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Baconian Probability and Hume's Theory of Testimony

DOROTHY COLEMAN

*Bacon, like Moses, led us forth at last,
The barren Wilderness he past,
Did on the very Border stand
Of the best promis'd Land,
And from the Mountain Top of his Exalted Wit,
Saw it himself, and shewed us it.*

— Abraham Cowley (1667)

I

Hume notoriously argued that no testimony is sufficient to justify belief in the occurrence of a miracle, defined as a violation of a law of nature, “unless the testimony be of such a kind, that its falsehood would be more miraculous, than the fact, which it endeavors to establish” (EHU 116). His argument for this thesis relies on the premise that in determining the credibility of testimony to any extraordinary event—whether miraculous or merely anomalous—“the evidence, resulting from testimony, admits of a diminution, greater or less, in proportion as the fact is more or less unusual” (EHU 113). Ironically, both advocates and critics of Hume’s “diminution principle”¹ have invoked a Bayesian model of conditional probabilities in evaluating his theory of testimony. While this fashionable approach is consistent with Hume’s focus on epistemic probability, or probability relative to evidence, I

prefer to sidestep this debate because both sides of it assume without argument that all epistemic gradations of probability should be evaluated using a Pascalian model of probability, that is, probability based on the mathematical calculus of chance, of which Bayesianism is one form. I will defend Hume on his own terms by showing that criticisms based on the calculus of chances are irrelevant for assessing his account of testimony because the model of probability on which he bases it is Baconian rather than Pascalian. The foremost advocate of Baconian probability, L. J. Cohen, has credited Hume for being the first to recognize explicitly "that there is an important kind of probability which does not fit into the framework afforded by the calculus of chance," a recognition he finds evident in Hume's distinction between "probabilities arising from analogy and probabilities arising from chance or cause."² The purpose of this paper is to interpret Hume's account of testimony in light of this insight and to discuss its implications for assessing his argument against the believability of miracles.

Critics of Hume's diminution principle, from his contemporaries, George Campbell and Richard Price, to the present,³ argue that even moderately reliable testimony to events having extremely low prior probability is nevertheless credible. Suppose, drawing from one of Price's counterexamples, that a blindfolded individual selects a ball from a container holding 99 white balls and one black ball, that a witness, W, reports that the ball selected was black, and that W's statements about this sort of thing are correct 9 out of 10 times. In this example, the probability that the selected ball is black is 99 to 1, whereas the probability that W's report is true is 9 to 1. Since the former probability is lower than the latter, Hume's diminution principle appears to require that the testimony is not credible, but this is absurd. So Hume's principle, following this reasoning, must be false.

Price's criticisms of Hume drew upon the work of Thomas Bayes.⁴ As a Bayesian, he believed that all degrees of belief or probability are quantifiable and that all rational degrees of belief conform to the Pascalian model of the calculus of chances. Price's criticism evidently made an impression on Hume, who wrote to Price saying that "the light, in which you have put this controversy, is new and plausible and ingenious, and perhaps solid. But I must have some more time to weight it, before I can pronounce this judgment with satisfaction to myself."⁵ Hume's subsequent revisions to his essay, however, show no departure from his commitment to the principle of diminution or the conclusions he drew from it. This suggests either that he later satisfied himself that Price's criticisms were beside the point, or that his words to Price were never more than an appreciative, reciprocating gesture of politeness for the refreshingly civil manner with which Price expressed his objections, with no intent to answer them.⁶ In keeping with his stated general policy "always

to leave the public to judge between my adversaries and me, without making a reply," it is more likely that he never intended to send him any response, since if he made any exception to this policy, as he explained to his other critic, Campbell, "[his] silence on any future occasion would be construed as an inability to answer, and would be matter of triumph against me."⁷ In any case, for Hume to characterize Price's counterexamples as "new" was an exaggeration on his part. Joseph Butler, for one, had marshaled similar objections to precursors of Hume's argument in his *Analogy of Religion*, a work with which Hume was most likely thoroughly familiar before the publication of his essay.⁸

Contemporary advocates and critics of Hume's diminution principle both invoke Bayesian analyses of conditional probabilities that developed from the protean form which had inspired Price's criticisms. If the model of probability Hume uses, however, is Baconian rather than Pascalian, then counterexamples involving games of chance would be irrelevant for assessing his account of testimony. The primary characteristic of Baconian induction is its eliminative method.⁹ Hume could be no more explicit that his account of testimony concerning miracles is based on Baconian probability as when he comments that "Lord Bacon seems to have embraced the same principles of reasoning" (EHU 129), illustrating his meaning by quoting from Bacon's exposition of the proper use of "deviant instances" for eliminating alternative hypotheses:

"We ought," says he, "to make a collection or particular history of all monsters and prodigious births or productions, ad in a word of every thing new, rare, and extraordinary in nature. But this must be done with the most severe scrutiny, lest we depart from truth. Above all, every relation [report] must be considered as suspicious, which depends on any degree of religion, as the prodigies of Livy: And no less so, every thing that is to be found in the writers of natural magic or alchimy [sic], or such authors, who seem, all of them, to have an unconquerable appetite for falsehood and fable." (EHU 129)¹⁰

Hume's allusion to Bacon should not be mistaken for a dogmatic rejection of revealed religion based on a crude appeal to authority. On the contrary, his theory of testimony provides a more principled, systematic justification for skepticism regarding religious miracles than Bacon himself provided. The purpose of the allusion to Bacon, then, appears more suited to signaling his conviction that the credibility of testimony should be analyzed in terms of eliminative induction rather than the calculus of chances.

Perhaps one reason commentators tend to defend or criticize Hume's account of testimony probability in Pascalian terms is that Baconian induction, after more than two centuries of mischaracterization, has been dismissed as a

dead end in the history of probability theory. Typical misconceptions allege Bacon had “little or no concern with probability,”¹¹ or take the enumerative part of his method to exhaust his account of induction, virtually ignoring the hypothetical-analogical reasoning he considers part of the inductive process, and relegating his method of eliminative inference to “deduction.”¹² An extreme example of this dismissive attitude, though one strongly influenced by Karl Popper, is Imre Lakatos’ remark that “Baconian method is now only taken seriously by the most provincial and illiterate.”¹³ More recent developments in probability theory, such as the work of L. J. Cohen, A. Grunbaum, and David Schum,¹⁴ as well as recent interpretive studies of Bacon’s *Novum Organum*,¹⁵ belie this assessment, and while advocates of Baconian probability remain in the minority, their challenge to the status quo is formidable and merits the attention of Hume scholars. Cohen has proposed that what all conceptions of probability have in common is that they provide different criteria for grading degrees of *provability*, and that degrees of provability allow for two kinds of scales. Pascalian scales take the lower extreme of probability to be disprovability or logical impossibility; the Baconian scale takes the lower extreme to be only non-provability or lack of proof.¹⁶ Because Baconian probability uses a different lower extreme than Pascalian probability, mathematical axioms that apply to the latter, such as complementational rules of negation, addition, and multiplication, do not apply to the former, with the consequence that degrees of Baconian probability are ordinal but not mathematical. Contextual considerations determine which scale is more useful or appropriate to employ. Baconian gradations of provability, its advocates argue, are particularly appropriate for assessing differential weight or relevance of evidence.¹⁷

To defend Hume’s diminution principle and his applications of it, I will proceed as follows. In part II, I will review Hume’s general account of probability to identify the contextual circumstances he believed were relevant for assessing probability along Baconian versus Pascalian scales. In part III, I will explain the implications of this account for his theory of testimony. Finally, in part IV, I will explain why Hume believed Baconian methods of eliminative induction could justify global skepticism regarding testimony to religious miracles without engaging in an evaluation of the particulars of reported miracles.

II. Probability of Chances, Causes, and Analogy

Perhaps the best way to begin clarifying Hume’s position is to examine his chapters on probability in the *Treatise of Human Nature* (Bk. I, pt. iii, secs. 11–12) and *Enquiry concerning the Principles of Human Understanding* (section 6). In the

Treatise Hume describes probability as one of "several degrees of evidence," and, following Locke,¹⁸ characterizes these degrees as different forms of argument. In the *Enquiry*, he describes probability as one of several "degrees of belief," which he then connects, in a footnote, with the *Treatise's* distinction between kinds of argument or evidence. Both works also contrast two conventions regarding the use of the term "probability"—a "philosophical" use he associates with Locke, and a practical use he associates with "common discourse." The philosophical convention contrasts probability with demonstrative or *a priori* knowledge, doing so according to degrees of conclusiveness each type of evidence provides. Philosophers like Locke who define knowledge as true belief depending on logical relations of ideas alone are "oblig'd," Hume explains, to characterize all inductive beliefs under the general term of probability, since the negation of any inductively justified conclusion, however strongly supported by experience, remains logically possible. While claiming to have "follow'd this method of expression" in his analysis of causal belief, Hume cautions that "in common discourse we readily affirm, that many arguments from causation exceed probability" (T 124; cf. EHU 56n), explaining that it would appear ridiculous to say that it is only "probable" that the sun will rise tomorrow, since such inferences, supported by uniform experience, justify a degree of certainty or assurance that leaves no room for practical doubt.¹⁹ In common discourse, probability refers instead to inferences that fall short of the threshold of practical certainty because the evidence supporting them is not perfectly uniform. Though rhubarb *usually* has purgative effects, to use an example Hume draws from Bacon,²⁰ it does not *always* do so. He sums up this account of probability by distinguishing among three "degrees of evidence" or argumentation, namely, "demonstrations, proofs, and probabilities" (T 124; cf. EHU 56n). Conclusions of demonstration are logically certain; conclusions drawn from proofs are morally or practically certain, and conclusions drawn from probabilities are less than practically certain.

Proceeding to use the term "probability" in the sense employed in common discourse, Hume next identifies two types of probabilities, namely, probability of chances and probability of causes. By probability of causes, he means a degree of uncertainty resulting from ignorance of causes; by probability of chances, he means a degree of uncertainty resulting from a supposed absence of causation. While believing that "chance is nothing real in itself" (T 125), and that "what the vulgar call chance is nothing but a secret and conceal'd cause" (T 130), he claims that the conception of chance as the absence of causation assists in analyzing probability of causes because, as he explains it, "our ignorance of the real cause of any event has the same influence on the understanding, and begets a like species of belief or opinion" as the

hypothesis of chance (EHU 56), namely, to render “all the particular events, comprehended in it, entirely equal” with respect to their probability (EHU 57). He illustrates probability of chances by calculating probable outcomes of tossing a die. If the outcomes were entirely a matter of chance, there would be no more reason to believe that a die should rest on one of its sides than for it to hang suspended in the air or disappear completely. Literally, anything can happen. The first condition that must be met, then, in order for a chance outcome to be more probable than another, is the presence of background causes that limit the range of chances. This condition is necessary but not sufficient: while background causation limits the range of chance outcomes, Hume explains (in this case, that a tossed die must fall to one of its six sides), each possible outcome within that range has no greater probability of occurring than any other, assuming no additional causes determine which side it will be (T 126). The second condition, then, that must be met in order for one chance outcome to be more probable than another is that there must be a superior number of one *kind* of equiprobable outcome over another. So, if the probability of a die landing on one of its six sides is $1/6$, and if four of its sides have the same kind of figure, then the probability of the die landing on that figure is $4/6$, and thus, more probable than the die landing on a face having another figure (T 126).

The source of uncertainty regarding probability of chances is the supposed absence of causation determining particular outcomes. In contrast, the source of uncertainty regarding probability of causes is ignorance of the causes that determine outcomes. Despite this difference, the method for assessing degrees of probability of causes and of chances is the same. Owing to ignorance of hidden causes that would explain different outcomes, each past outcome, Hume explains,

may be consider'd as a kind of chance; it being uncertain to us, whether the [new] object will exist conformable to one [past outcome] or another: And for this reason every thing that has been said on the one subject [probability of chances] is applicable to both. (T 135)

As is true for superior probability of chances, superior probability of causes requires (1) something that limits the range of equiprobable outcomes that can be considered, and (2) a superior number of like equiprobable outcomes within this range. Since any past outcome, Hume explains, “proves at least a possibility for the future” (T 135) and since we can infer causal relations “only by our past experience,” the range of possible outcomes that can be considered extends *only* to past outcomes (T 133), with each past outcome having equal weight in judging the probability of a future outcome. Since each past

outcome has an equal weight, only a superior number of like equiprobable outcomes determines which outcome is more probable (T 136). Opium *usually* produces drowsiness, Hume illustrates, but owing to the intervention of “unknown causes” it can fail to produce this usual effect (EHU 58). When intervening causes or relevant variables are unknown, all instances of opium consumption are “to *appearance* exactly similar” (EHU 58). In this situation, the degree of probability that opium will produce drowsiness is determined solely by the numerical difference between the total favorable outcomes and unfavorable outcomes (T 136)—in short, in terms of enumerative induction.

Hume’s account of probability of chances and causes shows without controversy that he was familiar with basic conceptions of probability based on the calculus of chances. Less obvious is whether he found in this account “a general method for laying out and assessing every kind of probable argument,”²¹ including those concerning the credibility of testimony. A recurrent criticism among those who think he does is that his analysis of probability commits him to accepting the “straight rule” of induction.²² To illustrate using one of Hume’s own examples of probability, if past experience shows that 19 out of 20 ships return safely to harbor, then the probability of the safe return of any given ship leaving the harbor, using the rule for calculating probability of causes, is 19/20 (T 134). But surely this is absurd, since we also know from experience that some circumstances are more relevant than others to the probability of a particular ship returning. A better assessment would factor in such considerations as the age of the vessel, the condition of its parts, the experience of the crew, or the weather. When criticizing Hume’s principle for balancing probabilities regarding testimony to extraordinary events, critics similarly argue that what determines the probability that a report is true is not the rate at which the event it reports occurs measured against the rate at which testimony tends to be true, but simply the existence of qualitative features seen in reliable testimony—for example, testimony delivered without doubt or hesitation from trustworthy, disinterested, relevantly competent sources who do not contradict themselves or one another. The straight rule does not take into account whether the number of instances are sufficiently large to be representative or whether some instances might have different inferential weight or force than others.

A related criticism of the straight rule is that it would stultify scientific inquiry. Suppose a set of 20 experiments shows that all 20 *A*’s have been conjoined with *B*’s. Such experiments then warrant a probability of 20/20, or 1, or what Hume calls “full proof” or “conviction free of all doubt and uncertainty,” in support of a causal law, *L*, that all *A*’s are *B*’s. If the probability of the law relative to this evidence is 1, then the complementational probability of an exception to the law relative to the same evidence is 0. As one

commentator complains, this leads to a stultification of inquiry because the evidence for a causal law then counts as full proof against any future instance that would constitute positive evidence against the law, in which case, "further inquiry into events that would undermine L is useless."²³

Did Hume endorse the straight rule, as these criticisms allege? To infer he did so on the basis of his rule regarding probability of causes overlooks the two highly restrictive conditions that he placed on it. He first restricted the rule to evidence of events having *contrary* outcomes. He never characterized proofs—past evidence of exceptionless, uniform outcomes or exceptionless regularities—as a mathematical limit of probability. Doing so would have been incompatible with his notion that demonstration is a higher degree of evidence than proof since the falsehood of a conclusion of an inductive proof is still logically possible. Another reason it would not have occurred to him to treat proofs as a mathematical limit of probability is likely his Baconian view that proofs, while "certain," can vary in their degree of certainty or weight, a point he made explicit in his letter to Hugh Blair (1761), who had asked him to respond to some of Campbell's criticisms of his essay on miracles. Explaining himself, Hume wrote:

The proof against a miracle, as 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; but there are degrees of this species, and when a weaker proof is opposed to a stronger, it is overcome.²⁴

Assigning a mathematical probability of 1 to all proofs would thus obscure the different degrees of certainty proofs can have. To the extent that proof requires observation of an exceptionless regularity, every proof is "full and certain when taken alone," yet one proof may be stronger or weaker in comparison to another. If proofs vary in degrees of strength, assigning a mathematical probability of 1 to all proofs would obscure the different degrees of strength proofs can have. Hume's notion of degrees of proof has a clear precedent in Bacon, who claimed that the purpose of his method was "to establish *degrees* of certainty."²⁵ He also agrees with Bacon about what sorts of circumstances determine the relative strength and weakness of proofs. Concurring, for example, with Bacon's view that a greater number of observations reduces the risk of hasty generalizations drawn from a limited or nonrepresentative range of instances,²⁶ Hume claims that one proof may be stronger than another because a greater quantity of observations support it (EHU 111). Since any observable outcome of an event proves, in Hume's view, a possibility for the

future, evidence which may have formerly counted as proof can change its character to a probability of causes when a newly observed outcome departs from a previously exceptionless regularity. In short, the weight of past evidence is not “fixed” but may increase or diminish in light of new evidence.

Hume’s second restriction on the rule for probability of causes provides further indication that he did not endorse the straight rule of induction without qualification. According to that restriction, the rule applies only to events that, apart from their contrary outcomes, only *appear* exactly the same. The rule does not say anything about how he thinks proofs and probabilities are to be assessed in light of evidence that shows these events are relevantly disanalogous.

Oddly, Hume’s comments on analogical probability tend to be overlooked.²⁷ Even when they have been noted, they have been taken to be symptomatic of some alleged “characteristic inconsistency” on Hume’s part.²⁸ Perhaps one reason for this assessment is that Hume introduces the concept of analogical probability only in the final paragraph of the *Treatise’s* chapter on probability of causes (Book I, part iii, sec. 12), and not at all in the *Enquiry’s* chapter on probability (section 6), where one would expect it, but rather in section 9, “Of the reason of animals.” Nevertheless, the importance of these passages is clearly signaled by their unequivocal claim that analogical probability is central to inductive reasoning in all its forms. In the *Treatise*, Hume describes analogy as a third “species” of probability, distinct from both probability of chance and causes, without which all inferences concerning matters of fact would be impossible:

But beside these two species of probability, which are deriv’d from an *imperfect* experience and from *contrary* causes, there is a third arising from ANALOGY Without some degree of resemblance, as well as union, ’tis impossible there can be any reasoning: but as this resemblance admits of many different degrees, the reasoning becomes proportionably more or less firm and certain. An experiment loses of its force, when transferr’d to instances, which are not exactly resembling, tho’ ’tis evident it may still retain as much as may be the foundation of probability, as long as there is any resemblance remaining. (T 142)

Although Hume left his remarks on analogical probability in the *Treatise* only to the final paragraph of its chapter on probability of causes, they take pride of place in the opening paragraph of the *Enquiry’s* section 9, “Of the Reason of Animals,” which, through its delineation of the circumstances that

make some people (and animals) better reasoners than others, sets the stage for Hume's discussion of testimony in part 10. These opening sentences read:

All our reasonings concerning matter of fact are founded on a species of Analogy, which leads us to expect from any cause the same events, which we have observed to result from similar causes. Where the causes are entirely similar, the analogy is perfect, and the inference, drawn from it, is regarded as certain and conclusive But where the objects have not so exact a similarity, the analogy is less perfect, and the inference is less conclusive; though still it has some force, in proportion to the degree of similarity and resemblance. (EHU 104)

These remarks on analogical probability reveal another way to understand Hume's view that some proofs can have greater force or weight than others. Proofs, probability of chances, and probability of causes presuppose judgments about similarities and differences among evidential instances. The weight of these proofs and probabilities of chance and causes may vary in light of the strength of their analogical evidence. It follows that when evaluating the probability of an event, Hume could not have meant to ask simply, "What is its rate of occurrence?" but also, "How analogous are the features of the event to known causal or probable patterns?" One proof can be stronger than another if it is based on greater relevant resemblances than another. Whereas probability of causes measures quantitative variations in rates of occurrence, analogical probability measures the weight or force of this evidence. Hume can thus agree with his critics that what determines the probability of a ship returning safely to harbor is not the frequency with which ships return intact, but analogical evidence about this evidence, such as whether the condition of the ship or the circumstances of its passage are similar to instances of ships having returned safely. Assuming that there are identifiable variables in the circumstances of ships' travels that may affect the outcome of their journeys, Hume's rule for probability of causes cannot exhaust the methods for assessing the probability of a ship's returning safely. Consequently, by "low probability" Hume need not always mean a low rate of occurrence; in some cases, he could mean a low degree of analogy with previously observed patterns among safe returns.

Those skeptical of the interpretation given here might object that even if Hume does not accept the straight rule of induction without restriction, his comments on analogical probability make no provision for distinguishing relevant from irrelevant analogies that make the kind of probability assessment described above possible. Without a criterion of relevance, *all* similarities and differences between objects must count equally. Consequently, Hume has

no other way to assess analogical probability than by the calculus of chances. For example, if one object resembles another in 9 out of 10 of its properties, and if there is no means for ascertaining which of these properties are more relevant to its outcome than another, then the “analogical probability” of that object producing the same outcome, given the limitations of Hume’s account, can be determined solely by a superior number of equally weighted similarities or differences between them, in this case, 9 out of 10 chances. This approach had been pursued later by John Stuart Mill,²⁹ but was fraught with difficulties. There is no limit to the ways events may resemble each other, and not all of these ways would be equally relevant. A ship may resemble other ships returning to harbor in having the same shade of gray, but this is hardly as relevant to the probability of its safe returning as is its analogy to the age and design of the other ships.³⁰ Applying these considerations to Hume’s account of testimony, critics urge that what determines the probability of a report being true is not the number of equally weighted similarities it bears to reports known to be true weighted against a similarly calculated probability of the reported event’s occurrence, but rather the report’s having qualities *relevantly* analogous to true reports—for example, testimony delivered without doubt or hesitation from trustworthy, relevantly competent sources who do not contradict them selves or one another and have no motive to deceive.

One would indeed wish Hume had attended to the problem of relevance in more detail. Significantly, however, Hume never expressed the analogical probability of an outcome as a numerical ratio, indicating, at the very least, that he did not *intend* to define it as a ratio of equally weighted similarities or differences between objects. The question is whether his epistemology provides conceptual resources out of which criteria for relevance could be developed. His doctrine of “general rules” and, more specifically, his “eight rules by which to judge causes and effects” are surely the most obvious candidates. Like Bacon’s list of “privileged instances,”³¹ these rules facilitate sifting or separating relevant from irrelevant analogical qualities. For example, one of these rules states,

the difference in the effects of two resembling objects must proceed from that particular, in which they differ. For as like causes always produce like effects, when in any instance we find our expectation to be disappointed, we must conclude that this irregularity proceeds from some difference in the causes. (T 174)

Following this rule, if two events produce different outcomes despite resembling qualities they share, we should look among their disanalogous qualities

to discover qualities relevant to their different outcomes. Additional rules applied to additional experiments can further isolate what qualities are more relevant than others. Each of Hume's rules assist in pointing towards and further isolating, through a series of cautious experiments, those qualities that are relevantly analogous for assessing an outcome's probability and eliminating those that are not. Following these general rules does not guarantee infallibility or completeness, but does allow for distinctions between reasonable and unreasonable (or, in Hume's terminology, between "philosophical" and "unphilosophical") judgments about what these relevant qualities are. Given that he has the resources in his eight rules to identify relevant variables, and given that there is no textual evidence indicating any inclination on his part to evaluate analogical probability using the model of equiprobable chances, it is wrong to say that his account of probability *requires* him to assign equal weight to similarities and differences between events, objects, and, consequently, wrong to say that the only method available to him for assessing analogical probability or, for that matter, the evidential weight of one proof in comparison to another, is by applying the straight rule axiom to the calculus of chances. On the contrary, analogical probability requires a non-Pascalian scale because the negation principle for analogical probability does conform to the Pascalian complementational axiom of negation, namely, $p(B/A) = 1 - p(\text{not-}B/A)$. The analogical probability for some event B , for example, depends on some degree of relevant resemblance between present circumstances and previous circumstances that were regularly followed by B . If the degree of resemblance between them is low, the analogical probability of B is low. But if the analogical probability of B is low, it doesn't follow that the analogical probability of not- B is high. That probability would depend on additional evidence of relevant resemblances between present circumstances and previous circumstances that were *not* followed by B . Not having strong analogical evidence for B is thus not the same as having strong analogical evidence for not- B . The available analogical evidence for not- B may be just as low as the analogical evidence of B . Consequently, the analogical evidence for B is not analogical evidence disproving not- B , but merely evidence not supporting not- B . As Cohen concludes,

analogical probability seems to belong naturally to a scale that spans the interval between provability and non-provability—between adequate evidence and no evidence—rather than to one that has a complementation principle for negation because it runs from provability to disprovability.³²

However incomplete or limited Hume's "eight rules" may be for the purpose of identifying relevant analogies, those who interpret Hume's conception of probability in its Baconian context will have a richer, more historically informed basis for evaluating his place in the history of probability theory than those who view him merely as a failed Pascalian.

Having now identified some of the more fine-grained complexities in Hume's account of probability in general, in the next part of this essay I will discuss some implications of this account for weighing the credibility of testimony of a particular sort, namely, reports of improbable events, and respond to some of the more persistent criticisms of his conclusions.

III. The Credibility of Testimony

Examining the basis for believing that someone's testimony is true, Hume begins first with an application of probability of causes.³³ Before taking into account specific circumstances that render testimony credible or incredible, Hume notes the commonplace that experience teaches that testimony is sometimes reliable and sometimes not, from which he concludes both that the credibility of evidence of testimony is a matter of probability rather than proof and that its degree of probability, considering only these facts, is determined by the rule for probability of causes, namely, weighing the number of instances testimony turns out to be true against the number of instances in which it does not: "We balance the opposite circumstances," he writes, "which cause any doubt or uncertainty; and when we discover a superiority on any side, we incline to it; but still with a diminution of assurance, in proportion to the force of its antagonist" (EHU 112). However, he proceeds to refine this account by identifying variables that tend to correlate with reliable testimony, such as those deriving from "the opposition of contrary testimony, from the character or number of the witnesses; from the manner of their delivering their testimony; or from the union of all these circumstances" (EHU 112). Clearly, Hume's rule for probability of causes is not appropriate for assessing the credibility of testimony when the presence and absence of these circumstances are detectable among different instances of testimony, since this rule applies only when instances *appear* exactly the same (EHU 58). Instead, analogical considerations must be involved. Hume's reference to variables that strongly correlate with false testimony indicate that assessing the credibility of testimony must invoke some rule of analogical probability. So, when is the probability low that a given piece of testimony is true? The truth of testimony has low probability, Hume explains, "when the witnesses contradict each other; when they are but few, or of a doubtful character; when they have an interest in what they affirm; when they deliver their testimony

with hesitation, or on the contrary, with too violent asseverations” (EHU 112–13). Circumstances such as these, he writes, “diminish or destroy the force of any argument, derived from human testimony” (EHU 111). The credibility of testimony is low, then, according to Hume, not when the *rate* of reliable testimony is low, but when the *weight* of testimonial evidence is low, namely, when the testimony is more analogous to past instances of false testimony, such as testimony given by people of dubious character, questionable competency, or vested interests, delivered with hesitation or inconsistency, or contradicted by other testimony. The more a report possesses such traits, the more we are justified in doubting its reliability. Reports by dishonest people are generally treated with greater skepticism than reports from those of honest character, though sometimes even liars tell the truth and we believe them. The degree of skepticism with which we treat their reports will depend on the presence or absence of other known circumstances relevantly corresponding to credible testimony, such as consistency with known facts or extensive corroborating testimony.

Hume claims that another variable affecting the credibility of testimony is whether the event it reports is extraordinary or unusual. This is not to say that reports of anomalous events can never be reasonably believed, any more than reports from dishonest people can never reasonably be believed. His point is that the extraordinary nature of an event, like the dubious character of the person relating the testimony, is a *prima facie* reason for doubting the truth of the report, a reason that may or may not be outweighed by the presence or absence of other qualities pertinent to reliability. Analogical considerations are paramount in any such assessment.

Hume’s first explicit reference to analogical probability regarding testimony occurs in his fabled story of an Indian prince³⁴ who refused to believe the “first reports” he heard about the effects of subfreezing temperatures on water. Hume argues that the prince “reasoned justly” (EHU 113) in doubting these first reports because the phenomena of frozen water would have been extraordinary relative to his experience, which had been limited to his tropical climate. The reported events of water turning to ice were extraordinary from the perspective of the Indian prince, Hume explains, because they “bore so little *analogy* to those events, of which he had constant and uniform experience” (EHU 113–14; emphasis added). Several commentators have found this remark puzzling since, as surely as Indians drink tea, the Indian prince would have had experience of at least one phase change of water, namely, its transformation from liquid to vapor when it reaches a critically high temperature, and thus could have inferred by analogy that other phase changes of water are likely. Hume’s second explicit reference to analogical probability may provide some insight as to why he did not consider this a possibility:

It must be confessed, that, in the present case of freezing, the event follows contrary to the rules of analogy, and is such as a rational Indian would not look for. The operations of cold upon water are not gradual, according to the degrees of cold; but whenever it comes to the freezing point, the water passes in a moment, from the utmost liquidity to perfect hardness. (EHU 114n)

To infer that water can exist in a solid state would be contrary to rules of analogy applied to the prince's experience because however many times he observes the phase change of water from liquid to vapor, this gives him no information, analogical or otherwise, about what other kinds of phase change, if any, water can undergo in temperatures he has never experienced. If phase changes were gradual processes—for example, if water at 40°F was icier, not just colder, than water at 45°F, and if water at 35°F was icier, not just colder, than water at 40°F, then the prince could infer, by analogy, that water at 30°F would be proportionately icier, not just colder, than water at 35°F. As it is, phase changes are not gradual, so the prince justly concludes that rules of analogy do not allow him to predict, from his experience of liquid and gaseous phase states of water alone, that water exists in a solid state as well. While contrary to analogy, the phenomenon of ice is not, however, *contrary* to his experience, since the conditions under which the phase change occurs are different from the climate conditions in which the Indian prince lives. Consequently, Hume allows that the Indian's legitimate skepticism, unlike skepticism concerning reports of religious miracles, could be sufficiently overruled by "pretty strong testimony"—not that of a witness who is 1 out of x -number of instances correct, but testimony that is analogous to known instances of reliable testimony.

Hume's application of his diminution principle cannot be understood independently of analogical probability. He does not use statistical probabilities to illustrate its application. His application of the principle *does* make explicit use of analogical probability. Hume never expresses analogical probability in numerical terms and explicitly describes it as a species distinct from mathematically expressed probabilities of chances and causes. In light of this evidence, one must conclude that counterexamples to his principle involving statistical probabilities are irrelevant and that more fruitful evaluations of his theory of testimony will emerge by focusing on the role of analogical probability in assessing weights of evidence.

Invoking Hume's own cautions concerning the influence of the "love of wonder" on human gullibility and penchant for telling tall tales, critics of Hume's diminution principle might object that while he is correct in asserting that the Indian prince's skepticism about first reports is justified, this is

only because of the general unreliability of “traveler’s tales” of marvels, not because the event follows contrary to the rules of analogy. “The strong propensity of mankind to the extraordinary and the marvellous,” Hume noted, inclines people to believe stories of anomalies (EHU 118) and to admire those who relate stories about marvels them (EHU 117), however implausible their stories might be. Love of admiration conspires with love of wonder to increase “the pleasure of telling a piece of news so interesting, or propagating it, and of being the first reporters of it” (EHU 119), whether or not one believes the “news” is actually true. The real reason for doubting first reports of extraordinary events, critics may thus conclude, is the suspicion that they are caused by either the gullibility and ignorance of the narrator or the pleasure he or she takes in exploiting the human tendency to believe whatever fascinates. If this is so, had the Indian prince received testimony from “but one man of integrity” and “probity, in a case of which he is allow’d to judge,” as Hume’s contemporary George Campbell had argued,³⁵ the prince’s skepticism would *not* be justified, regardless of whether the event is contrary to rules of analogy based on his experience.

The issue here is not whether motives or relevant competencies of those who make reports affect the credibility of their reports. Hume accepts that there are many reasons for doubting someone’s story. At issue is whether the extraordinary or marvelous nature of the reported event can affect the credibility of the report independently of these other considerations. Hume claims that it does.³⁶ Consider the following scenario: Suppose a student is working on a research project about snakes, and while browsing the internet for data he comes across the web site of a Brazilian newspaper reporting that a 135-foot anaconda, far larger than any known to exist heretofore, had been captured and killed in the Amazon rain forest. A photograph showing a half-naked aborigine supporting the dead snake over his neck and arms, with several additional feet of both ends of the snake coiled on the ground, accompanies the story. Suppose the student has learned from scientifically accredited sources that the standard size of an anaconda, the largest known species of snake, is 25 feet, and that the largest officially documented anaconda on record is 35 feet. From this information he can reasonably infer that the anaconda reported by the Brazilian newspaper, if it existed, would be a marvel. Knowing that newspaper tabloids enjoy and profit from exploiting the human weakness to believe tales of wonder, knowing that hoaxes have been reported even by more credible newspapers before, and knowing that newspaper reports about biological anomalies are not as reliable as scientific sources, the student would be rationally justified in concluding the report of the 135-foot anaconda is not reliable. These are surely strong and legitimate reasons for doubting the report, but so too is the extraordinary nature of

such a snake it reports. The student might wonder, how could such a snake be produced by standard-sized snakes of its kind? What circumstances could explain its production? If the snake was one of a newly discovered species of anaconda, why haven't there been more citations of this species? How can a snake of this size hide from predators or surprise its prey in order to survive? Concerns such as these justify doubting scientifically unaccredited reports independently of suspicions based on the motivations and competencies of those making such reports; if anything, they increase the weight of these suspicions. Similarly, the Indian prince's initial skepticism regarding first reports of large bodies of frozen water, thick enough, say, to support the weight of an elephant, would naturally involve suspicions about the motives and competencies of those who make these reports, but the extraordinary nature of what they report would also provide an independent *prima facie* reason for doubting the reports and increase the weight of suspicions based on probable motives and competencies of those making the reports. Hume claims that only "pretty strong" testimony can justly overturn this skepticism. What counts as "pretty strong?" In some circumstances we can justifiably accept the testimony of a single trustworthy honest and relevantly competent witness. In other circumstances, such as for reports of "cold fusion," we would justifiably require confirming testimony from several independent expert witnesses, because accepting these reports would require a reassessment of what were thought to be fundamental and previously well-confirmed laws of physics.

Critics may yet protest that Hume's diminution principle, if adopted, would have the disadvantage of encouraging provincial-minded skepticism towards testimony about times, lands, and peoples very different from our own. Coady, for example, argues Hume's principle would rule out belief in well-accepted historical testimony of "sacrificial offerings of human beings, trial by ordeal, Socrates' acceptance of death rather than freedom because of his philosophical convictions about justice, or the astonishing feats of Napoleon Bonaparte,"³⁷ simply because these occurrences are so unlike our own experiences. He quotes approvingly from the *Idea of History*, in which R. G. Collingwood argues against F. H. Bradley's Humean-like criterion for credible testimony by noting, "that the Greeks and Romans exposed their new-born children in order to control the numbers of their population, is no less true for being unlike any thing that happens in the experience of contributors to the *Cambridge Ancient History*."³⁸

Hume's case of the skeptical Indian prince shows, I think, that provincialism is by no means a consequence of his principle. He makes very clear that the prince's incredulity can be overturned by testimony whose evidential weight is greater or more complete than the evidence of the prince's limited experience of phase states of water. The evidence of "first reports" about water

turning to ice is not sufficiently complete because several eliminative questions pertinent to the reliability of these reports have yet to be answered: Are those who made these first reports relevantly competent and honest? Are they mere travelers, or trained natural scientists? Provided the testimonial evidence is more relevantly complete for its kind than the evidence of the prince's limited experience against the event it reports, the testimony can outweigh the prince's initial skepticism. Similarly, if the evidence for the credibility of testimony to the practice of exposure is more complete for its kind than the evidence of contemporary experience, whose living conditions are unlike those of ancient Greeks and Romans, Hume's diminution principle allows that the evidence of testimony for this ancient practice outweighs skepticism based on our limited experience alone.

Persistent critics may retort that the real problem with Hume's account of testimony is not so much that it stultifies inquiry as that conformity to "rules of analogy" is too vague to be a useful criterion. Even taking into account assistance from Hume's "eight rules" for sorting out relevant analogies, their application presupposes the analogies to be sorted can be clearly identified. The problem is that there are many different ways of judging analogies, some perceptual, some more abstract, and any number of analogies to take into account. At a perceptual level, lightning bolts and hair standing on end are very unlike; at a more abstract level, they are very much alike, since they are both instances of electrical activity. How one assesses their likeness depends a great deal on the degree to which one is informed of, or practiced in, discovering scientific principles. Trained, experienced minds may see relevant analogies where untrained, inexperienced minds do not; inexperienced, untrained minds may see relevant disanalogies where there are none. Consequently, judgments concerning analogical probabilities appear to be a function of subjective factors such as the dispositions and competencies of individuals to view things from one level rather than another. For analogy to function as a criterion of probability, some critics will insist, there must be a well-defined decision procedure for identifying appropriate levels of abstraction for interpreting experience. As Coady has argued, on one level the ancient practice of human sacrifice is unlike anything in modern experience, but "on a tolerant interpretation, [Hume's] principle would, for instance, allow me to credit human sacrifice in the past if I recognize in my world that some people are prepared to let others suffer in order to achieve important goals." The problem remaining, Coady explains, is that

now of course we no longer have a ready-made criterion because different people will assess such analogies differently The determination of matters like this will then depend a great deal upon

how one interprets the present But now the criterion of the analogous as a hard and fast test of credibility is beginning to dissolve, and it dissolves further when one reflects that the question of how one reads the present . . . may well depend in part upon how one learns from the past.³⁹

The most appropriate response to this criticism, I think, is to accept that there is “vagueness” in Hume’s criterion of analogical probability, if that signifies only the lack of a “hard and fast test” that people of different competencies, experiences, and dispositions can use to reach the same conclusions. Just as Bacon warns that his inductive method “is difficult to practice”⁴⁰ even if easy to state, so too Hume claims that his rules of induction are “very easy in their invention, but extremely difficult in their application” (T 175):

There is no phaenomenon in nature, but what is compounded and modify’d by so many different circumstances, that in order to arrive at the decisive point, we must carefully separate whatever is superfluous, and enquire by new experiments, if every particular circumstance of the first experiment was essential to it. These new experiments are liable to a discussion of the same kind; so that the utmost constancy is requir’d to make us persevere in our enquiry. (T 175)

Despite these difficulties, Hume believes that we can still identify ways in which the judgments of some are “wiser” than those of others. For example, echoing Bacon’s comment that it is better that “as many people as possible should have a keen sense for tracing and tracking physical similarities and resemblances,”⁴¹ Hume notes that “when we reason from analogies, the man, who has the greater experience or the greater promptitude of suggesting analogies, will be the better reasoner” (EHU 107).⁴² Since reasoning from experience requires attentiveness and memory, those who excel in these capacities will be better reasoners than those who do not. Some reasoners are better at identifying complexity than others: “Where there is a complication of causes to produce any effect,” Hume notes, “one mind may be much larger than another, and better able to comprehend the whole system of objects, and to infer justly their consequences” (EHU 107). Good reasoners use caution in drawing generalizations from their experience, whereas poor reasoners use haste: “The forming of general maxims from a particular observation is a very nice operation; and nothing is more usual,” Hume writes, “from haste or a narrowness of mind, which sees not on all sides, than to commit mistakes in this particular” (EHU 107). Noting that “byasses from prejudice, education, passion, party, etc. hang more upon one mind than another” (EHU 107),

he cautions that better reasoners consciously “lend a very academic faith to every report which favours the passion of the reporter” (EHU 125). After they have acquired confidence in separating reliable from unreliable testimony, superior reasoners rely on “books and conversations” to enlarge their knowledge from direct experience (EHU 107). Hume, I think, would be puzzled by the demand for a hard and fast test for determining correct assessments of analogical probability that would not be affected by the cognitive abilities of those who use it.⁴³ The purpose of analogical criteria is to guide judgment, not to substitute for it. Even the best probable reasoning can err—that is its very nature.

In light of what has been said so far in Hume’s defense, it might be tempting to sum up his views about testimony as asserting no more than a common-sense recommendation that extraordinary testimony requires extraordinary evidence. Earman, for one, rightly cautions against accepting this platitudinous reading: if Hume’s account of testimony amounted to no more than the thesis that extraordinary testimony requires extraordinary supporting evidence, it would not have garnered the attention it has received for over 200 years.⁴⁴ What makes his account rise above platitudes is his philosophically substantive conclusion “that no testimony can ever be sufficient to establish the occurrence of a religious miracle” (EHU 129). By a “religious miracle,” Hume means a violation of a law of nature caused by a particular volition of God. His claim, if true, would undermine revelation as one of the main pillars of Christian apologetics. Advocates of religious miracles do not disagree with Hume about whether extraordinary testimony requires extraordinary evidence; they disagree about whether testimonial evidence for miracles can, under certain special circumstances, justify belief in their occurrence. The plausibility of Hume’s account rests, then, with his ability to provide a principled reason for treating testimony to religious miracles differently than testimony to marvels.⁴⁵ In the next and final part of this paper, I will examine how Hume thinks he can apply a Baconian conception of degrees of certainty to justify skepticism regarding all testimony to religious miracles.

IV. Weighing the Evidential Force of Testimony to Miracles

Hume wrote his essay on miracles in the context of a long-standing debate between deists and orthodox theologians concerning the relationship between revelation and natural theology, the two main pillars of Christian apologetics.⁴⁶ For the most part, both deists and advocates of revealed religion agreed that natural theology proves the existence and benevolence of God without the aid of divine revelation, but while deists maintained natural theology exhausts the content of religious knowledge, orthodox Christians

held that natural theology supports the probability that God occasionally intervenes laws of nature to reveal additional religious truths whose acceptance is necessary for salvation, such as the divinity and teachings of Jesus. Against the deists, Hume argued that the order and design in nature cannot support the hypothesis that the ultimate cause of the world has moral qualities in the same sense that human beings understand them; against the orthodox, he argued that even granting natural theology can prove divine benevolence, this conclusion does not increase the evidential probability that God exercises his benevolence by intervening in nature through miracles.

Hume's argument against religious orthodoxy develops in two main parts, corresponding to the two-part division of his essay. The first part builds upon his concept of proof. If proof for a law of nature consists in a perfectly uniform experience that supports it, then the very same evidence that proves a law of nature constitutes a proof against any event that violates that law, even though violations of causal laws are logically possible. What happens, however, if there is *indirect* evidence of a violation from a proof based on testimony? A proof based on testimony requires experience of a uniform conjunction of certain traits of testimony with the truth of its content; testimony possessing such traits would amount to proof that the testimony is credible. If credible testimony reports an event that violates a proven law of nature, there is proof against proof, in which case Hume takes his diminution principle to imply that no testimony is sufficient to justify belief in the occurrence of a miracle "unless the testimony be of such a kind, that its falsehood would be more miraculous, than the fact, which it endeavors to establish" (EHU 116). I will call this Hume's "greater miracle" principle.

Many commentators find the concept of a greater miracle puzzling. One interpretation assumes Hume is being ironic since violations of a law of nature are just that, and none can be greater or less than another. On this view, Hume's "greater miracle" principle, stripped of its rhetorical flourish, says no more than that conflicting proofs simply cancel each other out, creating a skeptical impasse as to which proof to accept. This interpretation, however, creates only new puzzles. If it is correct, then the purpose of part 2 of his essay is not clear, since the argument about the evidence for miracles would be complete at the end of part 1. More importantly, it conflicts with Hume's explicit claim in part 2 that "there may be miracles . . . of such a kind as to admit of proof from human testimony" (EHU 127). An adequate interpretation should explain how these two parts are integrated into a whole.

A more likely interpretation of Hume's greater miracle principle will take seriously his own explanation of it in his letter to Hugh Blair. As noted earlier, Hume explained to Blair that while a proof is full and certain in itself,

some proofs have more weight than others. Consequently, when testimonial proof for an event indirectly conflicts with a proof of a law of nature the reported event would violate, one has only to determine which proof has greater weight to determine whether its falsehood would be the greater miracle. In both the *Treatise* and *Enquiry*, Hume claimed a proof will have greater weight than another provided it is based on either a larger number of instances or a greater degree of relevant analogies.

Part 2 of Hume's essay sketches three hypothetical reports of miracles to illustrate different applications of the greater miracle principle. The first two examples concern testimony to miracles having no religious significance. These are violations of laws of nature that are not ascribed to divine agency. Since Hume refers to miracles having religious significance as "religious miracles" (EHU 129), I will refer to these as secular miracles. The first example illustrates testimony to a secular miracle whose falsehood Hume thinks would constitute a greater miracle than the falsehood of the law of nature the reported event violates. The second example illustrates testimonial evidence for a secular miracle whose falsehood Hume thinks would not be the greater miracle. The third example concerns testimony to a religious miracle and illustrates Hume's reasons for thinking that such testimony would never be the greater miracle. Hume uses each of these hypothetical examples to establish some common ground with his orthodox opponents before addressing the main point of disagreement between them.

The stated purpose of the first example is to show that "there may be miracles . . . of such a kind as to admit of proof from human testimony," even if it "perhaps will be impossible to find any such in all the records of history" (EHU 127). By granting that violations of laws of nature are possible and that reports of their occurrence can be credible, Hume shows there is common ground between himself and his orthodox opponents, thereby immunizing himself against allegations that he arbitrarily defines violations of laws of nature either out of existence or out of the realm of believability. So, he asks his readers to suppose that

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: . . . that the tradition of this extraordinary event is still strong and lively among the people; [and] that all travellers, who return from foreign countries, bring us accounts of the same tradition, without the least variation or contradiction. (EHU 127-8)

Hume claims that analogical considerations break what would otherwise be a skeptical impasse between testimonial evidence for the eight days of

darkness and evidence supporting laws of nature that the eight days of darkness would violate. Despite the singularity of eight days of darkness, it is "rendered probable," he claims, "by so many analogies" it bears to many instances of natural "decay, corruption, and dissolution" (EHU 128). It is far from clear what analogies he has in mind, but supposing it might include phenomena such as solar eclipses, dust storms, and volcanic eruptions (which would be relevant to the aspect of darkness) or to instances of decomposition or atrophy (relevant to the aspect of disorder), these analogies diminish the weight of the proof against the eight days of darkness. Still, these analogies are not sufficient to establish the credibility of the reported eight days of darkness because significant disanalogies remain. However, if in addition the reports of eight days of darkness are "very extensive and uniform," and thus strongly analogous to instances of reliable testimony, Hume concludes the falsehood of the testimony would be more miraculous than the falsehood of the proof against the eight days of darkness, so that "our present philosophers, instead of doubting the fact, ought to receive it as certain." Even so, the certainty of the testimonial evidence is less than what it would have been had there not been any conflicting evidence for causal laws the reported event would violate, with the result that accepting the miraculous nature of the event is justified only as a tentative hypothesis meriting further investigation. So while the eight days of darkness should be accepted as certain, and tentatively accepted as a miracle, reasonable philosophers, Hume writes, "ought to search for the causes whence it might be derived" (T 128), since future investigations may reveal that what has been accepted as a miracle is only a marvel, or that what has been accepted as a law of nature is not a genuine law.

It is worth considering why Hume treats the testimony for this secular miracle to be so impeccable that its falsehood would be a greater miracle than the violation it reports. After all, in the paragraphs immediately preceding this passage, he comments in great detail how our instinctive love of surprise and wonder makes us naturally susceptible to self-deception and deceit concerning marvels. Would not reports of miracles, by their very nature more wondrous and surprising than reports of mere marvels, bring out the worst of this human folly, and if so, lack credibility?

Just as the story of the Indian prince illustrates that doubts based on the human passion for wonder are relevant, but not decisively relevant, to the credibility of reported marvels, so too the hypothetical eight days of darkness illustrates that the effects of wonder are not decisively relevant to justify rejecting reports of miracles. Provided the testimony for a secular miracle has sufficiently compensating credible features, we are justified in accepting the testimony, just as the Indian prince would have been justified in accepting

testimony about frozen water provided it had greater credibility than first reports. Since miracles are by definition more wondrous than mere marvels, the standards for accepting reports of miracles must of course be higher. Hume presents the plausible view that qualities such as the quantity, cultural diversity, and uniformity of the testimony together have sufficiently greater weight than doubts about our susceptibility to deception based on our love of wonder.

By way of contrast, his second example illustrates circumstances in which even very strong testimony does not reasonably outweigh doubts based on the human passion for wonder. Suppose, Hume writes,

that all the historians who treat of England, should agree, that, on the first of January, 1600, Queen Elizabeth died; that both before and after her death she was seen by her physicians and the whole court, as is usual with persons of her rank; that her successor was acknowledged and proclaimed by the parliament; and that, after being interred a month, she again appeared, resumed the throne, and governed England for three years. (EHU 128)

Like the previous example, the resurrection of Queen Elizabeth would be an instance of a secular miracle because no religious implications are drawn from it. There is no claim made, for instance, that her resurrection is evidence that she is a divinely anointed monarch or that her reign marks a gender-bending Second Coming. For this case, however, Hume urges that we should reject the testimonial evidence nonetheless. This may seem puzzling. Couldn't he have argued instead that her resurrection, like the hypothetical eight days of darkness, would have been probable in light of "so many analogies," such as reversals of coma? To simplify the issues, let it be granted that this analogy would diminish the weight of the proof that "the dead stay dead" in the same way that solar eclipses or dust storms might diminish the weight of proof that "the sun will rise tomorrow." Just as in the first example, these analogies would still not be sufficient to establish the credibility of the reported resurrection because more significant disanalogies remain. The critical question is whether the addition of analogical evidence about the testimony would be sufficient to show the falsehood of the testimony would be more miraculous than the Queen's resurrection. In this case Hume answers that the testimony is strong enough only to justify believing that her death and resurrection had been feigned and that the circumstances of the deceit should be investigated. While a pretense that could fool "all historians who treat of England," would itself be extraordinary, "the knavery and folly of men," he explains, "are such common phenomena, that I would rather believe the most extraordinary events to arise from their concurrence, than admit of so signal a

violation of the laws of nature" (EHU 128). However, since the first example has already shown Hume does not think a general propensity toward folly is a sufficient reason for rejecting particular reports of miracles, some other variable must explain his skepticism. This variable appears in his description of the testimony. Whereas reports of the eight days of darkness were stipulated to have come from "all authors, in all languages," the testimony for Elizabeth's death and resurrection is reported only by "all historians who treat of England." Since the reported resurrection is about a queen of a powerful country rather than about some ordinary person, the absence of more extensive and cross-cultural testimony raises suspicions about political or nationalistic motivations for deceit and self-deception. Wise reasoners, Hume maintained, "lend a very academic faith to every report which favours the passion of the reporter; whether it magnifies his country, his family, or himself, or in any other way strikes in with his natural inclinations and propensities" (EHU 125).

Hume's second example allows him to establish more common ground with his orthodox opponents who can agree that vested interests usually diminish the credibility of testimony, even if they consider testimony to biblical miracles, such as the resurrection of Jesus, as exceptions. Hume comes closer to addressing the crux of their disagreement by embellishing upon the second example to make it more analogous to the reported resurrection of Jesus. He asks his readers to postulate next that Queen Elizabeth's reported resurrection is taken to be a religious miracle, a violation of a law of nature caused by God to reveal some tenet of religion beyond what natural theology alone can support. Since Hume could anticipate that even his orthodox opponents would dismiss this sort of testimony, though of course for different reasons, the apparent purpose of his third example is to establish one last point of common ground between them, namely, that the alleged religious significance of a reported miracle is not sufficient justification for accepting the report as overriding evidence, neither for the occurrence of the miracle nor for any new tenet of religion allegedly revealed by it. Where then, is the real point of disagreement between them? The orthodox view is exemplified in Locke's comments on religious miracles:

Though the common experience and the ordinary course of things have justly a mighty influence on the minds of men, to make them give or refuse credit to any thing proposed to their belief; yet there is one case, wherein the strangeness of the fact lessens not the assent to a fair testimony given of it. For *where such supernatural events are suitable to ends aimed at by him, who has the power to change the course of nature*, there, under such circumstances, they may be the fitter to procure

belief, by how much the more they are beyond, or contrary to ordinary observation. This is the proper case of miracles, which well attested do not only find credit themselves, but give it also to other truths, which need such confirmation.⁴⁷

For Locke and other traditional advocates of miracles, the “religious significance” of a miracle does not by itself render testimony to its occurrence credible; the relevant reference class is narrower, namely, testimony to violations whose religious significance is “suited to ends” of divine being. Hume’s reply to this strategy, the heart of his argument against revealed religion, is that the only way to form reasonable beliefs about what these ends are is by observing the usual course of divine effects in nature. In Hume’s own words,

Though the Being to whom the miracle is ascribed, be, in this case, Almighty, [a religious miracle] does not, upon that account, become a whit more probable; since it is impossible for us to know the attributes or actions of such a Being, otherwise than from the experience which we have of his productions, in the usual course of nature. This still reduces us to past observation, and obliges us to compare the instances of the violation of truth in the testimony of men, with those of the violation of the laws of nature by miracles, in order to judge which of them is most likely and probable. As the violations of truth are more common in the testimony concerning religious miracles, than in that concerning any other matter of fact; this must diminish very much the authority of the former testimony, and make us form a general resolution, never to lend any attention to it, with whatever specious pretence it may be covered. (EHU 129)

Hume believes it is pointless to become mired in debates about the credibility of evidence for specific miracles because all such debates must eventually turn on an assumption about whether the miracle under consideration is consistent with or suited to God’s nature or plan. Appealing to other miracles, including prophesies, to support such assumptions would be question-begging, since this would involve assuming the authority of the miracles to prove the authority of miracles. Nor can the conclusions of natural theology justify the credibility of miracles. Even if demonstrative reasoning could prove the perfection and benevolence of God, the nature or meaning of this perfection and benevolence can only be inferred empirically, from experience of their effects.⁴⁸ The most probable inferences or proofs would therefore be those inferred from the more regular or perfectly uniform patterns among these effects. The question then is whether violations of laws

of nature are more common than “violations of truth” in human testimony to religious miracles. An enumeration of instances is not necessary to perform the subtraction. Given the kind of quantitative and analogical evidence required to support a law of nature, violations of laws of nature would presumably be comparatively rare. On the other hand, human history abounds with evidence of “faked” miracles or events initially misconstrued as miracles but later explained. Consequently, the weight of evidence supporting laws of nature is stronger than evidence supporting the truth of reports of religious miracles, and thus the falsehood of a law of nature, supported by extensive, relevantly analogous uniform experience, would be a “greater miracle” than the falsehood of testimony to religious miracles.

In this final part, I have explained how Hume’s greater miracle principle can be understood in terms of Bacon’s notions of degrees of certitude, analogical probability, relevance, and eliminative induction. I have reviewed Hume’s examples illustrating three possible outcomes of applying the principle to reports of miracles. I believe these examples show that his argument against the credibility of religious miracles is far more complex than a crude subtraction of unanalyzed numerical probabilities. Hume’s argument undeniably relies on quantitative subtraction, but also a consideration of relevant analogical probabilities. If this interpretation has not persuaded the reader that Hume’s argument against the credibility of religious miracles is plausible, I still hope to have shown convincingly that neither Hume’s account of miracles, his theory of testimony, nor his general account of epistemic probability are refuted on the basis of the probability calculus alone. Since there has been so little attention paid to the central role of analogical probability and Bacon’s notion of degrees of certainty in Hume’s discussion of testimony, I also hope to have shown, if nothing else, that no complete evaluation of his account can ignore them. However skeptical of Hume’s argument the reader may remain, “’twill be sufficient for me”—to borrow Hume’s words from another context—if I can bring this approach “a little more into fashion” (T 2).

NOTES

Earlier versions of this paper were presented at the Pacific Division Meetings of the American Philosophical Association, San Francisco, California, March, 1993, the 20th Hume Conference, Ottawa, Canada, July, 1993, and as the Presidential Address for the Society for Philosophy and Psychology, Louisville, Kentucky, April, 1996. All references to Hume’s *Treatise of Human Nature*, ed. L. A. Selby-Bigge, 2nd ed., revised by P. H. Nidditch (Oxford: Clarendon Press, 1978) and *Enquiries concerning*

Human Understanding and concerning the Principles of Morals, ed. L. A. Selby-Bigge, 3rd ed., revised by P. H. Nidditch (Oxford: Clarendon Press, 1975) are incorporated into the body of the text using the abbreviations T, EHU, and EPM, with page numbers following.

- 1 A convenient label used by John Earman, *Hume's Abject Failure* (New York: Oxford University Press, 2000), 49.
- 2 L. Jonathan Cohen, "Some Historical Remarks on the Baconian Conception of Probability," *Journal of the History of Ideas* 41 (1980): 225.
- 3 George Campbell, *A Dissertation on Miracles* (Edinburgh, 1762); Richard Price, "On the Importance of Christianity, Its Evidences, and the Objections Which Have Been Made to It," dissertation 4, section 2, in *Four Dissertations* (London, 1767). Recent variations of this criticism include Ronald Hambourger, "Belief in Miracles and Hume's Essay," *Nous* 14 (1980): 587–604; R. M. Burns, *The Great Debate on Miracles: From Glanville to David Hume* (Lewisburg: Bucknell University Press, 1981), 92–3, 127–8; Roy Sorenson, "Hume's Skepticism concerning Reports of Miracles," *Analysis* 20 (1983): 60; Colin Brown, *Miracles and the Critical Mind* (Grand Rapids: William B. Eerdmans Publishing Co., 1984), 62–3; Kenneth Merrill, "Hume's 'Of Miracles,' Peirce, and the Balancing of Likelihoods," *Journal of the History of Philosophy* 29 (1991): 85–113; Earman, *Hume's Abject Failure*.
- 4 His dissertation refers to Bayes's manuscript, "An Essay towards Solving a Problem in the Doctrine of Chances," *Philosophical Transactions of the Royal Society* (London) 53 (1763): 370–418, a posthumous publication Price arranged.
- 5 *New Letters of David Hume*, ed. Raymond Kiblansky and Ernest C. Mossner (Oxford: Clarendon Press, 1954), 233–4.
- 6 In the same letter, Hume wrote, "[I]t is but too rare to find a literary Controversy conducted with such proper Decency and Good Manners . . . But you like a true Philosopher, while you overwhelm me with the Weight of your Arguments, give me encouragement by the Mildness of your expression: and instead of *Rogue, Rascal, and Blockhead*, the illiberal Language of the Bishop of Gloucester and his School, you address me as a man mistaken, but capable of Reason and conviction."
- 7 Letter to George Campbell (no. 194), 7 June 1762, in *The Letters of David Hume*, ed. J. Y. T. Greig (Oxford: Oxford University Press, 1932), 1: 360–1.
- 8 Joseph Butler, *The Analogy of Religion* (London, 1736), part 2, section 2. Butler argued that since even the most ordinary facts, such as Caesar's crossing the Rubicon, have a presumption of "millions to one" against them, so the presumption against testimony to miracles cannot be substantially greater than testimony to ordinary facts. Butler directed his criticism to a version of the argument against miracles he describes as "commonly supposed." One obvious precursor to Hume's argument is that given by William Wollaston in *The Religion of Nature Delineated*, 2nd ed. (London, 1724). Familiar with Butler's work, Hume decided against including an essay on miracles in his *Treatise* as he originally intended. Hoping his first publication would receive approval from Butler, perhaps on the assumption that his recommendation would assist its literary success, Hume wrote to Henry Home confessing that

from cowardice he was “cutting off its nobler parts, that is, endeavoring it shall give as little offense as possible; before which I could not pretend to put it into the good Dr.’s hands.” See Letter 6 (1737) in *Letters* 1: 25.

9 “True induction,” Bacon wrote, “is founded on exclusion.” In *The New Organon* [*Novum Organum*], ed. Lisa Jardine and Michael Silverthorne (Cambridge: Cambridge University Press, 2000), Bk. 2, aph. 19.

10 See Bacon, *Novum Organum*, Bk. 2, aph. 29. This passage is not the only occasion in which Hume explicitly refers to Bacon’s eliminative methods to characterize one of his arguments. Addressing the controversy concerning psychological egoism, Hume wrote, “it is easy to attain what natural philosophers, after Lord Bacon, have affected to call the *experimentum crucis*, or that experiment which points out the right way in any doubt or ambiguity” (EPM 219), and proceeds to describe a test case that he thinks settles the issue. Bacon’s terminology was actually “*instantiae crucis*” (*Novum Organum*, Bk. 2, aph. 36). Hume’s philosophical writings, it would not be difficult to show, are replete with instances of eliminative induction, which in at least one place he refers to as his “sifting” manner (EHU 32).

11 Ian Hacking, “Hume’s Two Species of Probability,” *Philosophical Studies* 33 (1978): 21–37.

12 For a survey of different interpretations of “Baconianism,” see Antonio Perez-Ramos, *Francis Bacon’s Idea of Science* (Oxford: Clarendon Press, 1988), chaps. 2–3, 17–18.

13 Imre Lakatos, “Changes in the Problem of Inductive Logic,” in *The Problem of Inductive Logic* (Amsterdam: North Holland, 1968), 318.

14 Cohen, *The Probable and the Provable* (Oxford: Clarendon Press, 1977), 13; Cohen, “Some Historical Remarks on the Baconian Conception of Probability”; Cohen, “What Has Inductive Logic to do with Causality?” in *Applications of Inductive Logic*, ed. L. Jonathan Cohen and Mary Hesse (Oxford, Clarendon Press, 1980), 156–71; Cohen, *An Introduction to the Philosophy of Induction and Probability* (Oxford: Clarendon Press, 1989), 28–9; A. Grunbaum, “Is Falsifiability the Touchstone of Scientific Rationality? Karl Popper versus Inductivism,” *Boston Studies in the Philosophy of Science* 39 (1976): 213–52; David Schum, “Jonathan Cohen and Thomas Bayes on the Analysis of Chains of Reasoning,” in *Probability and Rationality: Studies on L. Jonathan Cohen’s Philosophy of Science*, ed. Ellery Eells and Tomasz Maruszewski (Atlanta, Ga.: Rodopi, 1991), 99–146; Schum, *The Evidential Foundations of Probabilistic Reasoning* (New York: John Wiley & Sons, Inc., 1994), chaps. 5.5 and 7.3.5.

15 Perez-Ramos, *Francis Bacon’s Idea of Science*, esp. chaps. 17–18.

16 Cohen, “Some Historical Remarks,” 224–5.

17 Cohen, *The Probable and the Provable*, part 1, sec. 3; Schum, *The Evidential Foundations of Probabilistic Reasoning*, chap. 5.5.

18 John Locke, *An Essay concerning Human Understanding*, ed. P. H. Nidditch (Oxford: Clarendon Press, 1975), Bk. 4, chap. 2.

19 Significantly, Richard Price rejected Hume's characterization of "proof," stating that "the greatest uniformity and frequency of experience will not offer a proper proof, that an event will happen in a future trial, or even render it so much as probable, that it will always happen in future trials." See *Four Dissertations*, 392–3. This difference explains in part why Hume would have found Price's criticisms of his account of testimony beside the point. The disagreement, however, is more than verbal—it directly concerns their disagreement about which scale of probability is appropriate to apply when assessing the weight or force of inductive evidence.

20 Bacon, *Novum Organum*, Bk. 2, aph. 46.

21 Kenneth Merrill, "Hume's 'Of Miracles,' Peirce, and the Balancing of Likelihoods," 91. See also Earman, *Hume's Abject Failure*, 25.

22 For a recent criticism of Hume's alleged use of the straight rule, see Earman, *Hume's Abject Failure*, chap. 9.

23 Earman, *Hume's Abject Failure*, 31.

24 Letter 188, in *Letters*, 1: 350. M. A. Stewart commented on this quotation in "Hume's Historical View of Miracles," in *Hume and Hume's Connexions*, ed. M. A. Stewart and John P. Wright (University Park, Pa.: The Pennsylvania University Press, 1994).

25 Bacon, preface to *Novum Organum*.

26 Bacon, "Outline of a Natural and Experimental History," sec. 4, in *The New Organon*, ed. Jardine and Silverthorne, 226.

27 For example, Hacking commended Hume for identifying probability of causes as a distinct species from probability of chances, but he draws no attention to Hume's account of analogical probability, which would have strengthened his insightful thesis that Hume saw that not all probability can be analyzed in terms of the calculus of chances. See Ian Hacking, "Hume's Two Species of Probability," *Philosophical Studies* 33 (1978): 21–37.

Exceptions to this oversight are L. J. Cohen, "Some Historical Remarks," 225–6; Barry Gower, "Hume on Probability," *British Journal for the Philosophy of Science* 42 (1991): 1–19; C. A. J. Coady, *Testimony: A Philosophical Study* (Oxford: Clarendon Press, 1992), 182–92; Don Garrett, *Cognition and Commitment in Hume's Philosophy* (New York: Oxford University Press, 1997), 144, 153–6; Earman, *Hume's Abject Failure*, 37–8. Neither Gower nor Cohen relates Hume's account of analogical probability specifically to his account of testimony. Garrett does, though he does not pursue its relevance to the distinction between Baconian and Pascalian probability; Coady assimilates Hume's position to Bradley's account of testimony (and wrongly so, I believe; see note 38 below). Earman dismisses Hume's appeal to analogical probability as too vague to be helpful.

28 L. J. Cohen, *The Probable and the Provable*, 42n. See also L. J. Cohen, *The Implications of Induction* (London: Methuen, 1970), 125 ff. and "Some Historical Remarks," 225. Although usually charitable in his interpretation of Hume, Cohen finds Hume's views about analogical probability at odds with, rather than

complementary to, his emphasis on enumerative induction in his analysis of the concept of cause.

29 John Stuart Mill, *System of Logic* (London, 1896), Bk. 3, chap. 20, sec. 1.

30 See Cohen, "Some Historical Remarks," 227.

31 Hume believes his list of eight rules is "all the LOGIC" needed to guide causal reasoning, and that its brevity is an "improvement upon a "long system of rules and precepts" (T 175), such as Bacon's list of twenty-seven "prerogative instances."

32 Cohen, "Historical Remarks," 226.

33 Merrill, "Hume's 'Of Miracles,' Peirce, and the Balancing of Likelihoods," 91.

34 For historical precedents for Hume's tale of the Indian Prince, see D. Wooton, "Hume's 'Of miracles,'" 191–229, and M. A. Stewart, "Hume's Historical View of Miracles," 200, 48n, both in *Hume and Hume's Connexions*, ed. Stewart and Wright.

35 Campbell, *A Dissertation on Miracles* (New York: Garland, 1983), 28, 31.

36 In criticizing Hume's position, Price (dissertation 4, sec. 2) countered that "improbabilities *as such* do not lessen the capacity of testimony to report the truth," but he misses Hume's point. Hume maintained that the improbability of an event causes skepticism or disbelief, not the falsehood of the testimony. Hume would agree with Jonathan Cohen that while induction about causes involves eliminative reasoning, not all eliminative reasoning is induction about causes. See Cohen, "What has Inductive Logic to do with Causality?" 156.

37 Coady, *Testimony: A Philosophical Study*, 187. Coady also cites an amusing parody of Hume's alleged theory of testimony by Richard Whately, *Historic Doubts Relative to Napoleon Bonaparte* (first published anonymously in 1819).

38 R. G. Collingwood, *The Idea of History* (Oxford: 1970), 240. Perhaps, however, the reports of "exposure" should not be so readily accepted after all. John Boswell has provided convincing evidence that "exposed" children in antiquity were rarely abandoned in such a way that they could not be found by someone who would care for them. See *The Kindness of Strangers: The Abandonment of Children in Western Europe from the Late Antiquity to the Renaissance* (New York: Pantheon Books, 1988).

Coady believes his Bradleyan-like interpretation of Hume's diminution principle is justified by Hume's stringent skepticism regarding testimonial evidence for the authenticity of the Ossian poems (182). He highlights Hume's remarks that "the greatest Cloud of Witnesses makes no manner of evidence" and that "as finite added to finite never approaches a hair's breadth nearer to Infinite, so a fact, incredible in itself, acquires not the smallest Accession of Probability, by the Accumulation of Testimony" (Hume, "Of the poems of Ossian," National Library of Scotland, MS 23159/17, pages 17–18). However, Hume's concern here is likely based on the quality of the testimony accumulated. In any case, Hume speaks more cautiously in his letter to Hugh Blair, merely stating that the authenticity of the Ossian poems "is so much out of the ordinary course of human affairs, that it requires the strongest reasons to make us believe it." He then describes in very specific terms the kinds of

testimonial evidence that would settle the issue. See Letter 215 in *Letters*, 1: 398–401. For more on the Ossian controversy and Hume’s treatment of miracles, see M. A. Stewart, “Hume’s Historical View of Miracles,” 190–3.

39 Coady, *Testimony: A Philosophical Study*, 188.

40 Bacon, preface to *Novum Organum*.

41 Bacon, *Novum Organum*, Bk. 2.

42 A passage that has always struck me as additional evidence for the traditional but still persistently challenged view that Philo, not Cleanthes, most represents Hume’s own views in the *Dialogues concerning Natural Religion*.

43 Coady urges that “it very unlikely that any hard and fast rule can be laid down for determining the outcome of such assessments of so diverse factors—what is required, as Locke saw, is not a criterion but a judgment,” 198, cf. 181. Contrary to Coady, I think Hume saw the need for both.

44 Earman, *Hume’s Abject Failure*, 42.

45 Earman, *Hume’s Abject Failure*, 42.

46 For an insightful discussion of this context, see Terence Penelhum, *Themes in Hume* (Oxford: Clarendon Press, 2000), chap. 11.

47 John Locke, *Essay concerning Human Understanding*, Bk. 4, chap. 16, sec. 13. Emphasis added.

48 The passage from EHU 129, quoted just previously, shows that Hume’s argument does not assume that the nature of God is knowable only by observing a constant conjunction between his agency and its effects. He allows that a cause may be known only by its effects by analogy, but adds the caveat that “it must be impossible to infer any new effects from that cause; since the qualities, which are requisite to produce these new effects along with the former, must either be different, or superior, or of more extensive qualities, than those which simply produced the effect, whence alone the cause is supposed to be known by us” (EHU 145).