TWO (FAILED) VERSIONS OF HUME'S ARGUMENT AGAINST MIRACLES

(forthcoming in *Faith and Philosophy*)

Nathan Rockwood

Hume's argument against believing the testimony of miracles is the most influential treatment of the topic, but there is not yet a consensus on how to interpret his argument. Two arguments are attributed to him. First, Hume seems to start with the infrequency of miracles and uses this to infer that the testimony of a miracle is *exceedingly unlikely*, and this then creates strong but defeasible evidence against the testimony of any miracle. Second, perhaps Hume takes the constancy of our experience of the laws of nature as *decisive* or *indefeasible* evidence against the testimony of any miracle. I explain the basis for each of these interpretations of Hume's argument, and then develop a novel criticism of the latter interpretations: namely, any inductive inference depends on the relevant similarity between the observed and the unobserved, but we may have reason for thinking that purported miracles are not relevantly similar, and thus our past experience cannot be used as reliable evidence about the testimony of (some) miracles.

David Hume famously argues that miracles violate the laws of nature and that this casts doubt on the testimony of miracles. Hume's argument against believing the testimony of miracles is far and away the most influential treatment of the topic. Yet, for all the attention it receives, there is not yet a consensus on how to interpret Hume's argument. Interpreters disagree about the strength of the intended conclusion: does Hume intend to show that, *in principle*, no testimony of a miracle could rationally be believed or merely that, *in any actual or realistic case*, the testimony of a miracle should be rejected? In this paper, I explain the basis for these competing interpretations and then argue that Hume's argument is a failure no matter how you interpret it.

Traditionally, people have thought that Hume intended to prove that it would never be rational to believe the testimony of any miracle.[1] Hume announces that he has discovered "a decisive argument" against miracles that will "be an everlasting check to all kinds of superstitious delusion."[2] After developing his objections, he concludes, "it is an established maxim, that no human testimony can have such force as to prove a miracle."[3] So, he seems to

think the inference is decisive; no further evidence from testimony could rationally persuade us to believe the miracle occurred. But, as many point out, this is an implausibly strong conclusion.[4] Surely it is *possible*, in at least some hypothetical examples, for the evidence from testimony to provide sufficient reason for believing the testimony of a miracle.

Hume's recent defenders concede that it is *possible* for the testimony of a miracle to be rationally believed, and they think Hume acknowledges this. And yet, they argue, Hume intends to prove that miracles are *exceedingly unlikely* and so, in any actual or realistic case, the testimony of a miracle should not be believed.[5] They argue that, on Hume's view, past experience creates a strong presumption against the testimony any miracle. This presumption could at least in principle be overcome by overwhelming evidence to the contrary, and thus Hume's objection is *defeasible* evidence against believing the testimony of miracles. For example, if every historian and cultural tradition said that beginning on January 1, 1600, there were eight days of darkness, then we ought to believe it.[6] But, in reality, no miracle is so well attested.[7] Lacking this kind of overwhelming testimony, goes this argument, we ought to believe what is most likely the case, and there is a strong presumption that there was no miracle, and hence we generally should not believe the testimony of a miracle.

My aim is to show that both versions of the argument fail. Let us grant everything that Hume wants as an assumption in his argument. Miracles are violations of the laws of nature. All observed events (or all but, possibly, the cases in question) conform to the laws of nature. Further, laws have predictive and explanatory power. Thus, normally, laws give us very good reason, perhaps decisive reason, for guiding our judgments about what did happen or will happen or would happen in ordinary cases. Grant Hume all of that, and still, I say, he has given a theist no compelling reason to reject the testimony of a miracle. For, inductive inferences depend on

the assumption that the observed cases are relevantly similar to the unobserved cases, but ordinary events that abide by the laws of nature *are not relevantly similar* to purported cases of divine intervention. Given this dissimilarity, we cannot use the observation of ordinary cases as evidence against purported cases of miracles.

With that brief overview, I turn now to explicating the arguments against miracles that are attributed to Hume. In the final section, I will then develop my objection to Hume's argument.

1. The Probability Argument

According to (what I will call) the *probability* interpretation of Hume's argument, Hume intends to show that miracles are exceedingly unlikely and so, in any actual or realistic case, the testimony of a miracle should be rejected. An advantage of the probability interpretation of the argument is that it avoids drawing the implausibly strong conclusion that no possible testimony of a miracle could be rationally believed. An objection to this interpretation, though, is that Hume seems to claim to draw a stronger conclusion than this interpretation would allow. In this section, I explicate this version of the argument and the reasons for and against attributing this argument to Hume.

Hume appeals to our past experience as evidence against miracles. An inductive argument uses past experience, or *observed* cases, to make an inference about (for us) an *unobserved* case. According to the probability interpretation, an inductive inference about miracles should be based on observed frequency in similar cases. We give "weight and authority" to a proposition "in proportion as we have found it to be *more or less frequent*."[8] Some causes "are entirely uniform and constant"; for example, "gravity is an universal law,

which has hitherto admitted of no exception."[9] And, he continues, "where the past has been

entirely regular and uniform, we expect the event with the greatest assurance."[10] But there are

other cases "where *different effects* have been found to follow from causes, which are to

appearance *exactly similar*."[11] Since judgments about probability depend on observed frequency,

the probability that an event occurred "admits of a diminution, greater or less, in proportion as

the fact is more or less unusual."[12]

      Hume uses the infrequency of observed miracles to establish that miracles are extremely

unlikely to occur. He argues:

> Nothing is esteemed a miracle, if it ever happen in the common course of nature. It is no
> miracle that a man, seemingly in good health, should die on a sudden: because such a
> kind of death, *though more unusual* than any other, has *yet been frequently observed* to
> happen. But it is a miracle, that a dead man should come to life; because that has *never
> been observed* in any age or country. There must, therefore, be a uniform experience
> against every miraculous event, otherwise the event would not merit that appellation. And
> as a uniform experience amounts to a proof, there is here a direct and full *proof . . .*
> against the existence of any miracle;[13]

An unusual event is infrequent and so improbable. A miracle "has never been observed" and so,

given the evidence from experience, a miracle is *extremely* improbable.

      According to the defenders of this interpretation, it is important not to overstate the

strength of the conclusion.[14] The conclusion, say they, is *not* that a miracle could never be

rationally believed; rather, the conclusion is that our past experience makes it exceedingly

unlikely that a miracle occurred. An assessment of the *overall* evidence would need to include

both the evidence from experience and the evidence from testimony. However, Hume seems to

think that the argument in Part 1 of "Of Miracles," shows that, given the evidence from

experience, the probability of a miracle is extremely low. The low probability of a miracle then

creates a strong presumption against any testimony of a miracle, but, on this interpretation, that

presumption could at least in principle be overcome by overwhelming evidence to the contrary.

Perhaps the strongest evidence in favor of the probability interpretation of the argument is that Hume follows his argument against miracles (quoted above) with a "general maxim" that specifies when the testimony of a miracle can and cannot be rationally accepted:

> no testimony is sufficient to establish a miracle, unless the testimony be of such a kind, that its falsehood would be more miraculous, than the fact, which it endeavours to establish . . . always reject the greater miracle. If the falsehood of his testimony would be more miraculous, than the event which he relates; then, and not till then, can he pretend to command my belief or opinion.[15]

According to the general maxim, we should weigh the evidence from experience against the evidence from testimony, and we should believe the testimony of a miracle only if it outweighs the evidence from experience. Defenders of the probability argument interpretation emphasize that Hume does not here explicitly state that the testimony of a miracle can never be believed.[16] Instead, Hume asserts that the testimony of a miracle should be believed only if it is more likely to be true than false. So, goes the argument, the conclusion of Part 1 leaves open the possibility that a testimony of a miracle can be rationally believed.

Further, in Part 2, Hume himself describes a case where the testimony of an apparent miracle should be believed. He says, "suppose, all authors, in all languages, agree, that, from the first of January 1600, there was a total darkness over the whole earth for eight days." In that case, "instead of doubting the fact, [we] ought to receive it as certain."[17] Robert Fogelin takes this example to show that "even if the standards for testimony in behalf of miracles are high, they remain, in principle, satisfiable."[18]

Another consideration supporting the probability interpretation of the argument is the existence of Part 2. If Hume had already established in Part 1 that no miracle could be rationally believed, then that would seem to make Part 2 superfluous. In Part 1 Hume grants that testimony might be so reliable as to amount to a "proof," but in Part 2 he retracts that assumption.[19] He

argues instead that the testimony of miracles is especially unreliable and hence provides little positive probable evidence for the truth of the claim. Alexander George argues that Hume's conclusion that miracles should not be believed "is only established by taking Parts 1 and 2 together."[20] According to George, in Part 1, Hume argues for the conditional claim, stated in the general maxim, that if evidence from testimony of a miracle does not outweigh the evidence from experience, then the testimony of the miracle should be rejected.[21] In Part 2, Hume then argues for the antecedent of the conditional, securing the conclusion that the testimony of a miracle should be rejected. This interpretation nicely explains how the pieces of the argument in "Of Miracles" fit together.

The probability version of Hume's argument can be summarized as follows. First, miracles are rarely, if ever, observed, and so the probability of a miracle given our experience is extremely low; the probability of a miracle, given our experience, is so low that it would take very strong evidence from testimony to outweigh the evidence from experience. Second, the evidence from testimony for a miracle is not very good anyway, and so (in any actual or realistic case) the evidence from testimony is not sufficient to justify a belief in a miracle.

While the probability argument can plausibly be attributed to Hume, there are also grounds for questioning this interpretation. For example, consider the eight days of darkness case, which is supposed to show that Hume is open to believing in the testimony of a miracle. Although Hume prefaces the example by saying "there may possibly be miracles, or violations of the usual course of nature, of such a kind to admit of proof from human testimony,"[22] it is not clear that he simultaneously grants (1) that the event occurs and (2) that it is really a miracle. For although he concedes we should believe the event occurred, he then says that we "ought to search for the causes" of the event and that it can be believed because the "event [is] rendered

probable by so many analogies."[23] I suspect Hume thinks the event can be believed precisely

because it is not really a violation of the laws of nature.[24] At best, Hume does not make it clear

that the event is really a miracle. Consequently, the example does little to show that Hume

believes it is possible to rationally believe the testimony of a miracle.

Moreover, Hume follows this with an example of an event that he clearly does regard as a

miracle, and his conclusion is that testimony of this miracle could never be rationally believed.[25]

Hume says:

> But suppose, that all the historians who treat of England, should agree, that, on the first of
> January 1600, Queen Elizabeth died . . . and that, after being interred a month, she again
> appeared, resumed the throne . . .

He concludes:

> I must confess that I should be surprised at the concurrence of so many odd
> circumstances, but should not have the least inclination to believe so miraculous an event.
> I should not doubt of her pretended death, and of those other public circumstances that
> followed it: I should only assert it to have been pretended, and that it neither was, nor
> possibly could be real.[26]

Unlike the prior case, there is no ambiguity that this is indeed a miracle ("it is a miracle, that a

dead man should come to life"[27]). Hume confesses that, despite the considerable evidence from

testimony, he could not possibly believe a miracle like this actually occurred. Contrary to the

probability interpretation, Hume does not appear to be open to believing the testimony of

miracles when the event is unquestionably a miracle.

The probability argument seems to understate the strength of Hume's conclusion. Hume

begins by claiming his proof against miracles is "a decisive argument"[28] and later draws the

categorical conclusion that "no human testimony can have such force as to prove a miracle."[29]

He also says the testimony of a miracle, when used as evidence for religion, is "full proof of a

cheat" and is "sufficient, with all men of sense, not only to make them reject the fact, *but even*

reject it without farther examination."[30] Hume has no business, on the probability interpretation, rejecting any miracle outright; he should be weighing the evidence for and against the miracle rather than simply dismissing the testimony of a miracle without further investigation.[31] In my view, then, the probability interpretation fails to capture the decisiveness which Hume claims for his argument.

The probability version of Hume's argument uses our uniform past experience as a premise and then draws the conclusion that a miracle is extremely improbable and so it would be exceedingly difficult (though not impossible) to rationally believe the testimony of a miracle. But if Hume were arguing only that miracles are unlikely, then even if his argument was successful it might nonetheless be rational to believe in the testimony of miracles, such as of the resurrection.[32] Furthermore, Hume himself seems to be drawing a much stronger conclusion than the probability argument allows. So, although the probability argument is seen as persuasive and can reasonably be attributed to Hume, it is not clear that Hume takes himself to be making the probability argument.

2. The "Proof" Against Miracles

According to (what I will call) the *proof* interpretation of Hume's argument, Hume intends to show that no testimony of a miracle could ever be rationally believed. This is how Hume has traditionally been understood, yet this position strikes many as implausible. Critics from then until now have argued that, surely, the evidence from testimony for a miracle can *at some point* outweigh the evidence from experience. As explained in the previous section, Hume's defenders often concede this point but then suggest that Hume never claimed to have drawn a categorical conclusion against believing the testimony of a miracle in the first place. In this section, I first

review the evidence that Hume does indeed intend to be drawing the categorical conclusion that

no testimony of a miracle can be rationally believed and, more importantly, *explain why* Hume

thinks this categorical conclusion is justified. I want to explain why this kind of proof should be

considered plausible even if not ultimately successful.

Hume claims to have discovered "a decisive argument" against believing the testimony of

miracles.[33] For, the testimony of miracles "is *less than* the evidence for the truth of our senses"

and "a weaker evidence can *never* destroy the stronger,"[34] implying that the testimony of a

miracle should *never* be believed. Later, he concludes his criticism of miracles by saying, "it is

an established maxim, that *no* human testimony *can have* such force as to prove a miracle."[35] So,

Hume seems to be drawing the categorical conclusion that no testimony of a miracle should be

believed.

Hume also describes his argument against miracles as a "proof,"[36] which he takes to be a

distinctive kind of argument.[37] He says:

> Mr. Locke divides all arguments into demonstrative and probable. In this view, we must
> say, that it is *only probable* all men must die, or that the sun will rise to-morrow. But . . .
> we ought to divide arguments into demonstrations, *proofs*, and probabilities. By proofs
> meaning such arguments from experience as leave no room for doubt or opposition.[38]

A proof is not an *a priori* demonstration. As others have pointed out, Hume does *not* simply

define a law of nature as an exceptionless generalization and then define a miracle as an

exception to an exceptionless regularity.[39] Instead, it is an "argument from experience";[40] it is an

inductive argument from observed cases to a conclusion about (for us) an unobserved case. But a

proof is not *merely* a probable argument either: he says the conclusion of a proof is "more than

probable."[41] Hume apparently thinks of a proof as having the status of something in between *a

priori* certainty and mere probability;[42] a proof is decisive in a way that a mere probability

argument is not.

One distinctive feature of a proof is that it provides decisive evidence for its conclusion. Hume says a proof "leave[s] no room for doubt or opposition."[43] In a letter to Hugh Blair, Hume explains, "The proof against a miracle, as it is founded on invariable experience, is of that *species* or *kind* of proof which is full and certain when taken alone, because it implies no doubt, as is the case with all probabilities."[44] Hume here indicates that the proof against miracles "when taken alone . . . implies no doubt": no further information is needed; all we need to know is that the miracle violated the laws of nature and *a fortiori* we can "reject it without farther examination."[45] By contrast, a probability argument against the testimony of miracles might create a strong presumption against believing in a miracle, but "when taken alone" it would not settle the matter.[46]

The proof interpretation here differs significantly from the probability interpretation. According to the proof interpretation, Hume argues that violating the laws of nature is decisive evidence, taken on its own, for rejecting any testimony of a miracle. Defenders of the probability interpretation adamantly insist that violating the laws of nature is not on its own decisive evidence; we must *also* consider the evidence from testimony which, at least potentially, could outweigh the evidence from experience. They point to Hume's discussion of conflicting proofs as texts supporting his openness to believing the testimony of miracles. The proof interpretation, though, does not allow for the possibility that the evidence from testimony could outweigh the evidence from experience. Alan Hájek, for example, convincingly argues that any contest between a proof from experience against a miracle and a proof from testimony for a miracle would end in a draw, with the result that we should suspend judgment and so *not believe* the testimony of the miracle.[47] So, the proof interpretation takes the violation of the laws of nature to

be decisive evidence on its own against the testimony of a miracle whereas the probability interpretation denies this.

However, it is not yet clear *why*, on this interpretation, Hume thinks his proof is so decisive. Here it will be profitable to examine Hume's grounds for making the inference. If we are clear about what the premises of his argument are, then it will be easier to see why he thinks he can conclude that no testimony of a miracle should ever be believed.

One explanation of the difference between a proof and probability argument is that a proof is an argument from *uniform* past experience whereas a probability argument is from *varied* experience.[48] As noted above, we make judgments about probability "*in proportion* as we have found it to be more or less frequent" and "when we transfer the past to the future, . . . we transfer all the different events, *in the same proportion* as they have appeared in the past."[49] If 75% of observed As are also Bs, then, given our evidence from experience, we should conclude that there is a 75% chance that an unobserved A is also B. As Earman points out, this also implies that if 100% of observed As are also Bs, then we should conclude that there is a 100% chance that an unobserved A is also B.[50] Further, Hume indicates that probability depends on observing *some* but *not all* As are Bs, whereas a proof depends on *all* observed As also being Bs.[51] The difference between an extremely small probability is markedly different than a probability of zero; if the probability of a miracle given our experience is extremely small, then the miracle can at least potentially be made probable given other evidence from testimony, whereas if the probability of a miracle given our experience is zero then it remains zero no matter what the evidence from testimony is.[52]

A proof of the sort just described has the misfortune of being wildly implausible. On this interpretation, a "proof" depends *only* on the premise that all observed As are Bs. Any observed

universal generalization will do. So long as all of the observed As have so far been Bs, we can conclude that the probability that an unobserved A is *not* B is zero. But that is absurd. For example, suppose all observed moa birds lived no longer than *n* years. Should we conclude that the probability that some unobserved moa bird lived longer than *n* years is *zero*? Should we reject any testimony, no matter how credible, that a moa bird lived longer than *n* years just because it has never been observed before? Hardly. An inference from uniform experience does not, on its own, justify such a strong conclusion.

Furthermore, Hume seems to concede that not all uniform past experience amounts to a proof. He imagines a prince from a warm climate who has only observed water as a liquid. The prince has "constant and uniform experience" of water as a liquid.[53] He then is told by a traveler that, where he is from, it gets so cold that water becomes solid. On the one hand, Hume says the prince "reasoned justly" rejecting the testimony on the basis of his past experience. On the other hand, he concedes that the prince could believe a "very strong testimony" that water becomes solid. Hume explains this concession by saying that the event is "*extraordinary*" but "it is not *miraculous*"[54]—i.e., water turning into ice does not violate an established law of nature. Hume here implicitly acknowledges that not all observed universal generalizations have the status of laws.

While one distinctive feature of a proof is that it is decisive, and a second distinctive feature is that it is an inference from a well-established law of nature. Indeed, the argument is decisive *because* it is an inference from the laws of nature:

> A miracle is a violation of the *laws of nature*; and as a *firm and unalterable experience has established these laws*, the proof against a miracle, from the very nature of the fact, is as entire as any argument from experience can possibly be imagined. Why is it *more than probable*, that all men must die; [etc.] . . . unless it be that, that these events are found agreeable to the laws of nature, and there is required a violation of these laws, or in other words, a miracle to prevent them?[55]

The premise of a proof is not *any* observed universal generalization whatsoever, but a well-established *law of nature*. We should doubt the testimony of a miracle *because* it violates the laws of nature.

Hume rightly sees an inference from an established law of nature as being an especially strong kind of argument. It is common now for philosophers of science to distinguish between *laws of nature* and *accidentally true generalizations*. An accidental generalization just happens to be true; it is a mere correlation (without causation). It is widely recognized that laws of nature support inductive and counterfactual inferences in a way that merely accidental generalizations do not: even if all observed moa birds lived no longer than *n* years, this does not guarantee that an unobserved moa bird *has* lived no longer than *n* years, nor does it show that no moa bird *could* live to be older than *n* years. An inference from an accidental correlation, like the age of the moa bird or the liquid water in Hume's Indian prince example, is merely a probability argument, and such a probability could be outweighed by other evidence. But, on Hume's view, an inference from a law of nature is stronger than that. An inference from the laws of nature is decisive.

One common objection to Hume's argument is that, if successful, it would rule out believing previously unobserved events, and that is implausible.[56] For example, if it was apparent, after many observations in a wide variety of circumstances, that all observed moas lived no longer than *n* years, and yet a scientist reports finding a moa that lived longer than *n* years, then we ought to believe the testimony of the scientist notwithstanding the many observations to the contrary. So likewise, goes the argument, Hume ought to be open to believing the testimony of a miracle even if a miraculous event of that kind had never been observed before. On Hume's view, though, the miracle is not rejected *merely* because it had not been

observed before. Hume can allow that the testimony of the scientist can rationally be accepted because this report would be an exception to merely an accidental generalization (not a law of nature), but, on the proof interpretation, he makes no such allowances for believing the testimony of a miracle because it would violate a law of nature (not just an accidental regularity).

A proof is an inference from an established law of nature and Hume rightly regards this as an especially strong kind of evidence. I can infer that, because of the law of gravity, if I were to let go of a pen, then the pen would fall to the ground. This inference is not tentative. I do not regard it as highly probable but remain, in principle, open to persuasion to the contrary. I need no other evidence. In that sense, then, I take the law of gravity "when taken alone" as decisive evidence, as settling the matter, concerning what happened. Perhaps others will be more cautious. But as for me, again setting aside cases of putative divine intervention, I find Hume's notion of a proof quite compelling. Intuitively, my inference from the laws of nature is much stronger than the inference from the observed generalization that there are no moa birds older than n years. It is one of the goals of philosophy of science to explain why an inference from the laws of nature are much stronger than an inference from a mere universal generalization.[57] But however that explanation goes, Hume is right to think that an inference from the laws of nature should be regarded as a distinctive kind of argument, and his claim that an inference from the laws of nature would be decisive is plausible.

Hume's appeal to the laws of nature is complicated by his view of laws. Interpreters usually (and in my view correctly)[58] hold that, for Hume, laws are a kind of universal generalization:

> There are *some causes, which are entirely uniform and constant* in producing a particular effect; and no instance has ever yet been found of any failure or irregularity in their operation. Fire has always burned, and water suffocated every human creature: The

production of motion by impulse and gravity is a *universal law*, which has hitherto admitted of no exception.[59]

Hume here implies that causes are laws, and a causal relation is a universal generalization. But while all laws are generalizations, not all universal generalizations are laws. Hume famously argues that causation is a "constant conjunction" of successive, contiguous events.[60] Universal generalizations that are *not* of successive, contiguous events are therefore not causal relations. So, Hume takes a law to be a *type* of universal generalization.[61]

Defining a law as a universal generalization complicates Hume's argument against miracles. First, if a law is a universal generalization of the form *all As are Bs* and a miracle is a violation of this universal generalization (so, *there is an A that is* not *B*), then we can know *a priori* that every testimony of a miracle is false. But this is not the argument that Hume intended to be making; he intends to make an inductive argument from our past experience. Second, a miracle would, if actual, make it so the universal generalization is false: if there is an A that miraculously is *not* B, then it is not true that *all As are Bs* and hence a miracle would falsify any law of nature.

To avoid these problems, David Johnson suggests that "*a miracle is a violation of an apparent law of nature*" but holds that that, if a miracle occurred, the *apparent* law of nature would not really be a law of nature after all.[62] For, Johnson insists, "the laws of nature, whatever else they may be, are . . . universal . . . generalizations which, furthermore, are *true*" and the generalization would be false if the miracle occurred, and hence the miracle would falsify the law.[63] On this view, "the 'law' is true *or* the 'miracle' occurred,"[64] but *it cannot be both*. This is not what Hume intended. First, Hume does not conclude that we should believe the "miraculous" event happened but then imply that we should revise our understanding of the laws; rather, he intended to show that because of the laws we ought to believe the miraculous event did not

happen.[65] Second, he describes an event that "if it were real, it might . . . be denominated a miracle; because, in *fact*, it is contrary to these laws,"[66] which implies that the law would remain a law even if a miracle occurred.

Better, John Mackie points out that theists often hold both that there is a law of nature and that the law has been violated.[67] He argues that the laws tell us what happens *absent divine intervention*[68]: if it is a law that As are Bs then, absent divine intervention, all As are Bs. (The law that As are Bs entails that $\forall x((Ax \, \& \sim Ix) \rightarrow Bx)$. The non-intervention condition ($\sim I$) is not necessarily part of the law—scientists do not add such clauses to their formulations of the laws— but nonetheless whether a given event obeys the laws or not depends on the non-intervention condition.) On this view, we could consistently maintain both that a miracle occurred and that it is an exception to a genuine law of nature.[69] This improved concept of laws of nature allows for the possibility of miracles and, in that case, miracles can no longer be ruled out by an *a priori* argument.[70] A miracle is then taken to be God, or another supernatural agent, causing an exception to what would have otherwise been a universal generalization (for Hume, a constant conjunction of successive, contiguous events).

According to the proof interpretation, Hume uses past experience as evidence for the laws of nature and then use the laws of nature as decisive evidence against the testimony of a miracle. This is in line with the traditional interpretation of Hume. Historically, interpreters have taken the premise of Hume's argument to be that miracles violate well-established laws of nature and the conclusion to be that no testimony of a miracle can be believe. What I have done, perhaps, is clarify *why* Hume regards his proof as more than a mere probability argument: it is *not* merely an inference from an observed *universal generalization*, but an inference from an established *law of*

nature; it is *because* the inference is from the laws of nature that he regards his proof against the testimony of miracles as so decisive.

While I find the textual evidence for this interpretation to be persuasive, the interpretation is open to challenges. Defenders of the probability interpretation, for example, will ask: why would Hume put forward his "general maxim" that states when the testimony of a miracle could be rationally believed if he regarded the argument in Part 1 as decisive proof against miracles? And why write Part 2, which aims to undermine the reliability of the testimony of witnesses? If Hume's proof had settled the matter, then the general maxim and Part 2 seem superfluous.

In my view, Hume's general maxim does specify the conditions for when it would be rational to believe a miracle, conditions which Hume implies cannot be satisfied. The maxim states, roughly, that we should believe the testimony of a miracle if, and only if, it is more likely to be true than false. Hume does accept that. So does Locke. And Sherlock. And Annet. And Campbell. And Price. And Paley. And everyone else in the eighteenth-century debate on miracles.[71] The general maxim is not the grand conclusion of Part 1; it is the starting premise. Hume knows that the proponents of miracles all accept the general maxim and the point in bringing it up is to imply that, given his proof against miracles in the prior paragraph, the conditions for rational belief in the testimony of miracles cannot be met.

Also, some commentators point out that Hume softens the conclusion of his argument in later editions of the *Enquiry*. In the first edition (1748), Hume concludes, "Upon the whole, then, it appears, that no testimony for any kind of miracle *can ever possibly* amount to a probability, much less a proof," which reads as a categorical claim about the testimony of miracles. But Earman and Fogelin respectively point out that, in the second edition (1768), Hume softens the conclusion by changing "*can ever possibly*" to "*has ever*", which they take to suggest that Hume

does not intend to draw a categorical conclusion rejecting the testimony of miracles.[72] However, in the very same paragraph, Hume states his "general maxim" that "*no human testimony* can have such force as to prove a miracle"; [73] this maxim remains a categorical prohibition against believing the testimony of a (religious) miracle even in the second edition. It is not clear, then, that he fully retreated from making the categorical conclusion.

Further, proponents of the probability interpretation typically grant that Hume is making an argument against miracles in Part 1, though they deny that Hume thinks this argument is decisive. They insist that a final rejection of the testimony of miracles must consider both the evidence from past experience and the evidence from testimony. Still, the evidence from experience creates a *presumption* against believing the testimony.[74] The Indian prince justifiably rejects the testimony that water becomes solid because this testimony conflicts with his uniform past experience. Likewise, the probability interpretation will concede, Hume thinks our uniform past experience creates a *presumption* against the truth of the testimony of miracles. The probability and proof interpretations agree, then, that Hume takes our past experience of the laws of nature to be *some* evidence against believing the testimony of a miracle. The disagreement concerns how decisive Hume takes that argument to be.

In my view, both the probability interpretation and the proof interpretation are plausible arguments in themselves and plausibly attributed to Hume. I prefer the proof interpretation since it better captures the strength of the inference (as he describes it), and I am also sympathetic to Hume's view that an inference from a law of nature is more than a mere probability. However, both interpretations are plausible and I need not insist on settling this interpretive dispute here. The objection I develop in the next section will apply to both the probability and the proof versions of Hume's argument.

3. The Failure of Hume's Argument

Hume uses the evidence from experience to undermine the testimony of miracles. Given our

evidence from experience, Hume thinks we can make the judgment that the probability of a

miracle in any given occasion is unlikely. This initial judgment about the probability of a miracle

can be called the "prior" probability of a miracle, meaning the probability of a miracle *prior* to

considering the evidence from testimony. The "posterior" probability would then be the

probability of a miracle *after* considering the evidence from testimony. Interpreted this way,

Hume's argument is that the prior probability of a miracle is so low that the posterior probability

of a miracle, or probability after considering the testimony of a miracle, is still too low to be

rationally believed.[75]

The standard objection to Hume is that, even if the prior probability of a miracle is

extremely low, the evidence from testimony *can* be strong enough to overcome this prior

improbability.[76] Hume's defenders emphasize, and his critics typically concede, that the

probability of a miracle given our experience is extremely low. But, his critics argue, the

evidence from experience is not the *only* thing that matters. The probability of a miracle given

testimony may be high, high enough that the probability of a miracle given experience and

testimony taken together is high. Further, Christian apologists, perhaps among others, argue that

some testimonies of miracles do in fact outweigh the evidence from experience against them.[77]

Hence, Hume has failed to show that we should reject the testimony of miracles (even in actual

cases).

While I agree with the standard criticism that the evidence from testimony can make a

miracle likely even if the prior probability of a miracle was low, my criticism of Hume's

argument is different. My claim is that, contrary to Hume, the prior probability of a miracle (or

the probability of a miracle given our experience but before considering the evidence from

testimony) is *not* always extremely low. If the probability of a miracle is not unlikely, then there

is not an especially high burden of proof that the evidence from testimony needs to meet. Far

from being an "everlasting check," the evidence from experience would not give us any reason to

reject the testimony of a miracle.

Both the probability and proof versions of Hume's argument are inductive inferences

from past experience. As Hume himself recognizes, all inductive inferences depend on the

assumption that the observed cases are *relevantly similar* to the unobserved cases.[78] Conversely,

if our past experience is *not relevantly similar* to (some of) those cases in which we have

testimony that a miracle occurred, then our past experience is not evidence about what happened

in those cases. So, if our past experience is not relevantly similar to purported miracles, then the

probability of a miracle given our experience is not low in those cases. Hence, Hume's appeal to

past experience would be all for naught. If so, then Hume's inductive argument against miracles

fails.

Hume argues that the probability of a miracle given our past experience is extremely low,

but *what* past experience does he have in mind? Perhaps he thinks *all* our past experience is

evidence against miracles. He describes experience of the laws of nature as "entirely uniform and

constant" which "has hitherto admitted of no exception,"[79] and elsewhere claims our "uniform

experience" is evidence "against every miracle" because such miracles have "never been

observed in any age or country."[80] Setting aside the question begging claim that miracles have

"never been observed," Hume may be thinking something like this: everyday, all-day, we

observe that events obey the laws of nature, and so we should think that *all* events obey the laws of nature. If so, then perhaps all our past experience is relevant to evaluating a purported miracle.

But this seems wrong. If I let go of my pen and see it fall, is that evidence that Jesus was not resurrected? Maybe Jesus was resurrected and maybe he wasn't, but that the pen fell seems totally irrelevant. *Not all* of our experience is relevant to the probability of miracles. Presumably, the only experience that matters for determining the probability of a miracle is our observation of *relevantly similar* cases. Perhaps this is why Hume says miracles are "contrary to uniform experience of the course of nature in cases *where all the circumstances are the same*."[81] Only our experience of *relevantly similar* cases can provide us with evidence against miracles.

The relevantly similar cases, if there be any, are those experiences that provide empirical evidence *that it is a law*. The empirical evidence for the law of gravity is what gives me reason to doubt that my pen will miraculously hover in midair when I let it go. Fair enough. But a law of nature tells us only what happens *absent divine intervention*. If it is a law that As are Bs, this tells us that *if there is no divine intervention* then an A will be B. But the law *does not tell us* what happens when there is divine intervention. (Alternatively, if Hume does assume that there are no exceptions to the laws, then he is begging the question.) So, our empirical evidence that it is a law that As are Bs is not relevant to those cases in which God intervenes.

Now suppose, just for the sake of argument, we have independent reasons for thinking that God exists and would want to miraculously intervene when certain conditions are met. It may be difficult to independently specify these conditions. Although I will not attempt to defend a view about what these conditions are, I will briefly mention two possibilities. First, Locke, Paley, and others in the eighteenth-century debate on miracles thought that they could establish, independent of any testimony of miracles or appeal to revelation, that if God were to reveal

certain truths then he would provide miracles as evidence for the revelation (indeed, this is the kind of argument Hume is attacking).[82] Second, if petitionary prayer has any efficacy, then perhaps we could reasonably believe that God would want to miraculously intervene in answer to prayer. Again, I am not here insisting that either of these suggestions are correct, but they are plausible candidates to consider when trying to identify what conditions, if any, God might want to perform a miracle.

For the sake of argument, let us just stipulate that we have reason to believe that God would want to miraculously intervene when conditions XYZ are satisfied. The probability of a miracle in XYZ cases is not low. If God wills there to be a miracle, then there will be a miracle. Further, we are assuming that we have reason to believe that God would want a miracle to occur in this type of case, and hence the probability of a miracle in XYZ cases is not low.

For my argument to work, I do not need to claim that a miracle is *likely* in XYZ cases (i.e., that a miracle would occur in all or most XYZ cases); I need only the claim that a miracle is *not unlikely* in XYZ cases. Hume's argument depends on the claim that the probability of a miracle is extremely low, perhaps one in a million or lower, and the low prior probability of a miracle then makes it difficult or impossible for the testimony of a miracle to be rationally believed.[83] But in XYZ cases, the probability of a miracle is *not* unlikely. When we are told by a reliable witness that the coin landed on heads (a one in two chance), or that a coin landed on heads five times in a row (about one in thirty chance), we should believe the testimony.[84] So long as an event is not especially unlikely, reliable testimony that the event occurred is probably true. And since a miracle would not be unlikely in an XYZ case, reliable testimony of a miracle in an XYZ case would probably be true.

Hume might try to insist that the empirically confirmed laws of nature make a miracle very unlikely, but it is here that we come up against the limitation of Hume's appeal to the laws of nature. A law that As are Bs tells us that, *absent divine intervention*, all As are Bs. The law does *not* tell us that an A would be B *when there is divine intervention*. If God wants there to be a miraculous exception to the law, then, notwithstanding that there is a law that As are Bs, God will make it so that there is an A that is not-B. A miracle is compatible with the law. We can accept all the empirical evidence for the law and yet still allow that God made an exception in a given case. So, when Hume points out that a miracle violates the laws of nature, that fact alone does not provide us any evidence at all that God did not intervene and perform a miracle. Now, absent some good reason to think that there was divine intervention, we ought to assume that there was no divine intervention. But we are assuming that we have good independent reasons for believing that God would intervene in XYZ cases. If so, then the law will not tell us that a miracle did not occur. It does not even make it unlikely. For a law simply will not tell us what will happen when God wants to intervene.

The challenge for this line of argument is to identify, independent of any specific testimony of a miracle, the conditions under which God would want to perform a miracle. But *if* we have reason to believe that God would want to intervene in a given kind of case, then well-established laws of nature pose no obstacle to believing a miracle occurred. So, if we can succeed in the difficult task of identifying cases in which God would want to intervene, then Hume's objection in Part 1 has no force whatever: a miracle in these circumstances is *not* unlikely.

One could concede the truth of the conditional claim (*if* we have independent reason to believe God exists and wants to perform a miracle in conditions XYZ, *then* our past experience

is not relevant to the probability of a miracle) and yet object that the antecedent of the conditional is always false, and hence the probability of a miracle is unlikely. Hume in particular is skeptical that natural theology can provide us with reason to believe God exists and, even if God exists, Hume is skeptical that we can discern what God would want to do in various circumstances: for example, he claims that a miracle "does not . . . become a whit more probable" when assuming God exists because "it is impossible for us to know the attributes or actions of such a Being."[85]

Yet, it is perhaps surprising to learn that Hume's argument against miracles depends on a claim about God's motivations. If we did have reason to believe God would intervene, a miracle would not be unlikely. It is only when we have no reason to believe God would intervene that the probability of a miracle is unlikely. But Hume's skepticism about God's motives is not a trivial claim, nor has he given an argument for this claim in the *Enquiry*. Although he does argue for this kind of skepticism about the divine nature in the *Dialogues Concerning Natural Religion*, it is interesting to discover that his criticism of the testimony of miracles turns on his criticism of our ability to know the divine nature more generally.[86] Hume, then, does *not* show that the probability of a miracle is extremely low given our experience, but instead that the probability of a miracle is extremely low given experience *and there is no reason to believe God would intervene*. I reject the former claim, but I am happy to concede the latter.[87]

Although it may be difficult to establish that God would want to intervene in certain kinds of cases, notice how the relevant considerations have shifted away from our empirical evidence for the laws of nature, which do not tell us anything useful about what will happen in certain kinds of cases, and towards more theological considerations such as the existence and nature of God. Hume's objection, the objection that the laws of nature give us evidence against

the laws of nature, is beside the point. The objection fails because if we have reason to believe God would want to perform a miracle in a case like this, then our past experience is not relevantly similar and so does not tell us anything useful about the probability that a miracle would occur in this kind of case.

In conclusion, there may be reasons to reject the testimony of miracles, but *the fact that a miracle would violate the laws of nature* is not among them. The probability of a miracle prior to considering testimony, so it seems to me, depends on our ability to identify (or not) the kinds of cases in which God would want to miraculously intervene. If we identify such reasons, then it can be rational to believe a miracle occurred in that kind of case; if we cannot identify such reasons, then the probability of a miracle given past experience will be low and so will call into question the testimony of miracles. The skeptic will insist that we cannot succeed in identifying reasons when God would want to intervene. Maybe so. But that is a very different reason for rejecting miracles than the argument Hume offers in Part 1 of "Of Miracles." The latter argument, so far as I can tell, is a complete failure; if we think that God is likely to intervene in a certain way, pointing out that it would violate the laws of nature gives us no reason whatever to reject the testimony that a miracle happened.[88]

Brigham Young University

References

Burns, R. M. 1981. *The Great Debate on Miracles: From Joseph Glanvill to David Hume* (Bucknell University Press).

Earman, John. 2000. *Hume's Abject Failure: The Argument Against Miracles* (Oxford University Press).

Flew, Antony. 1961. *Hume's Philosophy of Belief: A Study of His First Inquiry* (Routledge).

Fogelin, Robert. 2003. *A Defense of Hume on Miracles* (Princeton University Press).

George, Alexander. 2016. *The Everlasting Check: Hume on Miracles* (Harvard University Press).

Hájek, Alan. 2008. "Are Miracles Chimerical?" In *Oxford Studies in Philosophy of Religion*, edited by Jonathan L. Kvanvig, vol. 1 (Oxford University Press), 82–104.

Hume, David. 1739/1978. *A Treatise of Human Nature*, edited by L. A. Selby-Bigge, 2nd ed. Revised by P. H. Nidditch (Clarendon Press).

Hume, David. 1748/1975. *Enquiry Concerning Human Understanding*. In *Enquiries Concerning Human Understanding and Concerning the Principles of Morals*, edited by L. A. Selby-Bigge, 3rd ed. Revised by P. H. Nidditch (Oxford University Press).

Hume, David. 1932. *Letters of David Hume*, edited by J. Y. T. Greig (Oxford University Press).

Johnson, David. 1999. *Hume, Holism, and Miracles* (Cornell University Press).

Johnson, David. 2011. "Hume and the Reports of Miracles." In *Philosophy of Religion: The Key Thinkers*, edited by Jeffrey J. Jordan (Continuum), 137–58.

Larmer, Robert A. 2014. *The Legitimacy of Miracle* (Lexington Books).

Mackie, J. L. 1982. *The Miracle of Theism: Arguments for and against the Existence of God* (Oxford University Press).

McGrew, Timothy. 2005. "Review: *A Defense of Hume on Miracles*." *Mind* 114: 145–49.

McGrew, Timothy, and Lydia McGrew. 2009. "The Argument from Miracles: A Cumulative Case for the Resurrection of Jesus of Nazareth." In *The Blackwell Companion to Natural Theology*, edited by William Lane Craig and J. P. Moreland (Wiley-Blackwell), 593-662.

Psillos, Stathis. 2002. *Causation and Explanation* (Routledge).

Rockwood, Nathan. 2018a. "Hume on Laws and Miracles." *American Catholic Philosophical Quarterly* 92: 563–81. https://doi.org/10.5840/acpq2018829162

Rockwood, Nathan. 2018b. "Lockean Essentialism and the Possibility of Miracles." *Southern Journal of Philosophy* 52: 293–310. https://doi.org/10.1111/sjp.12277

Sobel, Jordan Howard. 2003. *Logic and Theism: Arguments For and Against Beliefs in God* (Cambridge University Press).

Swinburne, Richard. 2003. *The Resurrection of God Incarnate* (Oxford University Press).

Notes

[1] See Earman, *Hume's Abject Failure*, 21; McGrew, "Review: *A Defense of Hume on Miracles*," 145; Larmer, *Legitimacy of Miracle*, 53–54.

[2] Hume, *Enquiry*, 110.

[3] Hume, *Enquiry*, 127.

[4] See for example Johnson, *Hume, Holism, and Miracles*; Earman, *Hume's Abject Failure*; McGrew "Review: *A Defense of Hume on Miracles*"; Larmer, *Legitimacy of Miracle*.

[5] Flew, *Hume's Philosophy of Belief*; Fogelin, *Defense of Hume on Miracles*; Sobel, *Logic and Theism*; George, *Everlasting Check*.

[6] Hume, *Enquiry*, 127–28.

[7] Hume, *Enquiry*, 116.

[8] Hume, *Enquiry*, 58 (my emphasis).

[9] Hume, *Enquiry*, 57.

[10] Hume, *Enquiry*, 58.

[11] Hume, *Enquiry*, 58 (my emphasis).

[12] Hume, *Enquiry*, 113.

[13] Hume, *Enquiry*, 115 (my emphasis).

[14] Flew, *Hume's Philosophy of Belief*; Earman, *Hume's Abject Failure*; Fogelin, *Defense of Hume on Miracles*; George, *Everlasting Check*.

[15] Hume, *Enquiry*, 115–16.

[16] Earman, *Hume's Abject Failure*, 22; Fogelin, *Defense of Hume on Miracles*, 14, 24; George, *Everlasting Check*, 11.

[17] Hume, *Enquiry*, 127–28.

[18] Fogelin, *Defense of Hume on Miracles*, 31.

[19] Hume, *Enquiry*, 116.

[20] George, *Everlasting Check*, 12; see also Flew, *Hume's Philosophy of Belief*, 173; Earman, *Hume's Abject Failure*, 22.

[21] George, *Everlasting Check*, 11.

[22] Hume, *Enquiry*, 127.

[23] Hume, *Enquiry*, 128.

[24] See also McGrew, "Review: *A Defense of Hume on Miracles*," 147; Larmer, *Legitimacy of Miracle*, 59.

[25] Larmer, *Legitimacy of Miracle*, 58–60

[26] Hume, *Enquiry*, 128.

[27] Hume, *Enquiry*, 115.

[28] Hume, *Enquiry*, 110.

[29] Hume, *Enquiry*, 127. Perhaps Hume rejects specifically the testimony of *religious* miracles (see Fogelin, *Defense of Hume on Miracles*, 9–10; Johnson, "Hume and the Reports of Miracles;" Rockwood, "Hume on Laws and Miracles," 573).

[30] Hume, *Enquiry*, 129 (my emphasis).

[31] Earman, *Hume's Abject Failure*, 70–71.

[32] For example, see McGrew and McGrew, "Argument from Miracles."

[33] Hume, *Enquiry*, 110.

[34] Hume, *Enquiry*, 109 (my emphasis).

[35] Hume, *Enquiry*, 127 (my emphasis).

[36] Hume, *Enquiry*, 115.

[37] See also Rockwood, "Hume on Laws and Miracles."

[38] Hume, *Enquiry*, 56n (my emphasis).

[39] See for example Johnson, *Hume, Holism, and Miracles*, 6; Fogelin, *Defense of Hume on Miracles*, 17.

[40] Hume, *Enquiry*, 114.

[41] Hume, *Enquiry*, 114; also 52n.

[42] Rockwood, "Hume on Laws and Miracles."

[43] Hume, *Enquiry*, 56n.

[44] Hume, *Letters* v. 1, 350.

[45] Hume, *Enquiry*, 129.

[46] Cf. Fogelin, *Defense of Hume on Miracles*, 16–17.

[47] Hájek, "Are Miracles Chimerical?"

[48] See for example Earman, *Hume's Abject Failure*, 23; Johnson, *Hume, Holism, and Miracles*, 12.

[49] Hume, *Enquiry*, 58 (my emphasis).

[50] Earman, *Hume's Abject Failure*.

[51] Hume, *Enquiry*, 111.

[52] Sobel, *Logic and Theism*, 336–337.

[53] Hume, *Enquiry*, 114.

[54] Hume, *Enquiry*, 114n (emphasis original).

[55] Hume, *Enquiry*, 114–115 (my emphasis).

[56] See Burns, *Great Debate on Miracles*, 224–30; Earman, *Hume's Abject Failure*, 33–38; Larmer, *Legitimacy of Miracle*, 66.

[57] See Psillos, *Causation and Explanation*.

[58] See Rockwood, "Hume on Laws and Miracles."

[59] Hume, *Enquiry*, 57 (my emphasis).

[60] Hume, *Treatise*, 1.3.2.

[61] Psillos, *Causation and Explanation*; Rockwood, "Hume on Laws and Miracles."

[62] Johnson, *Hume, Holism, and Miracles*, 9, 56 (emphasis original).

[63] Johnson, *Hume, Holism, and Miracles*, 9 (emphasis original).

[64] Johnson, *Hume, Holism, and Miracles*, 26 (emphasis original).

[65] Hájek, "Are Miracles Chimerical?," 86–87; Larmer, *Legitimacy of Miracle*, 65.

[66] Hume, *Enquiry*, 115n (emphasis original).

[67] Mackie, *Miracle of Theism*, 25. For an alternative view, which denies that to be a miracle an event needs to violate the laws of nature, see Larmer, *Legitimacy of Miracle*.

[68] Mackie, *Miracle of Theism*, 19–20; see also Rockwood, "Lockean Essentialism."

[69] The falsification of an apparent law of nature, then, would require an apparently non-miraculous exception to the purported law. If an exception to an apparent law were *repeatable*, then that is evidence it is a non-miraculous exception, and hence evidence against the purported law of nature. (See also Swinburne, *Resurrection of God Incarnate*, 19.)

[70] Mackie, *Miracle of Theism*, 23.

[71] Earman, *Hume's Abject Failure*, 42.

[72] Earman, *Hume's Abject Failure*, 22; Fogelin, *Defense of Hume on Miracles*, 2.

[73] Hume, *Enquiry*, 127 (my emphasis).

[74] Fogelin, *Defense of Hume on Miracles*, 20, 67; Sobel, *Logic and Theism*, 310–11.

[75] We want to know what the probability of a miracle is given the testimony of it, or prob(M|T), and the prob(M|T) = [prob(T|M) x prob(M)] ÷ [prob(T|M) x prob(M) + prob(T|~M) x prob(~M)]. Hume seems to be treating the probability of a miracle given our experience as the probability of a miracle prior to considering testimony, or treating prob(M|E) as prob(M). If so, the "prior" probability of a miracle, in the relevant sense, is the probability of a miracle after being "updated" by the evidence from experience and yet prior to considering testimony.

[76] See Johnson, *Hume, Holism, and Miracles*, and Earman, *Hume's Abject Failure*.

[77] See McGrew and McGrew, "Argument from Miracles."

[78] See Hume, *Enquiry*, Section 4.

[79] Hume, *Enquiry*, 57.

[80] Hume, *Enquiry*, 115.

[81] Hume, *Enquiry*, 114n (my emphasis).

[82] See Burns, *Great Debate on Miracles*. More recently, Swinburne, *Resurrection of God Incarnate*, defends a similar view.

[83] For example, if the prior probability of a miracle, or prob(M), is one in a million, and the prob(T|M) is .95 while prob(T|~M) is .01, then the posterior probability of a miracle given the testimony, or prob(M|T), is .009%.

[84] If the prob(T|H) is .95 while prob(T|~H) is .01, then given the testimony the posterior probability of heads once is .99 and the posterior probability of heads five times in a row is .75.

[85] Hume, *Enquiry*, 129.

[86] One does not pick this point up from reading Hume's defenders, such as Fogelin, *Defense of Hume on Miracles*, or George, *Everlasting Check*.

[87] As noted at the beginning of this section, though, even if past experience does make a miracle unlikely, the probability of a miracle given testimony of it might be sufficiently high that, all things considered, the miracle is likely to be true (again, see Johnson, *Hume, Holism, and Miracles*; Earman, *Hume's Abject Failure*; etc.)

[88] I thank Alex Barrientos, Michael Hansen, Robert Larmer, Lex Newman, Eric Stencil, and anonymous reviewers for their comments on previous drafts of the paper.