

# An Application of Probability Theory to Three Theological Coincidences

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*"Evolution is an established fact, current research is merely uncovering the way it happened."*

*"I prayed this prayer and it happened, but as I look back on it, I'm not sure if it was God or just a coincidence."*

*"Jesus fulfilled so many specific Old Testament prophecies that he must have been the Messiah."*

Have you ever pondered the above ideas, or things like them? Is the origin of life from non-life by chance really an established fact? How do I know whether the event really was God answering my prayer? Are the prophecies really so specific that Jesus is the only one that could have fulfilled them? The three statements above share in common that they are unique and extremely unlikely. The difficult thing about assessing them is that, on the one hand, they are so rare that the fact that they happened at all is striking. On the other hand, there are so many possibilities that it seems reasonable that the particular one observed, or one like it, might indeed eventually happen. Using the mathematical theory of probability, in this essay we will attempt to quantify the above notions and thereby shed light on the three questions. In the process, we hope to model a general way of approaching such 'coincidence' questions so that the mathematically minded reader can apply this approach to other such questions they encounter in life.

## 1 Evolution

To explore whether the evidence suggests that the origination of the first organism arose by chance or by design, we will first consider the probability of the event occurring, followed by a discussion of its likelihood of occurring, and thereby providing an answer from the perspective of probability.

We will not here attempt a serious probability calculation on of the probability in general. It is far too complicated and unlikely. The same point may be made by boiling all of the biology down to the following. In order to make the simplest organism, suppose all we need to do is produce protein molecules from amino acids. The smallest protein molecules need about 100 amino acids. There are 20 amino acids, but conservatively estimate that about 1 in 4 will produce a viable molecule. Let  $X_i$  be the event that the  $i^{th}$  amino acid is viable,  $i = 1, 2, \dots, 100$ , Thus in the primordial ocean of amino acids, the probability that a single amino chain would form a viable protein molecule is

$$P(X_1 \text{ and } X_2 \text{ and } \dots \text{ and } X_{100}) = \frac{1}{4} \times \frac{1}{4} \times \dots \times \frac{1}{4} \approx 10^{-60}$$

This is 1 out of a one with 60 zeros behind it chance. Now, it is estimated that the minimum number of protein molecules for the simplest organism is 124 (Morowitz, 1968; a very conservative number compared to recent estimates)?. This reduces the probability to

$$10^{-60} \times 10^{-60} \times \dots \times 10^{-60} = (10^{-60})^{124} = 10^{-8060}$$

This is the probability for a single set of 124 protein molecules to all be viable and therefore live.

Next, consider the likelihood of the event occurring. Assuming there are an infinite number of amino acids in the ocean, let there be one set of 124 protein molecules for every atom in the universe, which is no more than  $10^{80}$  (See Dembski 2004)?. Also, suppose that the chemical reactions occur very quickly, at a rate of one billion ( $10^9$ ) reactions per second. Assuming that the universe has been existence for 20 billion years, which is under  $10^{16}$  seconds, this brings our probability calculation down to

$$10^{80} \times 10^{16} \times 10^9 \times 10^{-8060} = 10^{-7955}$$

This is the likelihood of the event occurring: 1 out of a one with 7955 zeros behind it chance.

Thus, using the largest possible sample space afforded by current science, the probability of biological life arising by chance is effectively zero. In response to this line of reasoning, some have attempted to enlarge the sample space in order to increase the probability. One approach is to postulate that the universe has been in existence for an infinite amount of time (oscillating universe theory, which has been discredited). Another approach is that there is a sufficiently large number of parallel universes. Such approaches are ad hoc and they illustrate how a coincidence (existence of biological life) can be viewed as either evidence for either intelligent design or Darwinian evolution. The choice depends upon whether the infinitesimal probability is taken at face value, or if astronomical numbers of additional resources are added to the sample space.

## 2 Prayer

To explore whether the evidence suggests that that a particular candidate event is an answer to prayer or not, we can analyze it in the exact same way as we did for the evolution question. That is, we will first consider the probability of the event occurring, followed by a discussion of its likelihood of occurring, and thereby providing an answer from the perspective of probability.

Consider the following true story, relayed to me by a friend named Rufus in September, 2008. Rufus was unemployed for several months. While an applicant at a job fair seminar, he was sitting at a front table. A company representative from the back of the room walked all the way up to the front and stopped in front of him and asked him if he knew anything about a company called Ingram Micro. He replied, "yes," and that he had worked there for 13 years, and proceeded to answer some questions of the gentleman. The company, Ingram Micro, was not represented at the job fair, nor did the representative who spoke with Rufus know him. In fact, Rufus was surprised at this coincidence and asked why he talked to him of all the people in the room. The man replied, "it just occurred to me at the moment I was walking by your table to ask you." The night before going to the job fair, Rufus prayed to God that He would give him a sign at the job fair. Rufus had already had a series of 6 interviews with Ingram Micro. He interpreted this as an answer to his prayer.

After sharing this story, I was actively thinking about this essay, and so I asked Rufus some follow-up questions, in order to quantify the question. The coincidence was the man asking Rufus about Ingram Micro. Rufus said there were about 35 people in the room, the man asked only one person about Ingram Micro that day, and that there were 10,000 companies which the man might have been asked Rufus about. Assuming all people and companies were equally likely, the probability of his asking Rufus about Ingram Micro is

$$\frac{1}{35} \times \frac{1}{10,000} = \frac{1}{350,000}$$

which is an extremely rare event. If we suppose that 10,000 events occurred to Rufus that day, then if each event had a 1 in 350,000 chance, then the probability of the extremely rare event occurring reduces to

$$10,000 \times \frac{1}{350,000} = \frac{1}{35}$$

which is still unlikely, but would still be expected to occur about once per month. Assuming these calculations, it is not surprising at all that Rufus experienced an extremely rare event in September 2008. What makes this situation different is that the night before Rufus narrowed the sample space with his prayer by asking for a sign at the job fair. This prayer narrowed the sample space in at least two ways. First, it decreased the possible time for the event to occur. Suppose that this was a tenth of his waking day. Second, it decreased the possible subject matter of the events. Suppose only 100 of the 10,000 events that occurred to Rufus that day qualified as pertaining to his unemployment status. Adjusting the previous  $1/35$  by these two reductions in probability is as follows,

$$\frac{1}{10} \times \frac{100}{10,000} \times \frac{1}{35} = \frac{1}{35,000}$$

which takes us back to a very low probability. The main point here is not that the above probability calculations are an accurate portrayal of reality. I think they are reasonable, but they could be questioned.

Rather, the main point is a demonstration that when a large sample space is considered, the probability of coincidences may be rather likely, e.g. 1/35. On the other hand, when the sample space is narrowed down by a specific prayer request, then the sample space shrinks and the probability of the coincidence occurring can indeed be very low. In this case, that means evidence that the answer is God and not chance.

### 3 Jesus' fulfillment of Old Testament prophecy

To explore whether the evidence suggests that that Jesus' fulfillment of Old Testament (OT) prophecies is highly unlikely or not, we can analyze it in the exact same way as we did for evolution and prayer. That is, we will first consider the probability of the event occurring, followed by a discussion of its likelihood of occurring, based on an assessment of the sample space. For this section, I will begin by sketching out the work of Peter Stoner (1963).?

Stoner cites eight OT prophecies and indicates reasons for selecting conservative lower probability bounds.

Table 1: Stoner's prophecy probability lower bounds

Name	Passage	Probability
1. Born in Bethlehem	Micah 5:2	$10^{-5}$
2. Had a forerunner	Malachi 3:1	$10^{-3}$
3. Enter Jerusalem on a foal	Zechariah 9:9	$10^{-2}$
4. Betrayal by friend resulting in hand wound	Zechariah 13:6	$10^{-3}$
5. Betrayal price = 30 silver pieces	Zechariah 11:12	$10^{-3}$
6. Cast 30 pieces of silver to the potter	Zechariah 11:13	$10^{-5}$
7. On trial, but did not defend oneself	Isa 53:7	$10^{-3}$
8. Was crucified	Ps 22:16	$10^{-4}$

Using Stoner's numbers, he calculates the probability of a single individual fulfilling all eight of the prophecies to be

$$10^{-5} \times 10^{-3} \times 10^{-2} \times 10^{-3} \times 10^{-3} \times 10^{-5} \times 10^{-3} \times 10^{-4} = 10^{-28}$$

Next, he asks how many people lived from the time of the prophecies up to the present time (c. 1963), and estimated 88 billion, rounded to  $10^{11}$ . Therefore, with  $10^{11}$  people each having a chance to realize an event with probability  $10^{-28}$ , the likelihood that the prophecies were fulfilled in a single person is

$$10^{11} \times 10^{-28} = 10^{-17}$$

which is virtually impossible. Therefore, Stoner writes, "Now these prophecies were either given by inspiration of God or the prophets just wrote them as they thought they should be. In such a case the prophets had just one chance in  $10^{17}$  of having them come true in any man, but they all came true in Christ" (p. 107).

There are two problems I would like to point out with this argument. First, in order for the final probability calculation, based on multiplying probability components together, to be legitimate, the component events must be independent of one another. By "independent," we mean that the occurrence of one event does not effect the probability of another. In the preceding evolution and prayer examples, the component events were roughly independent. In this example, however, some of the events are clearly not independent. For example, events 5 and 6 both involve 30 pieces of silver. The effect of dependence is to increase the probability. For example, the probability of casting 30 pieces of silver to the potter is much lower than the probability of the same event, given that the betrayal price was already 30 pieces. Another pair of dependent events are 4 and 8, involving hand wounds. To fix this, the dependencies should be made explicit and conditional probabilities should be calculated and employed. This would raise the overall probability.

The second problem is that there is ambiguity in the specification. In the prayer example, the specification was relatively clear. Rufus prayed the day before, he was looking for an answer the following day, or perhaps several days, on a specific topic. In this case, hundreds of pages of Scripture have to be mined in order to

select a small number of prophecies, which are then determined to have been fulfilled after the fact. There is definitional ambiguity, "What is a forerunner?" There is identificational ambiguity, "Why does Psalm 22:16 apply to Jesus of Nazareth when it can easily be seen to have applied to David, who wrote it?" There is selection ambiguity, "Granting that Zechariah 9:9 does refer to the Messiah, why choose that particular one? Why not verse 10, which reads,

"I will cut off the chariot from Ephriam  
And the horse from Jerusalem;  
And the bow of war will be cut off."  
And He will speak peace to the nations;  
And His dominion will be from sea to sea,  
And from the River to the ends of the earth.'?"

Clearly Zechariah 9:10 was not fulfilled by Jesus of Nazareth; it is eschatological, although still messianic.

These specification problems do not apply equally to each of the eight verses selected. For example, event 1 - Born in Bethlehem, seems well specified and therefore a legitimate event to consider in such calculations. This appears to be the exception rather than the rule. In my opinion, none of the others seven prophecies, as Stoner has presented them, are well specified. Therefore, in light of both the independence and specification problems, I do not assent to Stoner's probability argument that the likelihood of Jesus' fulfillment of OT prophecy is so low that it is indisputable. In principle the argument could be reworked, by making a more careful selection of prophecies, clearly defining their specificity, and addressing the independence issue. Indeed, Stoner indicates there are at least 300 such prophecies that could be employed. However, I have doubts about the viability of such an enterprise, because it seems to me to run counter to the nature of biblical prophecy. The purpose of biblical prophecy is primarily to encourage and exhort, rather than predict (1 Cor 14:3). That is not to say there is no predictive element; there clearly is. It is just that prediction is generally done in a hidden way (see 1 Cor 2:6-16). As such, it almost inherently carries a problem of specification.

## 4 Conclusion

In the above three examples, the same basic procedure was followed:

1. Calculate the probability of the unique event occurring
2. Calculate the number of chances for the event to occur (sample space)
3. Multiply the two numbers together to obtain the likelihood of the event occurring

When this is done, a rough estimate may be made of the likelihood of the event. By "rough", it is hoped that the general order of magnitude may be obtained. If the event is on the order of  $10^{-3}$  (one in a thousand) or larger, then it is probably reasonable to think that it was really chance. On the other hand, if it is less than that, and you have done your calculations conservatively and accurately, then chance has been ruled out as a good explanation. The alternative is that there is something else going on. In the case of evolution, non-chance implies design. For prayer, non-chance should generally understood to be God, although in cases where God is not the only one capable of the event (e.g. a "financial miracle"), other possibilities cannot be ruled out a priori. For Jesus' fulfillment of prophecy, two sources of error in using this approach were shown, dependent events and ambiguous specification.

In conclusion, by applying the above procedure, you could assess events in your life for whether they are reasonably explained by chance, or if other explanations should be sought. Realistically, I do not believe that this is how most of us tend to think, or will want to do it on a regular basis. However, it is my hope that going through this exercise will help to clarify the thinking we do when we wonder whether things are of divine origin vs. chance, and thereby obtain a benefit, albeit intangible.