C. Crombie *From Augustine to Galileo* (London: Heinemann, 1979), vol. 1, 114.
69. Sir David Ross *Aristotle* (London: Methuen, 1971), 139.
70. Stillman Drake (transl.) *Galileo Galilei: Two New Sciences* (Madison WI: University of Wisconsin Press, 1974), 49.
71. Swinburne *Is There a God?*, 44–45.
72. John Taylor, 'Gauge theories in particle physics', in Paul Davies (ed.) *The New Physics* (Cambridge: Cambridge University Press, 1989) ch. 17. Photon mass is discussed at 461–462.
73. Swinburne *Is There a God?*, 45.
74. *Idem Existence*, 76, 93; *idem Coherence*, 265; *idem Christian God*, 144–145.
75. *Idem Christian God*, ch. 7.
76. *Idem Is There a God?*, 19. See also *idem Christian God*, 167: 'there have to be some ultimate facts'.
77. *Idem Existence*, 93–94.
78. *Ibid*., 106.
79. The quotation is *idem Christian God*, 152. The point about what traces back to this claim seems sufficiently clear at *ibid*., 126.
80. *Ibid*., 162, 167. Some other places in *Existence* where metaphysical simplicity of some sort is arguably under notice are the following: 77, 95, 102, 130, 131, 282–284, 288–289, 296, 322.
81. *Idem Existence*, 93. The fitting together of the divine attributes is also discussed in *Christian God*, especially ch. 7.
82. *Idem Existence*, 94.
83. *Ibid*., 94.
84. *Ibid*., 52–53.
85. *Ibid*., 52.
86. *Ibid*.
87. W. V. Quine and J. S. Ullian *The Web of Belief* (New York NY: Random House, second edn 1978), 66–68.
88. Some second thoughts by Swinburne about naturalness and intelligibility are reported by Prevost *Probability*, 44, n 20.
89. Swinburne *Existence*, 94. In *Simplicity as Evidence*, 27–28, Swinburne gives a new argument for regarding 0 and 1 as simpler than 2 (this is apparently metaphysical or logical simplicity) and also a further argument for regarding infinite degrees of quantities as simpler than finite degrees (likewise). I regard these arguments as very dubious, but will not pursue them here.

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90. *Idem Existence*, 94–97.
91. *Ibid*., 94–95.
92. *Ibid*., 95.
93. *Ibid*.
94. *Ibid*., 291. The preceding sentence on 290 uses ‘substantial evidence’ in the deviant way referred to under ‘Exposition’, i.e. as meaning ‘not very close to 0’.
95. *Ibid*.
96. *Ibid*.
97. *Ibid*.

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