

“A Bayesian Analysis of the Cumulative Effects of Independent Eyewitness Testimony for the Resurrection of Jesus Christ”
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I

Rodney Holder¹ and John Earman² have made important progress in bringing rigor and clarity to Hume’s argument against miracles by placing it within a Bayesian framework. If hermeneutically accurate, the Holder and Earman account (EH) convincingly illuminates the fact that Hume failed to account appropriately for the effect of independent testimony upon the posterior probability of a particular miracle occurring. Even apart from questions of Humean interpretation, however, Bayesian modeling of such a case articulated by EH—in which there is multiple testimony to the occurrence of a single miracle—is illuminating and impeccable. If Hume meant something entirely different by his argument against miracles than the meaning that Holder and Earman grace him with, so much the worse for Hume. EH constitutes an accurate and informative representation of the situation that Hume wishes to evaluate.

EH proposes an important extension of Bayes’s theorem.³ Where R represents a specific miracle event—namely, the Resurrection of Jesus Christ—and T represents eyewitness testimony that R, Bayes’s theorem states:⁴

$$P(R | T) = \frac{P(R) \times P(T | R)}{P(T)} = \frac{P(R) \times P(T | R)}{P(R) \times P(T | R) + P(\sim R) \times P(T | \sim R)}$$

In the case that there are n independent, equally reliable testimonies to this single miracle event, the following equalities hold:

¹ Rodney D. Holder, “Hume on Miracles: Bayesian Interpretation, Multiple Testimony, and the Existence of God,” *British Journal for the Philosophy of Science* 49 (1998): 49-65.

² John Earman, *Hume’s Abject Failure: The Argument Against Miracles* (New York: Oxford University Press, 2000).

³ I am deeply indebted to Jonah Schupbach for helping me with this section of the paper.

⁴ For ease of presentation and reading, I will leave the ubiquitous background knowledge term out of all probability symbolisms.

$$P(T^1 \& \dots \& T^n) = P(T^1) \times P(T^2) \times \dots \times P(T^n) = P(T)^n$$

$$P(T^1 \& \dots \& T^n | R) = P(T^1 | R) \times P(T^2 | R) \times \dots \times P(T^n | R) = P(T | R)^n$$

$$P(T^1 \& \dots \& T^n | \sim R) = P(T^1 | \sim R) \times P(T^2 | \sim R) \times \dots \times P(T^n | \sim R) = P(T | \sim R)^n$$

Bayes's theorem should then be amended as:

$$\begin{aligned} P(R | T^n) &= \frac{P(R) \times P(T^1 \& \dots \& T^n | R)}{P(R) \times P(T^1 \& \dots \& T^n | R) + P(\sim R) \times P(T^1 \& \dots \& T^n | \sim R)} \\ &= \frac{P(R) \times P(T | R)^n}{P(R) \times P(T | R)^n + P(\sim R) \times P(T | \sim R)^n} \end{aligned}$$

Given that this ratio is now in the form $\frac{A}{A+B}$, we may simplify:

$$\begin{aligned} P(R | T^n) &= \frac{1}{1 + \frac{P(\sim R) \times P(T | \sim R)^n}{P(R) \times P(T | R)^n}} \\ &= \frac{1}{1 + \left[\frac{P(\sim R)}{P(R)} \right] \times \left[\frac{P(T | \sim R)}{P(T | R)} \right]^n} \end{aligned}$$

In this extended form of Bayes's theorem, which I label (EBT), I will refer to $\left[\frac{P(\sim R)}{P(R)} \right]$ as the prior

probability ratio term (PT) and to $\left[\frac{P(T | \sim R)}{P(T | R)} \right]$ as the likelihood ratio term (LT).

My project is modest for at least two reasons. First, my project merely builds on the probabilistic foundations of EH. Holder writes, "Whether or not there have been examples in history where the combined testimony of independent witnesses has enhanced the probability of a miracle's occurrence to greater than indifference level is a matter for empirical investigation."⁵ My project simply uses EH to perform this empirical investigation. More specifically, this paper constitutes an attempt to

⁵ Holder, 53.

spell out the implications of EH on testimonial arguments for the Resurrection of Jesus Christ. Second, the work that I perform throughout this paper is not completely original, but traces of it run throughout the history of such arguments for the Resurrection. Most notably, in his *Ninth Bridgewater Treatise*, Charles Babbage offers a parallel Bayesian analysis to EH and draws a few general conclusions pertaining to the positive effects of multiple testimony upon the plausibility of miracles.⁶

Yet, even if my project is modest, it is also much needed. The argumentative precision gained from the method I use is greatly needed in today's philosophy of religion. Too often, arguments for the Resurrection lack the rigor and precision for which analytic philosophy strives. For instance, on the subject of testimonial support for the Resurrection, Richard Swinburne writes, "Testimony by more than one witness to the occurrence of the same event makes it very probable indeed that that to which they testify is true – to the extent to which it is probable that they are independent witnesses."⁷ Upon reading this passage, one may rightly ask, "Is it necessarily the case that probability goes up with multiple testimony?" or "Just how probable is meant by 'very probable indeed'?" or "Is there any axiomatic method for measuring the effects of testimony on a particular theory?" etc. Because of the vague nature of such arguments, current debates over the plausibility of the Resurrection regularly hit impasses at the level of differences in personal opinions and intuitions. My application of EH to testimonial arguments for the Resurrection adds rigorous detail to points like Swinburne's; thus, making it possible to give satisfactory answers to such questions. Ultimately, my goal is to apply EBT to testimonial arguments for the historicity of the Resurrection as an objective tool to disentangle mere personal opinion from evidential support.

⁶ As included in Earman, *Hume's Abject Failure*, 203-12. Similar accounts to EH are also offered by the anonymous author of "A Calculation of the Credibility of Human Testimony" in the 1699 volume of the *Philosophical Transactions of the Royal Society (London)*, as included in Earman, *Hume's Abject Failure*, 193-94 and by Pierre Simon Laplace, "Concerning the Probabilities of Testimonies," in *A Philosophical Essay on Probability*, as included in Earman, *Hume's Abject Failure*, 194-202.

⁷ Richard Swinburne, *The Resurrection of God Incarnate* (New York: Oxford University Press, 2003), 13-14.

II

The effects of multiple, independent testimony on the posterior probability of an event are striking. No matter how much more probable it is that an event does not occur than that it does,⁸ given a sufficient number of moderately reliable independent witnesses testifying that the event occurred, the posterior probability of the event will go up exponentially as n increases and will, in the limit, become arbitrarily close to certainty. In other words, using EBT, no matter how top-heavy PT is, as long as LT is at least slightly bottom-heavy, then

$$\lim_{n \rightarrow \infty} P(R | T^n) = \frac{1}{1 + \left[\frac{P(\sim R)}{P(R)} \right] \times \left[\frac{P(T | \sim R)}{P(T | R)} \right]^n} = 1$$

Making this same point, Holder remarks, “No matter how small $P(R)$ one can choose n (finite) such that $P(R | T^n) > .5$. The point is that, as n increases, the factor $\left[\frac{P(T | \sim R)}{P(T | R)} \right]^n$ decreases very rapidly, soon becoming comparable with $P(R)$.”⁹

One serious challenge to my project arises from a consideration of PT , LT , and n . These are rather abstract and complex terms; surely we can’t seriously hope to put specific accurate figures on them. I attempt to account for this problem by using ranges rather than specific estimates of the objective values of the terms, and by allowing these ranges to cover estimates that I—no doubt optimistically—hope the atheist and the theist alike could be happy with.

For n , we need to estimate the number of statistically independent putative eyewitnesses to R . For n such witnesses, it must be the case that $P(T^1 | T^2 \& \dots \& T^n \& R) = P(T^1 | R)$. In other words, given the

⁸ Provided onw does not assign it a probability of zero. See section III.

⁹ Holder, 53 (For consistency’s sake, we have replaced Holder’s M with our R and his (q/p) with our LT raised to the n power). Also, see Earman, 55.

independence requirement, it cannot be the case that any such witness is more or less likely to testify that R given the testimonies of the other witnesses.

The New Testament provides an impressive list of eyewitnesses to the resurrected Jesus: Mary Magdalene (Mark 16:9-11; John 20:11-18), other women (Matt. 28:9-10), Peter (Luke 24:34; 1 Cor. 15:5), ten disciples in the upper room (Luke 24:36-43; John 20:19-25), eleven disciples in the upper room (Mark 16:14; John 20:26-31; 1 Cor. 15:5), seven disciples fishing (John 21:1-23), eleven disciples on a mountain (Mark 16:15-18; Matt. 28:16-20), the disciples at the ascension (Luke 24:44-49; Acts 1:3-8), two men on the road to Emmaus (Mark 16:12-13; Luke 24:13-23), over five hundred at one time (1 Cor. 15:6), James (1 Cor. 15:7), and Paul (Acts 9:1-19; 22:3-16; 26:9-18; 1 Cor. 9:1). From these passages, one could count as many as five hundred twenty eyewitnesses. But for the sake of charity, I shall assume that some of these eyewitnesses' testimony (for whatever reasons) should not count. In fact, I will designate that $n=10$, supposing that as many as five hundred ten of the recorded eyewitnesses are in some way disqualified. While I would actually assess n to be much greater than ten, I will proceed with this generous concession in favor of not-R for the sake of using figures I believe some non-theists could accept.

LT is a ratio that compares the likelihood of the testimonies given that R did not occur with the parallel likelihood given that R did occur. Importantly, this ratio does not mention $P(R)$ or $P(\sim R)$ in any way; thus, one's intuitions about the improbability of R should have no bearing upon the value one gives LT. When appraising LT, I am only interested in comparing the probabilities of the particular historical testimonies that we have, given that R actually did or did not occur. When one considers that the eyewitnesses for R had nothing to gain, faced intense suffering for their testimony, possessed upstanding character, and not a single recorded witness gave testimony to the contrary, it seems gracious to assign

LT the value of 1/10. If one has doubts about the gracious nature of this estimate, more could be shown to argue that LT is bottom-heavy.¹⁰

I expect the most difficult and controversial variable to assess is PT. Since PT represents the probability of not-R over R apart from the eyewitness testimony. One should consider the relevant supporting evidence for R such as the empty tomb, the centrality of the Resurrection in the preaching of the early church, the significant departure from the Jewish culture and religion that is found in the Resurrection accounts, the general historical accuracy of the New Testament, and other confirming evidence for R. Even when one weighs this evidence against the arguments against the existence of God (*e.g.*, the problem of evil), I think the theist can grant an exceptionally generous assignment of PT to be 1,000,000/1. I personally find this figure to underestimate an accurate ratio for PT, but I believe this modest assessment should be amenable to many non-believers. In other words, I have conceded this inflated underestimation so that I can demonstrate the effects of multiple eyewitnesses for R on grounds that reasonable unbelievers could accept.

So, my generous estimates for the variables in EBT are PT= 1,000,000/1, LT= 1/10, and n= 10.

With the variables assigned graciously so as to include advocates of not-R, EBT yields:

$$P(R | T^{10}) = \frac{1}{1 + \left[\frac{1 \times 10^6}{1} \right] \times \left[\frac{1}{10} \right]^{10}} = \frac{1}{1 + \left[\frac{1}{10^4} \right]} = \frac{1}{1.0001} \approx .9999$$

Indeed, the results are striking. As the independent testimony increases, the evidence overwhelmingly confirms the epistemic probability of R. Moreover, what I find extraordinary is how powerful this confirmation is for R, even granting diminished values that many non-believers could accept and that most theists would say are abysmal, given the evidence for each claim. Not only does

¹⁰ George N. Schlesinger offers a convincing case for the even stronger claim that LT is extremely bottom-heavy by appealing to the fact that there are a very large number of ways for false testimony to be given but not so for true testimony in Schlesinger, "The Credibility of Extraordinary Events," *Analysis* 51 (1991): 120-26.

the EH account provide clarity in counting the cumulative effects of eyewitnesses, it demonstrates that even with charitable values for each term the evidence for R is compelling.

III

John Earman presents five possible “ways out” of this conclusion for non-believers.¹¹ First, one may “point to some defect either in Bayesianism itself or in the Bayesian analysis of multiple witnessing.”¹² An adequate response to any critique of Bayesianism is beyond the scope of this paper, and one would need a case-by-case defense of the EH model in order to respond to arguments against this analysis of multiple witnessing. Thus, this paper offers no response to such critique.

Second, one may “set the prior probability of [the Resurrection] to zero.”¹³ In this case, the denominator of PT will equal zero; thus, EBT will not be workable. I am unsure why someone would think that the $P(\text{Miracle}) = 0$. Given the possibility that a god exists, it seems perfectly reasonable to say that it is remotely possible for a miracle to occur. My point here can be made clearer by expounding probabilistically on $P(R)$ with the theorem on total probability:

$$P(R) = P(G) \times P(R | G) + P(\sim G) \times P(R | \sim G)$$

where G = the proposition that there is a god. Presumably, $P(R | \sim G) = 0$; so,

$$P(R) = P(G) \times P(R | G)$$

Given this equality, it would seem that the prior probability of R is tied to the probability of there being a god. One could easily argue for a non-zero value for $P(R)$, then, by appealing to arguments for theism. If the objector replies by insisting that $P(G) = 0$, then I would assume the objector can offer good reasons for thinking it is logically impossible for a God to exist. It would seem unreasonable to reject

¹¹ I am grateful for Jonah Schupbach’s observation concerning Earman’s five “ways out” and many of the counterarguments against them.

¹² Earman, 60.

¹³ Ibid.

the possibility of theism (*i.e.*, claiming that $P(G) = 0$) and also unreasonable, then, to reject the possibility of R (*i.e.*, claiming that $P(R) = 0$).

“The third out is to set the prior probability above zero but still so low that the testimony of a million witnesses would not push the posterior probability to a respectable level.”¹⁴ In this case, one affirms the exponential decrease in LT but also avers that PT is so dramatically top-heavy that no feasible numbers that are given to PT and to n will be enough to counter the effects of LT.

In order to make this way out succeed, one has to assign outrageous numbers to the terms of EBT. Assigning insurmountable numbers to these terms, though, reveals intellectual dishonesty. For I have already granted an assessment of the evidence that is weighted heavily in favor of the objector of R. Unless some new and compelling evidence is discovered that permits an even stronger evaluation of the evidence against R, those who make this move reveal that their conclusion is driving the probability assignments in the equation. Indeed, this is an intellectually dishonest approach to any argument. At this point, the non-believer’s hypothesis seems to be guilty of a charge that Antony Flew once brought upon theism: the atheist’s beliefs seem unfalsifiable. Pertaining to such hypotheses, Flew writes, “A fine brash hypothesis may thus be killed by inches, the death by a thousand qualifications.”¹⁵

“The fourth out,” according to Earman, “is to deny the independence assumptions that were crucial to the positive results.”¹⁶ In the particular case of R, I may add that one could also argue against the number that one assigns to n by appealing to a lack of historical evidence for the witnesses. In defense of n, I have pointed out that there is evidence to acknowledge over five hundred witnesses that R. In the spirit of generosity, however, I decided only to count ten witnesses, allowing the proponent of not-R to dismiss the majority of the testimony. Those who disagree with my assessment of n have two

¹⁴ Ibid.

¹⁵ Antony Flew, “Theology and Falsification,” in *New Essays in Philosophical Theology*, ed. Antony Flew and Alasdair MacIntyre (New York: The Macmillan Company, 1955), 97.

¹⁶ Earman, 60.

clear paths of dissent. They could argue either that the evidence supports an even lower, non-zero number than I have proposed or that no testimony for a miracle could ever seriously be admissible. If proponents of not-R believe that my estimate for n is too high, the burden of proof rests on them to demonstrate how a smaller value for n can be plausibly supported in light of the historical data.

Those who take the other strategy might be tempted to follow David Hume's allegation that no testimony for a miracle could ever exist. Hume made this case in *An Enquiry Concerning Human*

Understanding:

There is not to be found, in all history, any miracle attested by a sufficient number of men, of such unquestioned good-sense, education, and learning as to secure us against all delusion in themselves; of such undoubted integrity, as to place them beyond all suspicion of any design to deceive others; of such credit and reputation in the eyes of mankind, as to have a great deal to lose in case of their being detected in any falsehood; and at the same time, attesting facts performed in such a public manner and in so celebrated a part of the world, as to render the detection unavoidable: All which circumstances are requisite to give us a full assurance in the testimony of men.¹⁷

In response, let me call attention to two points. First, note that Hume's standards for eyewitnesses require eyewitnesses to be so compelling that their testimonies alone ought to confer justification to believe the event to which they testify. For the purposes of EBT, however, the witnesses only need to be fair and independent. To say that a witness is fair is not to concede that the witness is utterly impeccable. Rather, a fair witness is merely one whose testimony should be considered when weighing the evidence. In many cases EBT could be used granting numerous fair witnesses and still yield a low epistemic probability for the claim in question.

Second, there is a fundamental inconsistency for those who suggest that the testimony in this instance ought to be discarded because of the miraculous claims of this testimony. George Mavrodes

¹⁷ David Hume, *An Enquiry to Human Understanding*...

has pointed out two serious problems with this Humean critique of miraculous testimony.¹⁸ In the first place, this type of criticism conflates the probability of the miracle and the probability of the testimony. Second, to rule against miraculous testimony on the grounds that one personally has never witnessed a miracle has disastrous consequences. For this methodology would eliminate all testimony to events that one has not experienced. Mavrodes explains,

[I]f we are to proceed empirically, we have to take the testimonies as we find them. We cannot just make up testimonies to suit ourselves. *Nor can we properly leave out testimonies just to suit ourselves.* In the case of miracles, the fact that there are these other troubling minority testimonies, the testimonies of those who claim to have experienced miracles themselves, become part of the data with which we must deal.¹⁹

Fifth, one may assert that LT is not bottom-heavy. Critics might argue either that LT should be assessed as 1/1 or that LT should be top-heavy. For they might accept Hume's doctrine of the "knavery and folly of man."²⁰ Hume argues against the strength of the testimony for a miracle on the grounds that people are prone to believe outlandish stories.

The many instances of forged miracles, and prophecies, and supernatural events, which, in all ages, have either been detected by contrary evidence, or which detect themselves by their absurdity, prove sufficiently the strong propensity of mankind to the extraordinary and the marvellous, and ought reasonably to beget a suspicion against all relations of this kind. This is our natural way of thinking, even with regard to the most common and most credible events. For instance: There is no kind of report which rises so easily, and spreads so quickly, especially in country places and provincial towns, as those concerning marriages; insomuch that two young persons of equal condition never see each other twice, but the whole neighbourhood immediately join them together. The pleasure of telling a piece of news so interesting, of propagating it, and of being the first reporters of it, spreads the intelligence. And this is so well known, that no man of sense gives attention to these reports, till he find them confirmed by some greater evidence. Do not the same passions, and others still stronger, incline the generality of mankind to believe and report, with the greatest vehemence and assurance, all religious miracles?²¹

¹⁸ George I. Mavrodes, "David Hume and the Probability of Miracles," *International Journal for Philosophy of Religion* 43 (1998): 167-82.

¹⁹ *Ibid.*, 180 (emphasis in original).

²⁰ Hume, *Enquiry*...

²¹ Hume, *Enquiry*....

But Hume’s worries about the “knavery and folly of man” are not sufficient to appraise LT as 1/1 or top-heavy. Indeed, the approach offered by Hume fallaciously conflates the probability of R with the likelihood that numerous independent and fair eyewitness testimonies exist. In order to make LT 1/1 or top-heavy, one would have to justify either that eyewitness testimony for any event is equally likely to occur given that the event occurred and did not occur (in case LT is 1/1) or that eyewitness testimony for an event is more likely to occur when the event does not occur (in case LT is top heavy). Neither justification seems salvageable. Moreover, if anyone could justify assessing LT as 1/1 or top-heavy, this would result in untoward consequences about the evidential weight of eyewitness testimony for any event, not just for miracles. Thus, I believe this *prima facie* case establishes strong grounds for keeping LT bottom-heavy.

IV

I have argued that the axioms of probability provide fruitful grounds for situating the evidence for the Resurrection of Jesus Christ. Specifically, the EH account adds rigor and clarity to the explicit strength that independent, eyewitness testimony confers on the epistemic likelihood that the Resurrection is rationally plausible. More remarkably, the EH account presents a plausible way to demonstrate the overwhelming evidential case for the Resurrection—even while using diminished values for the evidence that many non-believers would find acceptable. Therefore, it is rational to believe that the eyewitnesses testify truly—Jesus is risen!²²

²² I would like to thank Jonah Schupbach and Timothy McGrew for valuable help and comments on earlier drafts of this paper. I would also like to thank a number of Western Michigan University’s graduate students who gave me critical feedback on an earlier informal presentation of this paper.