

## **Explaining and Explaining Away in Science and Religion**

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### **Abstract**

There is no good reason to think that there is a necessary conflict between science and the existence of God, but is there still some way in which science might support atheism? The most plausible strategy for atheism is to argue that scientific explanations can remove the need for God in some cases via 'explaining away'. This paper proposes a number of questions to help identify whether explaining away takes place in a given context and explores several cases where explaining away might be thought to occur, with particular attention given to the most obvious case: the theory of evolution.

**Key words:** explanation; explaining away; Bayesian confirmation; evolution; design; fine-tuning; origins of religion

### **Introduction**

The idea that the history of the relationship between science and religion is one of on-going conflict has been comprehensively refuted by historians of science. Summarizing this conclusion, historian of science Colin Russell writes:

The common belief that . . . the actual relations between religion and science over the last few centuries have been marked by deep and enduring hostility . . . is not only historically inaccurate, but actually a caricature so grotesque that what needs to be explained is how it could possibly have achieved any degree of respectability.<sup>1</sup>

Science, however, continues to play a key role in many debates about the existence of God. Theists often claim that certain scientific findings provide confirmation of the existence of God, while atheists often appeal to science in order to undermine religious belief. If atheists are to adopt this approach, arguably, the most plausible strategy is to argue that scientific explanations can remove the need for God in some cases via 'explaining away'. The idea is

that although two explanations might not be logically incompatible with each other, there is no need to infer two explanations when one will do. When I learn that my children were playing in the study, the hypothesis that there has been a burglary becomes redundant as an explanation for the untidiness.

Has science explained away God? Richard Dawkins thinks so. He writes, ‘Historically, religion aspired to *explain* our own existence and the nature of the universe in which we find ourselves. In this role it is now completely superseded by science.’<sup>2</sup> Since Dawkins thinks the only reason to believe in God would be because of the explanations God is supposed to provide, it seems to follow that science has indeed explained away God. This is a very hasty conclusion to draw, however. In appealing to God as an explanation, Richard Swinburne writes, ‘I am postulating a God to explain what science explains; I do not deny that science explains, but I postulate God to explain why science explains.’<sup>3</sup>

One question here is whether theism should be considered in explanatory terms at all. While it is certainly true that God should not be thought of merely as an explanation, it is far from clear why God, as Creator of the universe, should play no explanatory role, especially when we consider God as providing a personal rather than scientific explanation.<sup>4</sup> A more general concern might be that arguments for God’s existence based on explanation do not lead to the God of Christian theism, but in response it can be pointed out that while the arguments of natural theology are indeed limited, they are not inconsistent with the God of Christian theism either. Finally, it is worth noting that it is possible to hold that there is merit in arguments of this kind without their playing a central role in the rationality of religious belief.<sup>5</sup>

Of course, appealing to science is not the only strategy open to atheism. In the context of design arguments, philosopher of biology Elliott Sober distinguishes between Humean and Darwinian responses to design.<sup>6</sup> The Humean response is based not on the ability of science to provide alternative explanations, but on the identification of defects in the design argument itself. By contrast, the Darwinian response to design is not satisfied with the philosophical arguments of Hume, but is only confident in rejecting design when a scientific explanation of the evidence in question is in place. This distinction is not a sharp one, however. Graham Oppy supports a Humean response to design arguments, but draws attention to various explanations that Hume had (or could have had) as alternatives to design.<sup>7</sup> It is far from clear that the alternatives offered, which include an infinite regress, chance and an ensemble of worlds, establish his claim that ‘these considerations show that design was not the best

explanation prior to 1859',<sup>8</sup> but they do show that the Humean approach to design can also involve appealing to alternative explanations.

Nevertheless, Sober's distinction between responses to design where alternative scientific explanations play a central role and other types of responses is still important. The goal in this paper is to explore the former strategy of explaining away in three contexts: evolution, fine-tuning and the origins of religion. In general, there is a question as to when one hypothesis explains away another hypothesis. For example, in the context of design, it cannot be assumed that simply proposing any *possible* alternative explanation is sufficient to explain away design. This paper explores how it might be possible to determine whether explaining away occurs in a given context and then applies this work in several case studies.

The concept of explaining away has been studied in the artificial intelligence literature through the use of probabilistic models.<sup>9</sup> Also, in previous work a Bayesian approach was used to explore explaining away in the context of design arguments and involved defining the conditions under which explaining away occurs.<sup>10</sup> The purpose of the current paper is to extend that work by attempting to identify a number of key questions, which focus on explanation more than probability, in order to help identify when explaining away occurs. An attempt will be made to provide answers to these questions in several different contexts. Given the brief discussion in some of these examples, they are intended to indicate how this approach can be used rather than to provide definitive answers in every case.

### **Explanation and Confirmation**

As noted in the introduction, a Bayesian approach to the notion of explaining away was adopted in previous work. In philosophy of science, Bayesianism is one of the leading approaches to scientific reasoning and is based on the idea that rational agents update their rational degrees of belief, which are represented by probabilities, in accordance with Bayes' theorem.<sup>11</sup> For a hypothesis  $H$  and evidence  $E$ , Bayes' theorem can be expressed as:

$$P(H|E) = \frac{P(E|H)}{P(E)} \times P(H), \quad (1)$$

where  $P(H)$  is known as the prior probability of  $H$  before evidence  $E$  is taken into account,  $P(E)$  is the probability of evidence  $E$ ,  $P(E|H)$  is the probability of the evidence conditional on  $H$  being true and is sometimes referred to as the likelihood of  $H$  or the predictive power of  $H$ , and  $P(H|E)$  is the probability of  $H$  given  $E$ . Bayes' theorem is a well-known theorem of the

probability calculus and so is uncontroversial. Bayesians, however, say that rational agents should update their rational degree of belief in H, taking into account evidence E by a process of conditionalization so that the agent's new (or posterior) degree of belief is given by:

$$P_{Post}(H) = P(H|E) \quad (2)$$

where  $P(H|E)$  can be obtained from Bayes' theorem. There has been much debate about Bayesian conditionalization, but we shall not pursue this topic here.

Another approach to scientific inference is known as inference to the best explanation (IBE).<sup>12</sup> The basic idea in IBE is that various explanatory hypotheses can be compared in terms of how well they explain the relevant evidence and the hypothesis that provides the best explanation is considered to be the one that is most likely to be true. Much debate has surrounded the validity of IBE as a mode of reasoning and the related question of whether it is compatible with Bayesian reasoning.<sup>13</sup> Regardless of whether the two modes of reasoning are fully compatible, the key feature for the purposes of this paper is that explanatory mechanisms can play a role in Bayesian reasoning. In particular, the term  $P(E|H)/P(E)$  on the right-hand-side of Bayes' theorem is sometimes referred to as the explanatory power of H. Suppose, for example, that  $P(E) = 0.1$  and that E is entailed by H so that  $P(E|H) = 1$ . In this case, H has very great explanatory power, a value of 10. Clearly, if the explanatory power is greater than one, then the posterior probability of H is greater than the prior probability. In this case E is said to *confirm* H. This does not mean that H is probably true, but just that it is more probable than it was before evidence E was taken into account. Similarly, if this term is less than one, then the posterior probability of H is less than the prior probability, and in this case E is said to *disconfirm* H. Again, this does not mean that H is probably false, but just that it is less probable than it was before evidence E was taken into account. To summarize:

*If  $P(E|H) > P(E)$ , then by Bayes' theorem  $P(H|E) > P(H)$  and E is said to confirm H.*

*If  $P(E|H) < P(E)$ , then by Bayes' theorem  $P(H|E) < P(H)$  and E is said to disconfirm H.*

This approach, known as Bayesian confirmation theory, is a standard way to treat the impact of evidence on hypotheses in the philosophy of science and it has also been widely used in the context of evidential arguments for the existence of God, most notably by Richard Swinburne.<sup>14</sup> For our purposes, the core notions of confirmation and disconfirmation and

their connection with explanation as noted above provide the background to the notion of explaining away that will be considered in the next section.

## **Explaining Away**

### *Defining 'Explaining Away'*

Suppose that in some context we have an initial hypothesis, HI, for evidence E. Let us suppose that we do not know for sure whether HI is true, but given the nature of the hypothesis, we have good reason to believe that if it were true it would provide a good explanation of E. To take a simple illustration, suppose I arrive home from work and find that my study is extremely untidy, even more so than usual with books and papers all over the floor, drawers pulled out of the desk, etc. Considering the explanatory hypothesis that a burglary has taken place, I reason that this is exactly what I would have expected had a burglary taken place. In such a scenario, the evidence confirms the hypothesis.

To put this in terms of probability, let us suppose that the prior probability of HI (the burglary in the illustration) is  $P(HI)$  and once the evidence E (the evidence of the untidy study) is taken into account this results in a posterior probability  $P_E(HI)$ , where the subscript E denotes that it is the probability once the evidence E has been taken into account. Under the assumption that E confirms H, then  $P_E(HI) > P(HI)$ .

Consider now an alternative hypothesis, HA, which, if it were true, would also provide an explanation of the evidence E. We can assume that the evidence E also confirms HA just as it confirms HI. Now we have two explanatory hypotheses, HI and HA, either of which on its own would explain the evidence. In the context of inference to the best explanation, we would want to compare the explanations to determine which was most likely to be true, but here our goal is different. Instead, consider the scenario where HI and HA may be compatible and where further evidence comes to light to show that the alternative hypothesis HA is indeed true. Now the question is: what effect does this have on the initial hypothesis HI?

Returning to the illustration, suppose that the alternative HA is that my children were playing in the study and caused havoc. Let us further suppose that my wife tells me that this hypothesis is indeed true. Even though the burglary and children playing hypotheses are not necessarily incompatible (it is possible that my children played in an already untidy office due to a burglary that took place earlier in the day), once I learn that my children were playing there is no longer any need to infer a burglary; there is no need for two explanations when one will do. Or, at least, this is reasonable assuming that the children playing

hypothesis accounts for all the evidence sufficiently well. In general, though, we cannot simply assume that learning the truth of HA will render HI redundant.

Once again, let us put this in terms of probability. Having already taken evidence into account when evaluating the probability of HI as expressed by  $P_E(HI)$ , we must now take the truth of the alternative explanation HA into account. We will represent this new probability for HI as  $P_{E,HA}(HI)$ . So now we have three probabilities to bear in mind:

*$P(HI)$  – the prior probability of HI before any evidence was taken into account;*

*$P_E(HI)$  – the probability of HI taking into account the evidence E;*

*$P_{E,HA}(HI)$  – the probability of HI taking into account the evidence E and the alternative hypothesis HA.*

We have already assumed that  $P_E(HI) > P(HI)$ , but what effect does HA have? The different possibilities allow us to determine whether explaining away occurs and, if so, what type of explaining away takes place.

*No Explaining Away* – this occurs if  $P_{E,HA}(HI) \geq P_E(HI)$ . In this case, learning that HA is true does not count against HI. The confirmation that E provides for HI is not weakened by HA and if  $P_{E,HA}(HI) > P_E(HI)$ , then HA actually provides further confirmation of HI.

*Partial Explaining Away* – this occurs if  $P(HI) < P_{E,HA}(HI) < P_E(HI)$ . In this case, the effect of learning that HA is true is to reduce the probability of HI somewhat, but not down to its original level before E was taken into account. The initial confirmation of HI due to E has not been completely negated; there is still some residual confirmation of HI.

*Complete Explaining Away* – this occurs if  $P_{E,HA}(HI) \leq P(HI)$ . In this case, the effect of learning that HA is true is to reduce the probability of HI back down to at most its original level before E was taken into account. The initial confirmation of HI due to E has been completely negated.

*Absolute Explaining Away* – this occurs if  $P_{E,HA}(HI) = 0$ . In this case, the effect of learning that HA is true is to show that HI is false, which is the case if HI and HA are incompatible.

It is worth noting that in English there is some variation in the usage of the terminology ‘explaining away’. For example, one might say that ‘HA explains away HI’ or that ‘HA explains away evidence for HI’. At least in the cases of partial and complete explaining away, there is a three place relation between the initial hypothesis HI, the alternative hypothesis HA and the evidence E. To capture this we could say that ‘HA explains E and explains it away as

evidence for HI', but this is a rather unwieldy expression, so typically one of the other expressions will be used.

More formal definitions of partial and complete explaining away and the conditions under which they occur can be found in an earlier paper.<sup>15</sup> A further issue considered in that article is the degree to which the evidence E and alternative explanatory hypothesis HA together confirm (or disconfirm) the initial hypothesis HI, referred to as the *degree of residual confirmation*. The goal in the current paper is to identify questions that will enable us to determine what kind of explaining away, if any, might occur in a given context and to make some qualitative comments about the degree of residual confirmation.

#### *Determining whether and to what extent explaining away occurs*

Under certain reasonable assumptions about the two explanatory hypotheses, HI and HA, learning that HA is true will partially explain away HI. These assumptions include: E is most likely to occur if both hypotheses HI and HA are true, less likely to occur if one of HI and HA is true and the other false, and still less likely to occur if neither HI nor HA is true.<sup>16</sup>

Five questions will help to address further the questions of whether and to what extent explaining away occurs. The relationship between these questions and the probabilistic analysis of explaining away presented in an earlier paper<sup>17</sup> will be explored in the Appendix. In each case, we will state the question and explain its relevance:

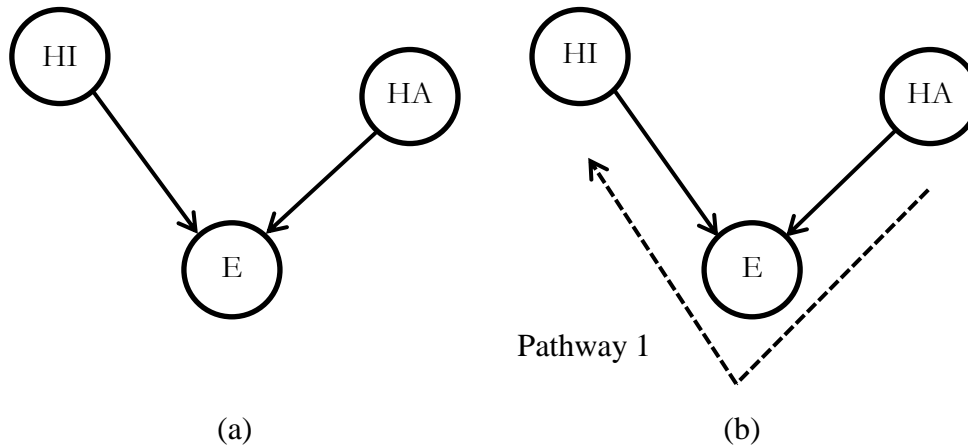
#### *Question 1. Is the alternative explanatory hypothesis HA incompatible with the initial hypothesis HI?*

If the two hypotheses are incompatible, then learning that HA is true tells us that HI must be false. If this occurs then absolute explaining away takes place.

#### *Question 2. How likely is it that the alternative explanatory hypothesis HA would result in evidence E without the help of HI?*

Suppose that in actual fact HA is true and HI is false. In such a scenario question 2 is asking how well the evidence E is accounted for. Other things being equal, the greater the probability of E in this case, the greater the extent to which explaining away occurs. Figure 1 illustrates this situation. Figure 1(a) illustrates that HI and HA both provide explanations for E. As such, E provides evidence for both HI and HA. Figure 1(b) illustrates that learning that HA is true can affect the probability of HI via pathway 1 (pathway 2 appears in figure 2). If HA provides a good explanation of E so that E is as likely to occur without the help of HI as

it is with HI, then pathway 1 represents a negative influence of HA on HI, since the truth of HA makes HI less likely to be true.



**Figure 1.** The solid lines in diagrams (a) and (b) indicate that the evidence E depends on the initial hypothesis HI and on the alternative hypothesis HA. The dashed line in diagram (b) indicates a pathway by which HA can affect HI.

*Question 3. Is the alternative explanatory hypothesis HA known to be true? Or how strong is the independent evidence for it?*

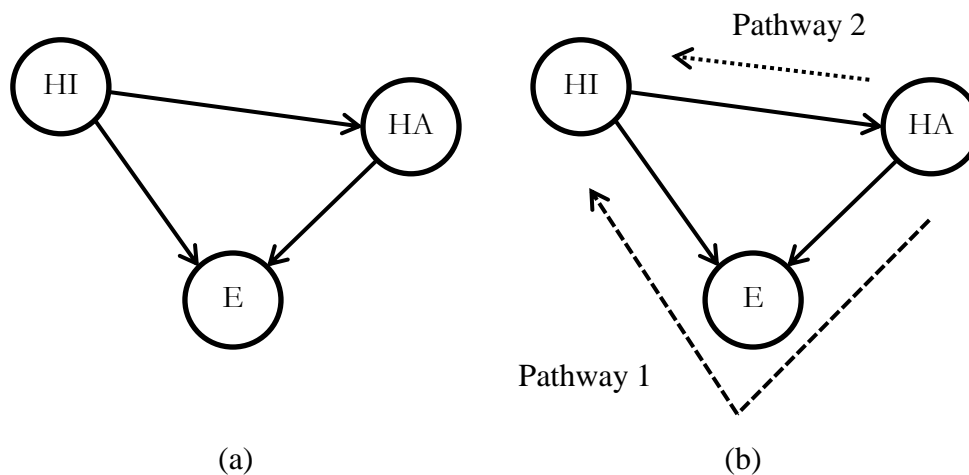
The idea so far has been to explore explaining away under the assumption that the alternative explanatory hypothesis HA is discovered to be true independently. In reality, however, we obtain independent evidence for HA and this evidence might be weak or strong. Suppose there is no independent evidence for HA, then no explaining away takes place. By contrast, if the new evidence entails HA, then this is just equivalent to learning HA to be true. In typical scenarios, other things being equal, the stronger the evidence for HA, the greater the extent to which it explains away HI.

*Question 4. Does the alternative explanatory hypothesis HA depend on HI?*

If there is a positive dependence of HA on HI in the sense that HA is much more likely to occur if HI is true than if HI is false, then this decreases the extent to which explaining away occurs and, if this dependence is strong enough, can give rise to HA providing additional confirmation of HI. Alternatively, if there is a negative dependence of HA on HI in the sense that HA is much less likely to occur if HI is true than if HI is false, then this increases the extent to which explaining away occurs and, if this dependence is strong enough, can result in HA completely explaining away E as evidence for HI. This is illustrated in figure 2, which is



similar to figure 1, except that there is now a second pathway by which HA can influence HI. In order to determine whether and to what extent explaining away occurs, the contributions from both pathways need to be taken into account.



**Figure 2.** As for figure 1 except that HA depends on HI and the dotted line in diagram (b) indicates a second pathway by which HA can affect HI.

*Question 5. Is E taken as providing evidence for HI in the first place (i.e. before we find out that HA is true)?*

If not, then it is not clear that there is anything for HA to explain away. Essentially it means that pathway 1 no longer exists and so HA only has an effect on HI via pathway 2. If HA and HI are incompatible, for example, then learning that HA is true means that HI is false. More generally, if there is a direct positive (negative) association between HI and HA, then learning that HA is true increases (decreases) the probability of HI, but this is via pathway 2 rather than pathway 1.

The different types of explaining away and the five questions identified above will now be used to investigate putative cases of explaining away.

### **Evolution and Design**

The most obvious case where a scientific theory might be thought to explain away religious belief is the theory of evolution. In light of the discussion so far, this raises a number of questions. Consider the various types of explaining away. Does evolution *absolutely* explain away God, which amounts to disproof of the existence of God? Or does it *completely* explain away the existence of God by removing one convincing reason for belief in God? Or does it

*partially* explain away the existence of God, making the existence of God less likely than it would have been otherwise? Or, finally, could it actually make it *more likely* that God exists? The purpose of this section is to explore whether the truth of evolution achieves any of these things. In order to do this, we will simply assume that evolution is in fact true.

### *Absolute Explaining Away?*

Some of the most prominent defenders of a scientifically motivated atheism give the impression that evolution absolutely explains away the need for God. At times Richard Dawkins seems to claim that this is the case:

Natural selection, the blind, unconscious, automatic process which Darwin discovered, and which we now know is the explanation for the existence and apparently purposeful form of all life, has no purpose in mind. It has no mind and no mind's eye. It does not plan for the future. It has no vision, no foresight, no sight at all. If it can be said to play the role of the watchmaker in nature, it is the *blind* watchmaker.<sup>18</sup>

Clearly, if our existence is the result of an unguided process, then this is incompatible with the claim that it is the result of God's plan. As Alvin Plantinga points out:

Now it is part of Christian and other theistic belief that God has created human beings, and created them in his own image. Obviously, if Dawkins's claim is true, this claim is false.<sup>19</sup>

Roughly the argument from evolution to the non-existence of God seems to be:

1. If God exists, human life would be the result of a guided process.
2. If evolution is true, humans are not the result of a guided process.
3. Evolution is true.

Therefore, God does not exist.

Premise 2 is highly questionable, however. As Plantinga points out, the claim that evolution is unguided is a 'metaphysical or theological addition' and he draws attention to various ways in which God could have guided the evolution of life that are compatible with the theory of evolution.<sup>20</sup> For example, God could have set up the initial conditions sufficiently precisely to

ensure the desired outcome or he could directed evolutionary processes throughout the history of life.<sup>21</sup> In the latter case, there is of course the question of *how* God would have acted in a way that is compatible with evolution, but a variety of models of special divine action have been proposed including those based on quantum mechanics,<sup>22</sup> chaos theory<sup>23</sup> or top-down causation, where God acts on the world as a whole.<sup>24</sup> Whatever the merits of particular proposals, they offer ways in which God could interact with the world and so could have guided evolution.

Elsewhere Dawkins seems to have something else in mind. It is not that evolution disproves the existence of God, but that it undermines the design argument for belief in God. Logically speaking, God could guide the evolutionary process in the ways Plantinga mentions, but there is no need to appeal to such guidance. Furthermore, Dawkins thinks that the design argument is the only argument for God worth considering and so with its demise the rationality of belief in God is in tatters. Dawkins writes:

The argument from design is the only one still in regular use today, and it still sounds to many like the ultimate knockdown argument. The young Darwin was impressed by it when, as a Cambridge undergraduate, he read it in William Paley's *Natural Theology*. Unfortunately for Paley, the mature Darwin blew it out of the water. There has probably never been a more devastating rout of popular belief by clever reasoning than Charles Darwin's destruction of the argument from design.<sup>25</sup>

Perhaps his reasoning could be formulated as follows:

1. Darwin demonstrated that the design argument does not provide any reason for belief in God.
2. The other arguments for the existence of God also fail.

Therefore, there are no good arguments for the existence of God.

Apart from being logically valid, this argument has some significant problems: the two premises and the conclusion. Plantinga's discussion of Daniel Dennett's link between evolution and atheism seems to suggest that this argument might provide a summary of his views as well. Not surprisingly, Plantinga takes Dennett to task for his failure to engage with the arguments for the existence of God. Also, if Plantinga is correct, theists should not be concerned about the conclusion: it can be rational to believe in God even in the absence of arguments, since according to Plantinga belief in God is properly basic.<sup>26</sup> Certainly, the

arguments presented by Dawkins and Dennett provide no reason to accept premise 2 and premise 1 is also highly questionable since evolution has no direct bearing on the fine-tuning version of the argument from design.<sup>27</sup>

Perhaps something can be salvaged from the Dawkins-Dennett line of thought, however. Whatever one thinks of the other arguments for the existence of God, doesn't evolution at least remove the need for God in biology? Perhaps it made sense to appeal to a designer to explain the complex structures of living organisms before Darwin, but surely there is no longer any need for design. In the terminology of earlier sections, evolution has completely explained away the need for God in biology.

Many theists as well as atheists seem to think that this conclusion is correct. Evolutionary biologist Francisco Ayala writes:

The strength of the argument-from-design to demonstrate the role of the Creator was easily set forth. Wherever there is function or design, we look for its author. Paley had belaboured this argument with great skill and profusion of detail. It was Darwin's greatest accomplishment to show that the complex organization and functionality of living beings can be explained as the result of a natural process, natural selection, without any need to resort to a Creator or other external agent.<sup>28</sup>

If design arguments are to be defended at all, it is often assumed that their focus must be on the laws of nature or the constants of physics rather than living organisms. As philosopher Peter van Inwagen puts it when introducing his discussion of fine-tuning of the universe:

It is commonly held that the teleological argument has been refuted by the Darwinian account of evolution – indeed by the very existence of the Darwinian account, whether or not we know it to be true. And this may very well be so if we take the scope of the argument to be limited to living organisms (that is, to those objects in the natural world whose features the Darwinian theory gives an account of). But what of the cosmos as a whole?<sup>29</sup>

As the above quotations from theists illustrate, it is not only atheists and agnostics who think that evolution has explained away the need for design in biology even if there might be room for design in physics. Furthermore, even though theistic evolutionists, intelligent design proponents and creationists disagree about the truth of evolution, many seem to agree that, if

true, it would have this effect. The goal in the rest of this section is to determine whether they are correct.

We need to clarify what exactly is supposed to be achieved by explaining away. Apart from absolute explaining away, the other types of explaining away do not establish that there is no designer. Rather, if successful, partial (complete) explaining away undermines partially (completely) the evidential force of the design argument. However, someone could reject a design argument based on biological life while still believing that life is the result of God's plan and is at least in that sense the result of design. But it is still not quite right to say that it is a design argument based on biological life that has been undermined. It could plausibly be argued that biological life provides evidence of design because the evolution of life itself depends on laws of nature and on the fine-tuning of various physical parameters. Note that design in this case has essentially been moved from features of the biological world to general features of the world as expressed in the laws of nature and physical parameters. Here we will construe what is supposed to have been explained away as the idea *that there is evidence for design in biology over and above any evidence for design in the laws of nature and the fine-tuning of the physical parameters.*

#### *Answering the Five Questions*

Let us now turn to the five questions identified in the last section to try to determine whether evolution does explain away design in this sense. First of all, though, we need to state the evidence to be considered and the two hypotheses:

Evidence E – the existence of intelligent life;

Initial explanatory hypothesis D – living organisms are the result of design by God;

Alternative explanatory hypothesis EV – living organisms are the result of evolution (and other natural processes to produce life in the first place).

#### *Question 1. Is evolution EV incompatible with design D?*

As discussed earlier, there does not seem to be any good reason to think this to be the case. Even if it turns out to be incompatible with a *design argument*, it is not incompatible with design in the sense that the designer could have guided the evolutionary process. If evolution is to count against design, it will have to do so via explaining away.

*Question 2. How likely is it that evolution EV would result in intelligent life E without the help of design D?*

A detailed answer to this question is well beyond the scope of this paper, but several points can be noted. A prominent viewpoint advocated by Stephen Jay Gould is that evolution is very sensitive to contingent events such as the extinction of the dinosaurs.<sup>30</sup> According to this view, had things worked out slightly differently, we would not be here, so although evolution explains the existence of human life and intelligent life more generally, it only does so with very low probability. Interestingly, the nineteenth century philosopher and theologian James McCosh discussed the idea that the contingency view of evolution might provide support for design. Summarizing his view, historian John Hedley Brooke writes:

If the human race were the product of so many contingencies, then either it was a more monumental fluke than atheists had ever dreamed, or, as McCosh wryly put it, the prevalence of accident could not be accidental ... The point that struck McCosh was that the evolution of man had required “adjustment upon adjustment of all the elements and all the powers of nature towards the accomplishment of an evidently contemplated end.”<sup>31</sup>

An alternative to the contingency view has been advocated by Simon Conway Morris, who claims that the evolution of intelligent life was almost inevitable. In particular, he emphasizes the role of evolutionary convergence, which refers to the evolution of the same biological trait in independent lineages.<sup>32</sup> Related to this is his notion of ‘inherency’, which is the idea that templates for complex structures were formed long before the complex structures themselves and hence that even relatively simple organisms contained within them the potential for much greater complexity and even intelligence. If Conway Morris is right that the evolution of intelligent life was almost inevitable, this would mean that there is considerable scope for explaining away to occur via pathway 1 (see figure 2). However, he also argues that the origin of life was highly fortuitous, requiring a very specific kind of solar system and very favourable conditions on Earth. As we shall see, this will become relevant when considering question 4.

While the examples of evolutionary convergence are striking, Conway Morris’s claim concerning the inevitability of intelligence is controversial. His work points to evolutionary progress in the sense of increasing complexity and sophistication in sensory modalities, for example, and it also suggests that evolution is more structured and constrained than might

have been imagined. However, as Elliott Sober points out, even if each transition in the evolution of human beings was very probable, it does not follow that the overall process was very probable since multiplying large probabilities together many times results in a very small probability.<sup>33</sup> Furthermore, many would claim that even when convergence is taken into account, the evolution of intelligence is still dependent on certain levels of complexity having been attained, which may well have depended in turn upon various contingent events. Richard Dawkins, for example, emphasizes the improbability of various key transitions in the history of life, claiming that the origin of the eukaryotic cell and the origin of consciousness may be ‘even more momentous, difficult and statistically improbable’ than the origin of life.<sup>34</sup> If the probability of intelligent life arising via an unguided evolutionary process is very low due to transitions of this kind, it does not mean that evolution is false, but it does weaken its ability to explain away the evidence for design.<sup>35</sup> This means that although evolution may well have a negative influence on design via pathway 1 (see figure 2), arguably this effect is not as significant as might have been thought.

*Question 3. Is evolution known to be true? Or how strong is the independent evidence for it?*

The approach taken in this paper is simply to assume not only that there is evidence for evolution, but that it is known to be true. The goal is to determine whether it explains away design given this assumption.

*Question 4. Does evolution depend on design?*

As noted earlier, it can be claimed that since evolution depends on the laws of nature, it does depend on design, but given that we are considering evidence for design specific to the biological context, such a move does not help design in this case. Paul Draper has argued that far from depending on design, we would not expect the designer (God) to use an evolutionary process.<sup>36</sup> As such, evolution would count against design. But consider the alternative hypothesis EV that living organisms are the result of evolution (and other natural processes to produce life in the first place). Let us grant that if life is the result of design then the probability of EV is lower than the probability of some alternative process involving special creation by the designer. Even so, the relevant question is whether EV is more probable given design than it would be without design. And it seems reasonable to think that it is more probable because it is plausible to think that the probability of life coming into existence by an unguided process is very low given the complexity of even the simplest organisms. Clearly, this belief could be undermined by a convincing explanation showing that the origin

of life is not all that improbable as the result of unguided natural process, but in the absence of such an explanation the belief seems reasonable. As such EV would actually provide evidence *for* design. Thus, evolution would have a positive influence on design via pathway 2.

Consider again Conway Morris's point about the inevitability of the evolution of intelligence. To the extent that this idea strengthens evolution's ability to account for intelligent life with high probability (see question 2) and so to strengthen its ability to explain away design via pathway 1, it also raises the question of why it is that evolution should work in such a way as to make intelligent life probable. This suggests that the laws of nature place greater constraints on evolutionary processes than we might have imagined and arguably this provides a further reason for thinking that these laws have been designed. It would support the claim that evolutionary processes are dependent on design and so strengthens the positive influence on design via pathway 2. Given Conway Morris's views on the highly specific conditions required for the origin of life in the first place, this suggests a very strong influence on design via pathway 2. His views on evolution are generally taken to imply that it is more congruent with a theistic than atheistic worldview and this is borne out in the analysis here since although evolution might undermine design via pathway 1, it strongly supports it via pathway 2.

*Question 5. Is the existence of intelligent life taken as providing evidence for design in the first place (i.e. before we take evolution into account)?*

Unless intelligent life would provide evidence for design in the absence of evolution there is nothing for evolution to explain away. Of course, there are more general objections to design arguments including those based on the existence of suffering in the natural world. It is worth noting in response that it is quite possible to hold that suffering counts against the existence of God and that intelligent life counts in favour of the existence of God. Furthermore, it is still worth considering whether *evolution* explains away design in biology *if* it is granted that design would have some force in the absence of evolution. Given the answers to the five questions, it seems that it does not explain away design, but before reaching this conclusion another objection needs to be considered.

#### *An Objection*

A general concern about appeals to design in biology either before or after Darwin is that it involves the God-of-the-gaps. Note, however, that design is not being invoked to fill in a



*causal* gap in the scientific account. Appealing to God to intervene causally in a process that is otherwise understood is highly problematic as illustrated by Newton's idea that God needed to intervene from time to time to keep planetary orbits stable. The design argument being considered here does not require such interventions and is quite compatible with an evolutionary account; indeed the whole point is to explore whether there is a case for design in biology under the assumption that evolution is true. If there is a gap, it is an *explanatory* gap rather than a *causal* gap and so it is no more open to the God-of-the-gaps charge than the claim that fine-tuning of the universe is very improbable in the absence of design. While much more could be said about the merits or otherwise of design arguments, it certainly seems plausible to think that intelligent life would count in favour of design in the absence of evolution and indeed that it did so before Darwin. Richard Dawkins seems to grant that there was some force to the design argument before Darwin since he claims that it was Darwin who defeated it.

It is worth making a brief comparison with the ideas presented here and those of Intelligent Design (ID). Although a full *biological design argument* has not been presented here,<sup>37</sup> there is agreement with ID that there is a biological case for design, but there are also a number of points of disagreement. First, an eliminative approach to design is prominent in the ID literature, but serious objections have been raised against this approach.<sup>38</sup> By contrast, a comparative Bayesian approach is advocated here. Secondly, while ID is compatible with an evolutionary process of some kind, its proponents generally consider design to be incompatible with standard evolutionary theory. By contrast, standard evolutionary theory has been assumed in this paper. Thirdly, ID is generally proposed as a new *scientific* hypothesis, whereas here design is proposed as a philosophical argument based on current science and so it is more akin to design arguments based on fine-tuning in cosmology. Finally, ID does not identify the designer. While a Bayesian approach would not necessarily need to identify the designer, it would arguably be stronger if the argument is considered as part of an overall case for the God of theism.<sup>39</sup>

### *Conclusions on evolution and design*

If it is granted that intelligent life provides evidence for design before taking evolution into account, does it still do so afterwards? In other words, does evolution explain away design in biology? The answers to the five questions strongly suggest that it does not completely explain away design. This is partly due to the answer to question 2. If the probability of intelligent life evolving without design is very low, then this limits the ability of evolution to

explain away design via pathway 1 even though it would partially explain it away via this pathway. Also, the answer to question 4 suggests that evolution might actually count in favour of design via pathway 2, although it is doubtful that this is sufficient to completely negate the partial explaining away via pathway 1. Overall, it seems reasonable to conclude that although evolution might partially explain away design in biology, it does not do so completely. The residual degree of confirmation also depends on the contribution from the two pathways and so, if the negative influence via pathway 1 is not too large and there is a positive influence via pathway 2 as has been argued, then the residual degree of confirmation may well be quite high. If this conclusion is correct, there is still force to the design argument in biology over and above any force the design argument might have in the context of the laws of nature and parameters of physics. No doubt the answers provided to at least some of the five questions could be disputed, but the main point of the discussion is to show that it is far from obvious that significant explaining away occurs.

### **Other Case Studies**

In this section, two further case studies where explaining away might be thought to occur are considered: fine-tuning and the origins of religion. As in the case of evolution, a proper study of each of these topics would require a much more detailed treatment than that presented here. However, it must be remembered that the goal here is to illustrate how claims about explaining away can be evaluated and how the significant factors can differ from one case to another.

#### *Fine-tuning*

The discovery that the existence of carbon-based life depends crucially upon various physical parameters lying within very narrowly defined constraints has breathed considerable life into the design argument. There has been much discussion of examples of fine-tuning and detailed arguments for design based on fine-tuning which will not be recounted here.<sup>40</sup> Furthermore, whether a multiverse explains away fine-tuning as evidence for design has also been considered in a previous article<sup>41</sup> and so the treatment here will be very brief since the idea is just to explore how the discussion in the previous work relates to the questions identified in section 3.

Fine-tuning constitutes the evidence, design the initial explanatory hypothesis and a multiverse the alternative explanatory hypothesis, which is sometimes claimed to explain away design. Let us consider the five questions in turn.

*Question 1. Is a multiverse incompatible with design?*

No, it seems clear that there is no logical conflict, so a multiverse would not disprove design; if it is to count against it design, it will have to do so via explaining away.

*Question 2. How likely is it that a multiverse would result in fine-tuning in the absence of design?*

Arguably, it would make the existence of a universe fine-tuned for life very likely indeed. If there are sufficiently large numbers of universes with different physical parameters, then it is very likely that a universe with suitable values for life will exist. This makes explaining away (and even complete explaining away) feasible in principle via pathway 2.

*Question 3. Is the multiverse hypothesis known to be true? Or how strong is the independent evidence for it?*

There is a lot of debate about the status of a multiverse as a scientific hypothesis and whether there could be evidence for it.<sup>42</sup> We could certainly not say that there is strong evidence for a multiverse. This presents a real problem for the multiverse in terms of explaining away. If we assume that a multiverse would not itself require design (see question 4 below), we can grant that if we knew that a multiverse exists, then this would explain design via pathway 1, but the mere possibility of a multiverse does not achieve this.

*Question 4. Does the multiverse hypothesis depend on design?*

Robin Collins has argued that a number of factors need to be in place for a multiverse of the right kind to exist.<sup>43</sup> We will not evaluate this argument here, but if he is right this would certainly weaken any explaining away that might otherwise occur since a multiverse would have a positive influence on design via pathway 2.

*Question 5. Is fine-tuning taken as evidence for design?*

Yes, many people (both theists and atheists) consider it as evidence for design and so, if this viewpoint is to be undermined, explaining away is necessary.

In summary, question 3 is the Achilles' heel for the multiverse where explaining away is concerned and Collins' answer to question 4 provides a further possible problem. There is no reason to think that any significant level of explaining away occurs in this case. It is doubtful

whether even partial explaining away takes place and so there is a high residual degree of confirmation of design.

### *Origins of Religion*

Another area where explaining away might be thought to occur is in the context of evolutionary explanations of the origin of religion.<sup>44</sup> In this case, the evidence is the existence of belief in God and the question is whether evolutionary accounts of such belief explain it away as evidence for God. There are various types of evolutionary account, but the discussion here will be kept at a more general level.<sup>45</sup> Some care needs to be taken to ensure the hypotheses are not formulated in such a way as to trivially entail the evidence such as ‘belief in God is the result of evolution’. For the purposes of this paper, the initial hypothesis can be taken to be ‘God exists’ and the alternative hypothesis that ‘humans are the product of evolution’. A recent exchange on this topic took place between Joseph Bulbulia, who argues that evolutionary accounts plausibly undermine religious beliefs, and Michael Murray and Jeffrey Schloss who take the opposite view.<sup>46</sup> The five questions will now be considered in the context of their exchange.

#### *Question 1. Is the evolutionary hypothesis incompatible with the existence of God?*

In his example to illustrate how Bayesian reasoning can be applied to this debate, Bulbulia formulates mutually exclusive hypotheses, ‘Gods exist’ and ‘Gods do not exist’, with evolutionary accounts being incorporated into the latter, yet elsewhere in his article it seems clear that he thinks there is no logical incompatibility between religious belief and evolutionary explanations. Arguably, Bulbulia’s argument would be better formulated in terms of the compatible hypotheses proposed here and the claim that religious belief is undermined via explaining away. There is no good reason to think that the existence of God (or Gods) is logically incompatible with evolutionary accounts; indeed, it is far from obvious that evolutionary accounts of belief in God are easier to reconcile with atheism than with theism. If such accounts are to undermine belief in God in some way, they will have to do so via explaining away rather than as a result of logical incompatibility.

#### *Question 2. How likely is it that evolutionary accounts would give rise to belief in God without any input from the theistic hypothesis?*

This is an ongoing topic of debate and is rather difficult to answer in the abstract because it depends on which evolutionary mechanisms are under consideration. A variety of accounts

have been proposed including memetic, group selection and evolutionary by-product accounts and advocates of one approach are not always persuaded by the merits of the others. Also, as in the earlier discussion of evolution of intelligent life, questions could be asked about the probability of various steps in the evolution of religious belief. For example, supposing that evolution accounts for the origin of beliefs regarding the existence of humans after death and granting that belief in God would motivate pro-social responses as Bulbulia points out, how likely is it that the transition to belief in God would occur? As in the earlier discussion, even if the probability of some such transitions were low, this would not necessarily undermine the value of such accounts, but it would raise a question mark over their ability to explain away belief in God. Nevertheless, given that there is something of a consensus that at least some evolutionary explanations do account for the evidence as Bulbulia and also Murray and Schloss seem to agree, we will assume that evolutionary accounts are at least moderately likely to give rise to belief in God. This means that there is scope for explaining away to occur via pathway 1.

*Question 3. Is the evolutionary hypothesis known to be true? Or how strong is the independent evidence for it?*

Given the way in which the evolutionary hypothesis has been formulated here, we will assume that it is known to be true. As such, this enhances the scope for explaining away to occur. Of course, were the problem to be formulated differently, the answer to question 3 might be different. For example, if the evidence was ‘the nature and diversity of religious belief’ and the alternative hypothesis was ‘belief in God is the result of evolution’, then different answers would be needed for several questions.

*Question 4. Does the evolutionary hypothesis depend on the existence of God?*

The question can be put like this: is it more probable that evolution would result in humans if there is a God than if there is not? Related to the discussion provided earlier on the evolution of intelligent life there are reasons to think that the answer is ‘yes’. As Murray and Schloss point out in their response to Bulbulia, things might have been very different if God does not exist. For example, the physical universe might not have existed or, if it had, it might not have been fine-tuned for life. We can also add that the difficulties involved in reducing mental states to physical states provide reason for believing that the production of human beings with mental states such as beliefs (including beliefs about God) via unguided evolutionary processes is not too high. Again, this does not necessarily constitute a problem

for evolution, but it does suggest that the evolution of humans is more probable in a theistic universe than in a naturalistic one. Thus arguably there is a positive dependence between the two hypotheses via pathway 2, which reduces the scope for explaining away.

*Question 5. Is the existence of belief in God taken as evidence for the existence of God?*

Perhaps the fact that belief in God is widespread could be used as evidence for the existence of God, but it is not clear how much weight this would add to the case for God's existence. If so, there is not much to be explained away in the first place. More generally, however, the argument from religious experience is taken by some theists to contribute to an overall case for the existence of God and it could be argued that evolutionary accounts have the potential to undermine it. While Bulbulia is sceptical about the weight that should be given to other theistic arguments, he recognizes that if religious believers have other reasons for their beliefs that are independent of evolutionary accounts, the impact of such accounts on their beliefs might be quite small.<sup>47</sup>

In summary, since there is no intrinsic incompatibility between the existence of God and evolutionary accounts of such belief, having reasons to accept the latter does not necessarily undermine the former. Nevertheless, it could still do so via explaining away and the answer to question 2 suggests there is scope for that to occur. However, the reasons given in response to question 4 arguably provide at least as strong a case for thinking that any undermining via pathway 1 will be compensated for by the positive dependence on pathway 2. Thus, if these arguments are correct there is no good reason to think that even partial explaining away occurs. Furthermore, even if it does, the answer to question 5 suggests that it would not be particularly significant since arguably the existence of belief in God and arguments from religious experience provide at best only limited evidence for God in the first place.<sup>48</sup>

## **Conclusions**

A general approach has been proposed to help determine whether belief in God or some other aspect of theistic belief has been explained away by an alternative explanatory hypothesis. In particular, five questions have been identified to facilitate this process. These questions relate to whether the two hypotheses are incompatible, how well the alternative hypothesis accounts for the evidence without support from the theistic hypothesis, whether there are good reasons to believe the alternative hypothesis is actually true, whether the alternative hypothesis actually depends on the theistic hypothesis, and whether the evidence should have been

considered to support the theistic hypothesis in the first place. Explaining away is not an all-or-nothing matter and so different types have been identified – absolute, complete, partial – as well as a further scenario where the alternative hypothesis might actually provide further evidence for the theistic hypothesis.

Three different case studies have been considered with most attention given to the case of evolution and design. In all three cases, it has been argued that neither absolute nor complete explaining away take place although the reasons for this differ in each case. In particular, it has been argued that there is no good reason to think that evolution explains away design even in the context of biology. While aspects of the arguments could certainly be disputed, it should be clear that there is no easy way to move from ‘science explains’ to ‘science explains away God’ and those who wish to make such claims need to engage in detailed arguments relating to the five questions identified in this paper.

Clearly, the brief discussion of each of the case studies is intended to illustrate the potential of the approach rather than to provide definitive answers. Given that science plays a prominent role in debates about the existence of God and that scientific progress is often claimed to explain away theistic belief, it is hoped that the approach proposed in this paper will help to shed some new light.

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### **Appendix**

In order to justify the relevance of the questions identified in the text to explaining away, some of the results on the formal probabilistic account of explaining away proposed in an earlier paper are considered. First of all, consider the following definition of the **degree of residual confirmation**:

***Definition.** Let each of  $H_I$  and  $H_A$  be an hypothesis such that if it were true it would provide an explanation for evidence  $E$ . Suppose that  $E$  confirms  $H_I$ . The **degree of residual***

**confirmation** of hypothesis  $HI$  by evidence  $E$  once another hypothesis  $HA$  is discovered to be true is given by  $\log [P(HI|E,HA)/P(HI)]$ , where  $P$  is a probability distribution.<sup>49</sup>

The idea underlying this definition is that even though  $HA$  might partially explain away  $HI$ , unless it completely explains it away there will still be some residual confirmation of  $HI$  by  $E$  after  $HA$  has been taken into account and this is what the degree of residual confirmation (DRC) is intended to capture. If  $P(HI|E,HA) = P(HI)$ , then complete explaining away occurs and the DRC = 0. Alternatively, if  $P(HI|E,HA) > P(HI)$ , then either no explaining away or partial explaining away occurs and the DRC is positive, while if  $P(HI|E,HA) < P(HI)$ , then DRC is negative.

In the case where the alternative hypothesis,  $HA$ , is known to be true the DRC is given by:

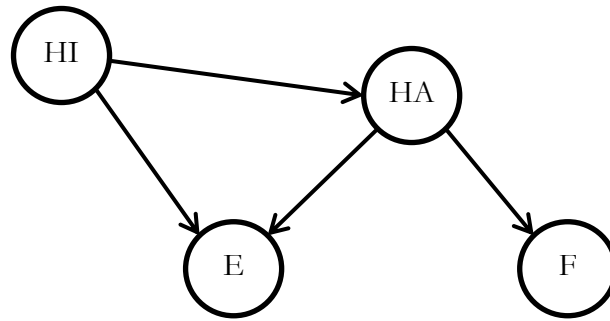
$$\log \left[ \frac{P(HI|E, HA)}{P(HI)} \right] = \log \left[ \frac{1}{P(HI) + L \times P(\sim HI)} \right] \quad (A1)$$

where

$$L = \frac{P(E|\sim HI, HA)P(HA|\sim HI)}{P(E|HI, HA)P(HA|HI)}. \quad (A2)$$

Suppose now that  $HA$  is not known to be true, but there is some independent evidence for it denoted  $F$ . This can be represented diagrammatically as in figure 3. In this case the DRC is given by  $\log [P(HI|E,F)/P(HI)]$ . The posterior probability of  $HI$  given  $E$  and  $F$  can be expressed as:

$$P(HI|E, F) = P(HI|E, HA)P(HA|E, F) + P(HI|E, \sim HA)P(\sim HA|E, F). \quad (A3)$$



**Figure 3.** As for figure 2 except that  $F$  represents evidence for  $HA$  that is independent of  $HI$  and  $E$  given  $HA$ .



In other words,  $P(HI/E,F)$  is a weighted sum of the case where  $HA$  is known to be true,  $P(HI/E,HA)$ , and the case where  $HA$  is known to be false,  $P(HI/E,\sim HA)$ . Note that in the case where  $F$  provides conclusive evidence for  $HA$ , it follows that  $P(HA/E,F) = 1$  and so  $P(HI/E,F) = P(HI/E,HA)$ , which means that the DRC is as specified in (A1).

Consider now each of the questions in turn.

*Question 1. Is the alternative explanatory hypothesis  $HA$  incompatible with the initial hypothesis  $HI$ ?*

The relevance of this question is straightforward. If  $HI$  and  $HA$  are incompatible, then  $P(HA/HI) = 0$  and hence if  $HA$  is known to be true, then  $HI$  is known to be false. Suppose that  $HA$  is not known to be true, but there is independent evidence  $F$  for it as shown in figure 3. Since  $HI$  and  $HA$  are incompatible, such evidence lowers the probability of  $HI$  and so in this case at least partial explaining away will occur.

*Question 2. How likely is it that the alternative explanatory hypothesis  $HA$  would result in evidence  $E$  without the help of  $HI$ ?*

In equation (A1), if  $L = 0$ , then  $P(HI/E,HA) = 1$  and so no explaining away occurs.

Alternatively, if  $L \geq 1$ , then complete explaining away occurs.  $L$  is the product of two terms:  $P(E/\sim HI,HA)/P(E/HI,HA)$  and  $P(HA/\sim HI)/P(HA/HI)$ . Focussing on the first of these terms, we can see that if  $E$  is just as likely given  $HA$  with or without  $HI$ , i.e.  $P(E/\sim HI,HA) = P(E/HI,HA)$ , then this contributes to a higher value of  $L$  and so to explaining away.

Alternatively, if  $E$  is much less likely given  $HA$  without  $HI$  than it is given  $HA$  with  $HI$ , i.e.  $P(E/\sim HI,HA) \ll P(E/HI,HA)$ , then this contributes to a lower value of  $L$  and so reduces the extent of explaining away.

*Question 3. Is the alternative explanatory hypothesis  $HA$  known to be true? Or how strong is the independent evidence for it?*

Suppose that if  $HA$  were known to be true it would partially explain away the evidence for  $HI$ , i.e.  $P(HI/E,HA) < P(HI/E)$ . This means that  $P(HI/E,\sim HA) > P(HI/E)$  and from equation (A3) it follows that  $P(HI/E,F) > P(HI/E,HA)$  provided the evidence for  $HA$  is not conclusive. In fact, assuming that explaining away would occur if  $HA$  were known to be true, then the weaker the independent evidence  $F$  for  $HA$ , the greater the DRC and so the less the extent of explaining away.

*Question 4. Does the alternative explanatory hypothesis HA depend on HI?*

As noted in the discussion of question 2,  $L$  depends on the term  $P(HA/\sim HI)/P(HA/HI)$ . If  $HA$  is positively dependent on  $HI$ , i.e.  $P(HA/HI) > P(HA/\sim HI)$ , this contributes to a lower value of  $L$  and so reduces the extent of explaining away.

*Question 5. Is E taken as providing evidence for HI in the first place (i.e., before we find out that HA is true)?*

Suppose  $E$  provides strong evidence for  $HI$ , but significant partial explaining away or complete explaining away occurs if  $HA$  is discovered to be true. This provides scope for undermining  $E$  as evidence for  $HI$  and if  $E$  is the best or only reason for believing in  $HI$ , then such explaining away could be considered as significantly undermining the evidential basis for belief in  $HI$ . By contrast, if  $E$  only provides weak evidence for  $HI$  in the first place, even complete explaining away may not be all that significant for the overall evidential basis for belief in  $HI$ .

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<sup>1</sup> C. A. Russell, 'The Conflict Metaphor and its Social Origins', *Science and Christian Belief*, 1 (1989), 3–26.

<sup>2</sup> Richard Dawkins, *The God Delusion* (London: Bantam Press, 2006), 347, emphasis in original.

<sup>3</sup> Richard Swinburne, *Is There a God?* (Oxford: Oxford University Press, 1996), 68.

<sup>4</sup> See Richard Swinburne, *The Existence of God*, 2nd ed. (Oxford: Oxford University Press, 2004), 26–47.

<sup>5</sup> This seems to be the view of Alvin Plantinga. Although the approach in this paper assumes an evidentialist perspective, arguably similar points about explaining away could be made from a non-evidentialist perspective in terms of dealing with defeaters. See Plantinga's *Warranted Christian Belief* (Oxford: Oxford University Press, 2000), 357–373.

<sup>6</sup> Elliott Sober, 'The Design Argument', in W. Mann (ed.), *The Blackwell Guide to the Philosophy of Religion* (Oxford: Blackwell, 2004), 117–147.

<sup>7</sup> Graham Oppy, *Arguing About Gods* (Cambridge: Cambridge University Press, 2006), 232–238.

<sup>8</sup> *Ibid.*, 235.

<sup>9</sup> See for example Judea Pearl, *Probabilistic Reasoning in Intelligent Systems*, (San Francisco: Morgan Kaufman, 1988); M. P. Wellman and M. Henrion, 'Explaining "Explaining Away"', *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 15 (1993), 287–292.

<sup>10</sup> David H. Glass, 'Can Evidence for Design Be Explained Away?', in J. Chandler and V. Harrison (eds.), *Probability in the Philosophy of Religion* (Oxford: Oxford University Press, 2012), 79–102.

<sup>11</sup> See for example Colin Howson and Peter Urbach, *Scientific Reasoning: The Bayesian Approach*, 3rd ed. (Chicago: OpenCourt, 2005).

<sup>12</sup> See Peter Lipton, *Inference to the Best Explanation*, 2nd ed. (London: Routledge, 2004).

<sup>13</sup> See *ibid.*, chapter 7.

<sup>14</sup> Richard Swinburne, *The Existence of God*.

<sup>15</sup> Glass, 'Can Evidence for Design Be Explained Away?'

<sup>16</sup> These assumptions result in partial explaining away if there is no direct relationship between  $HI$  and  $HA$ , i.e. they are marginally independent. Even if there is a direct relationship, explaining way will still occur unless there is a sufficiently strong direct positive dependence between  $HI$  and  $HA$  so that explaining away would not occur at all or a sufficiently strong direct negative dependence between  $HI$  and  $HA$  so that complete explaining away would occur.

<sup>17</sup> Glass, 'Can Evidence for Design Be Explained Away?'

<sup>18</sup> Richard Dawkins, *The Blind Watchmaker* (London: Penguin, 1988), 5.

<sup>19</sup> Alvin Plantinga, *Where the Conflict Really Lies* (Oxford: Oxford University Press, 2011), 14.

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<sup>20</sup> It might be thought that even if design is compatible with some sort of evolutionary process it is not compatible with a *Darwinian* process since it depends on random mutations, but random just means that there is no physical mechanism that causes mutations *because* they are beneficial.

<sup>21</sup> If God's guidance is confined to the initial conditions, that would still go beyond usual arguments based on design in the laws of physics, since it requires what we might call superfine-tuning at the level of the initial conditions in order to ensure that intelligent life would come into existence.

<sup>22</sup> See, for example, Robert J. Russell, 'Quantum Physics and the Theology of Non-Interventionist Objective Divine Action', in P. Clayton and Z. Simpson (eds.), *Oxford Handbook of Religion and Science* (Oxford University Press, 2006), 579-595; see also Plantinga's proposal and discussion of special divine action in 'What is "Intervention"?'', *Theology and Science*, 6 (2008), 369-401.

<sup>23</sup> See John Polkinghorne, *Science and Christian Belief* (London: SPCK, 1994).

<sup>24</sup> See Arthur R. Peacocke, *Theology for a Scientific Age* (Oxford: Blackwell, 1990).

<sup>25</sup> Dawkins, *The God Delusion*, 79.

<sup>26</sup> For a detailed defence of this claim, see Plantinga, *Warranted Christian Belief*.

<sup>27</sup> Dawkins does offer a further argument against belief in God on the grounds that God is highly improbable, which he claims is based on Darwinism. For a response see David H. Glass 'Darwin, Design and Dawkins' Dilemma', *Sophia*, 51 (2012), 31-57.

<sup>28</sup> Francisco J. Ayala, 'Intelligent Design: The Original Version', *Theology and Science*, 1 (2003), 17.

<sup>29</sup> Peter van Inwagen, *Metaphysics* (Boulder, Colorado: Westview Press, 1993), 131.

<sup>30</sup> Stephen J. Gould, *Wonderful Life: The Burgess Shale and the Nature of History* (New York: Norton, 1989).

<sup>31</sup> John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991), 315. A similar view can be found in Keith Ward, *God, Chance and Necessity* (Oxford: Oneworld, 1996), chapter 4.

<sup>32</sup> Simon Conway Morris, *Life's Solution: Inevitable Humans in a Lonely Universe* (Cambridge: Cambridge University Press, 2003).

<sup>33</sup> Elliott Sober, 'Contingency or Inevitability? What would happen if the evolutionary tape were replayed?', *New York Times*, November 30, 2003.

<sup>34</sup> Dawkins, *The God Delusion*, 140. We will not focus here on the issue of consciousness since many, including Conway Morris, are sceptical about attempts to explain it in purely material terms. However, there may still be a relevant point about the development of corresponding complex brain structures.

<sup>35</sup> Richard Swinburne claims that there is 'a very considerable, but not unanimous, scientific view that the laws and initial conditions of our universe make it very probable that human life will evolve in more than one place in the universe' (*The Existence of God*, 189) and on this basis does not appeal to a design argument based in biology in the way described here. He notes, however, that if it is very improbable, as claimed here, such an argument would have force.

<sup>36</sup> Paul Draper, 'Evolution and the Problem of Evil', in L. Pojman and M. Rea (eds.) *Philosophy of Religion: An Anthology*, 5th ed. (Belmont, California: Thomson Learning, 2008), 207-219.

<sup>37</sup> Clearly, for a full *biological design argument* a detailed case would need to be made in place of the assumption that there would be a good case for design in the absence of an alternative explanation.

<sup>38</sup> The eliminative approach is found in Michael Behe's arguments from irreducible complexity (*Darwin's Black Box*, New York: Touchstone, 1996) and is spelt out formally in William Dembski's explanatory filter (*The Design Inference*, Cambridge: Cambridge University Press, 1998). For criticisms from a Bayesian perspective see B. Fitelson, C. Stephens and E. Sober, 'How Not to Detect Design', *Philosophy of Science*, 66 (1999), 472-488 and Timothy McGrew, 'Toward a Rational Reconstruction of Design Inferences', *Philosophia Christi*, 7 (2005), 253-298.

<sup>39</sup> These points are certainly prominent in the ID literature, although to what extent they are necessary features of ID is a question for ID proponents to address.

<sup>40</sup> See Robin Collins, 'The Teleological Argument: An Exploration of the Fine-Tuning of the Cosmos', in W. L. Craig and J. P. Moreland (eds.), *Blackwell Companion to Natural Theology* (Chichester: Wiley-Blackwell, 2009), 202-281; Swinburne, *The Existence of God*, 172-188.

<sup>41</sup> Glass, 'Can Evidence for Design Be Explained Away?'

<sup>42</sup> See for example the articles by George Ellis and Don N. Page in B. Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007).

<sup>43</sup> Robin Collins, 'The Multiverse Hypothesis: A Theistic Perspective', in Carr, *Universe or Multiverse?*, 459-480.

<sup>44</sup> See, for example, Daniel Dennett, *Breaking the Spell: Religion as a Natural Phenomenon* (New York: Viking, 2006). Dennett draws on the work of Pascal Boyer (*Religion Explained: The Evolutionary Origins of Religious Thought* [New York: Basic Books, 2001]) and Scott Atran (*In Gods we Trust: The Evolutionary Landscape of Religion* [Oxford: Oxford University Press, 2002]).

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<sup>45</sup> Dennett, for example, mentions five different types of evolutionary explanation.

<sup>46</sup> Joseph Bulbulia, 'Bayes and the Evolution of Belief', in J. P. Moreland, C. Meister and K. A. Sweis (eds.), *Debating Christian Theism* (New York: Oxford University Press, 2013), 223-241; Michael J. Murray and Jeffrey P. Schloss, 'Evolutionary Accounts of Religion and the Justification of Religious Belief', in *Debating Christian Theism*, 242-258.

<sup>47</sup> The reason for Bulbulia's scepticism is based on the idea that evolutionary mechanisms can result in biased judgments about these matters. While this may be true, such biases are not unique to these arguments and it would require much more by way of argument to show that traditional arguments provide no justification for belief in God.

<sup>48</sup> The assumption here has been that explaining away is to be evaluated in the context of an evidential case for the existence of God. If the rationality of belief in God is understood in a non-evidentialist sense in terms of reliability of belief forming mechanisms, then Bulbulia's argument could be understood as providing a defeater and the answers to questions 1 to 4 as a response to it. For more on this point see the response by Murray and Schloss.

<sup>49</sup> This is definition 3 from Glass, 'Can Evidence for Design Be Explained Away?' The discussion here is based on results presented in that paper. For example, equations (A1) and (A2) correspond to equation (12) in the original paper.