

The Red Sea Crossing: can secular science model miracles?

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Some secular scientists have a new strategy: instead of completely rejecting Scripture, they accept parts of it in exchange for the power to filter out God and His works, especially miracles. An example of this strategy is found in the attempt to explain the Red Sea crossing as a natural phenomenon. However, these explanations cannot explain the details of the biblical accounts or tests of self-consistency.

Instead of blatantly rejecting biblical history, some secularists are now explaining miracles as complex natural events. A recent example is the Red Sea crossing of Exodus 14. Oceanographers and atmospheric scientists have proposed natural explanations, supported by mathematical models.¹⁻³ This is a growing trend. For example, marine geologists concluded that Noah's Flood was merely the post-glacial, catastrophic infilling of the Black Sea.⁴ Their explanation was doomed by contradictions with both Genesis and field data.⁵⁻¹⁰ Close examination of these theories reveals key contradictions with the historical narrative and a troubling trend to a kinder face on the same old attacks.

Oceanographic explanation

Nof and Paldor^{2,3} explained the Red Sea crossing by mathematically computing an optimized water-receding distance and the approximate height of a return wave to kill the Egyptians. Note their sugar-coated positivist slant:

“We chose to deal with this unusual type of research that advances archaeology, biblical history, and religion as well as physical oceanography because we view the role of science as an aid not only in advancing its own cause but also in advancing other avenues of human endeavor.”¹¹

In other words, Bible stories are acceptable as long as a secular science filters out God.

They suggested a crossing at the northern end of today's Gulf of Suez (figure 1). Fortuitous winds from the north-west were channelled between the mountains, creating sufficient velocity over a limited time and area to push water south in a ‘setdown’ or decrease in mean water level (table 1). Although the Hebrew term for the wind direction is most commonly translated ‘east’, Nof and Paldor assert a linguistic flexibility that allows it to mean ‘north-west’—today's most common wind direction.

Crucial to their theory is tenuous timing. First, they proposed a tsunami to create a wall of water, generated by

a geologic event such as an earthquake, volcanic eruption, or plate motion. But there were two serious problems: 1) it ignores the strong wind in the text; and 2) water would move at the same speed in both directions, precluding sufficient time for Israel to cross. So they rejected a geologic cause but still concluded that the event could be explained by natural phenomena.¹²

Nof and Paldor³ broadened their analysis to include atmospheric data. Analysis of two different atmospheric probability models led them to conclude that the Gulf of Suez crossing was the result of a cyclical wind setdown with a ~1,000-year cycle. They also re-emphasized the submerged ridge and concluded:

“We have demonstrated that the likelihood of the storm necessary to ‘part’ the Red Sea (20 m s^{-1} north-northwest wind blowing for 8–14 h over the Gulf of Suez) is once in a period of $O(1000 \text{ yr})$. We suggest that the Red Sea crossing has been termed a ‘miracle’ simply because the above likelihood period is greater than the human life span, so that even if it occurred at a given time prior to the legendary crossing, it was not remembered by later generations.”¹¹

It may be convenient to see God's miraculous acts in history as merely fortuitous timing astounding credulous ancients, but the plain reading of the narrative is not so easily overcome. For example, what are the odds of the cycle occurring *exactly* when Moses raised his staff? What cycle might explain God's command to do so?

Atmospheric explanation

Drews and Han¹ noted the failure of Nof and Paldor to explain the most likely direction of the wind and the *two* walls of water. But they too think the answer is a wind setdown but affecting a lake in the north-eastern Nile Delta. Such an event was documented at Lake Menzaleh, to the west of the Suez Canal (figure 1), in 1882 by British Major-General Alexander B. Tulloch. An overnight, easterly wind pushed

the lake water approximately seven miles north-west, stranding boats that normally sailed in 1.5–1.8 m of water.

Based on this single event, Drews and Han¹ invoked a similar one for the Red Sea crossing, which they date at 1250 BC. We prefer an earlier date¹³ but leave that argument to others. Drews and Han¹ proposed an oxbow-shaped area across a possibly larger Lake Tanis, near the Pelusiac Branch of the Nile (figure 1). Using variable wind speeds of 100–118 km/h, they suggested a water level drop of 2 m in the lake and 3 m in the Pelusiac Branch of the Nile, exposing an area 5–6 km wide for approximately 3.9 hours. Although the *area* exposed might have been sufficient for ~2.5 million people and their animals to have crossed in a night, the *time* of 3.9 hours was not sufficient, especially given the extensive mud flats predicted by their computer model.

Discussion

Addressing the relationship between the Bible and forensic history will depend on one’s worldview. This relationship is certainly more complex than presented by these secular authors. The Christian worldview constrains forensic history by the limited, but true, data in the narratives. On the other hand, naturalism attempts to control the meaning of the narrative via ‘science’.^{14,15} Selective reading of the narrative, especially if God is excluded, is not helpful. Eliminating God’s work in space and time from narratives that emphasize it is a philosophical choice, not a scientific one.

These studies also illustrate a tension between gradualism and actualism—the method that restricts interpretation of geologic strata in the past to the reservoir of observed

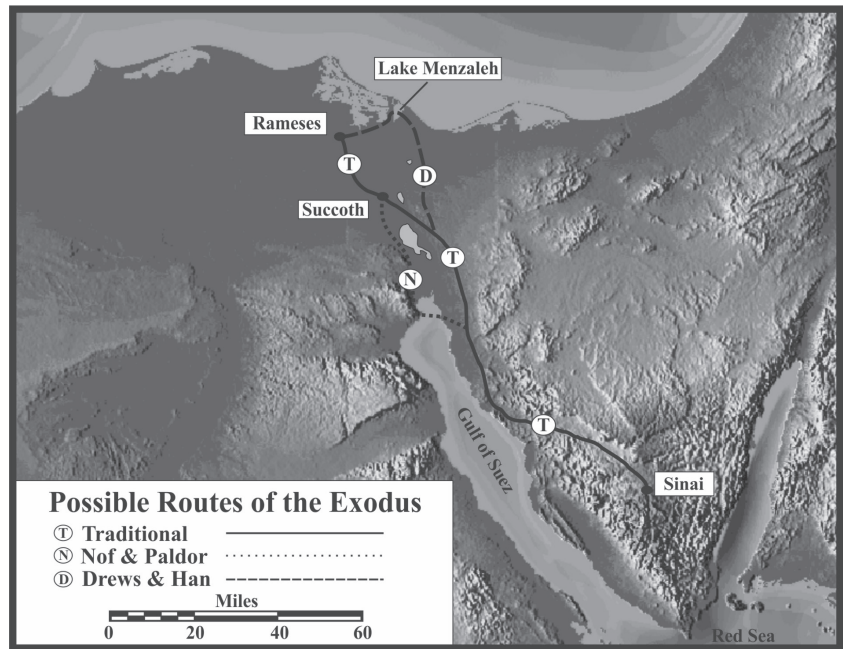


Figure 1. The traditional (T) route of the exodus from Unger⁴⁰ differs from those of Nof and Paldor (N) and Drews and Han (D). Climate change and variable sea level position over three millennia add uncertainty to the location of the Red Sea crossing.

geologic processes—in geologic thought. Gradualism has a difficult time with unique events, while observed rare events are not always a good template for the past by virtue of their rarity. Also, secular authors struggle to square the circle; to find a ‘natural’ answer to a supernatural event. Despite the occasional wind setdown of shallow lakes, this phenomenon is sufficiently distinct from the Red Sea opening to be a non-starter. Note how the authors use nebulous ‘cycles’ to place singular events safely back into the cage of gradualism.

The new strategy

Recent years have seen a new strategy by critics of Christianity. Instead of simply dismissing all Scripture, there appears to be a trend that accepts just enough of the Bible to satisfy a few Christians, while denaturing it of the divine

Table 1. Modelled setdown in northern Gulf of Suez from Nof and Paldor.² Highlighted row indicates their preferred set of conditions necessary to explain the crossing using a natural approach.

	Wind Speed		Sea-Level Drop		Receding Distance		Time to Maximum Withdrawal	Rate of Return		Time of Return
Hurricane Winds	35 m/s	78.3 mph	5.8 m	19.0 ft	3.0 km	1.9 mi	Not Calculated	5.0 m/s	11.2 mph	Minutes
Strong Winds	20 m/s	44.7 mph	2.5 m	8.2 ft	1.2 km	0.75 mi	"Several Hours"	5.0 m/s	11.2 mph	Minutes
Moderate Winds	7.0 m/s	15.7 mph	0.37 m	1.2 ft	0.2 km	0.12 ft	10 Hours	5.0 m/s	11.2 mph	Minutes

to satisfy fellow secularists. The Old Testament is no longer simple myth, a ‘dumbed-down’ account for ‘low-information’ ancients, or part of a religious conspiracy (e.g. Dan Brown’s novels). Instead, it is simply a rough history with the same errors found in any other account.

This new strategy may be a result of better apologetics and the better dissemination of information using the internet. Christian apologists have dissected the head-on attacks, and shown them filled with falsehood. For that reason, some secularists have abandoned the broadsword for the stiletto. Biblical accounts are granted a superficial historical reality but are filtered, by ‘scientific experts’, of the supernatural. The plagues of Egypt are attributed to the eruption of Santorini¹⁶ and the Flood to the post-Ice Age rise of the Black Sea level.⁴ Textual evidence for Hezekiah’s tunnel is ignored in favour of geological speculation.¹⁷ Jesus did not walk on water; he supported himself on the pile of stones in the Sea of Galilee.¹⁸ In a similar manner, historians praise Christianity for its (undeniable) role in fostering science¹⁹ and in providing a template for natural history in the 18th and 19th centuries,²⁰ although the Bible’s *accounts* of that history are dismissed as ‘outmoded interpretation’.²¹

But the end result is the same; the being, word, and work of God are denied. Attempts to grant secular legitimacy to biblical narratives thus amount to a form of control. Excluding the truth in exchange for partial ‘scientific’ acceptance makes secularists gatekeepers of truth. It is a subtle twist to the old fallacy of positivism. Note the iron fist inside the velvet glove in the first quote of this article above.¹¹

Implying that *any* part of the biblical narrative is false denies basic theology. It is impossible for God to lie (Hebrews 6:18) and *all* the Bible is *His* revelation (II Timothy 3:16). Christians who fall for the new secular strategy in the pursuit of intellectual respectability are borrowing trouble. When current theories are set aside for future ‘discoveries’, they will be left struggling to keep up.

Flaws in secular analyses of the Red Sea crossing

These ‘natural’ explanations of the Red Sea crossing fail for several reasons. They are inconsistent with the facts of the narrative. God is not hidden or obscure. He is the main character. If the Red Sea crossing was just a rare ‘natural’ event, Scripture is wrong, both in the immediate narrative and in its broader context. If one part is wrong, then any other part can be too.

Both the oceanographic and atmospheric theories invoke special events (natural miracles?) to satisfy their models. While attempting to accommodate *some* biblical history, they create an alternate reality. A cursory examination reveals their errors. There is confusion over wind direction. Geography is driven by convenience for models, not what the Bible says. Secular scholars cannot even agree on a location. Nof and Paldor^{2,3} look south; Drews and Han¹ to a northern lake.

Neither theory explains the walls of water or the *dry* land between. Both ignore the timing: extraordinary conditions begin *as needed*, are maintained *as needed*, and end precisely *as needed* to protect Israel. As a side note, the drowning of *all*

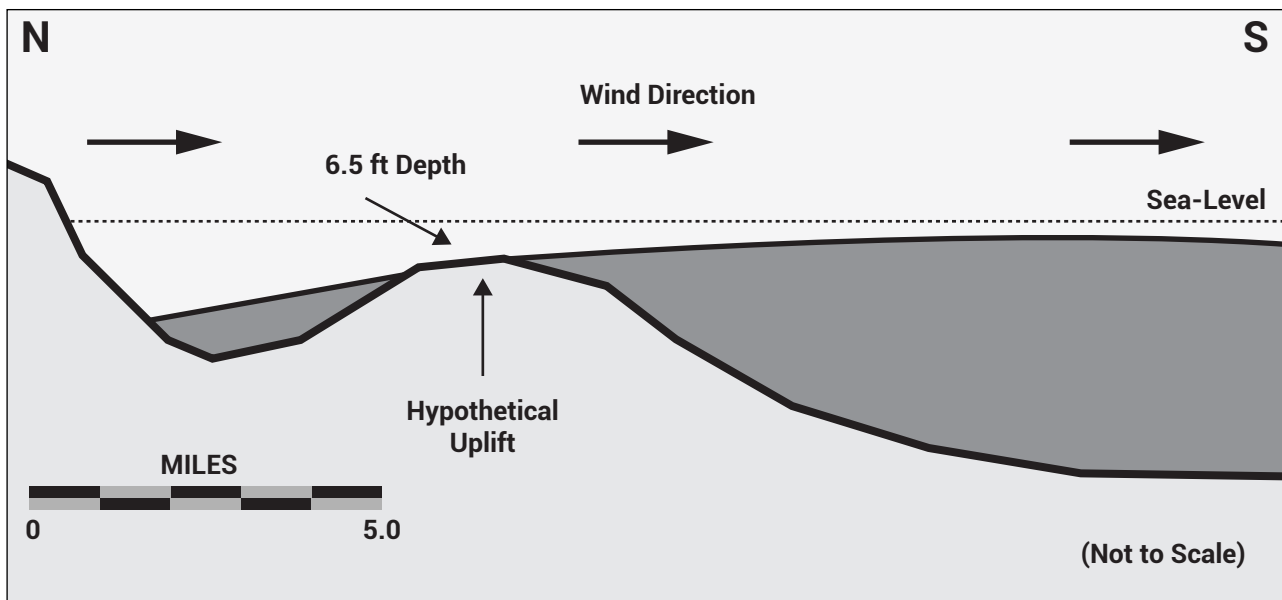


Figure 2. Nof and Paldor^{2,3} invoked a submerged land bridge. There is no present bathymetric evidence for it but it is necessary to their model, providing the ‘dry land’ passage after a wind setdown. (Modified from their figure 4.)

the Egyptians suggests too that the water depth was greater than the ~2 m proposed by Drews and Han.

Secularists miss the main point. Nature did not drive the events; God did. He controlled it. The Bible states that the wind blew all night from the east. Yet, the water also withdrew to the east.²² This contradicts modelling done by both groups.

The broader context also argues against ‘natural’ explanations. Israel has just escaped Egypt via a series of miraculous plagues that even pagan intellectuals thought had been caused by “the finger of God”.²³ Throughout the book, God speaks audibly. A cloud of fire leads Israel. Manna falls from heaven. Quail flock to the camp, as requested. Water comes from rocks on command. God speaks audibly to the whole congregation at Sinai. Oceanographic concerns, though interesting, are at best a sidebar.

Another problem is the dry land Israel crossed. A firm, dry path would have been necessary to carry the load of so many people and animals. But that creates serious problems for naturalists. It requires more than the removal of overlying seawater to create *dry* land; it also requires suppression of rising groundwater from the strata beneath the sea floor, especially in a muddy lake bed. Solid ground would have been even more necessary for the ‘*natural*’ explanations to succeed because, in both scenarios, Israel would have crossed in the face of near hurricane-force headwinds, an impediment strangely unmentioned in the narrative.

The ‘natural’ explanations rely on wind setdowns configured to preordained solutions in mathematical models. This kind of investigation is more directed mathematical speculation than science. Similar types of computer models have been questioned, discounted, or even rejected.^{24–26} Furthermore, both models show a low percentage of iterations that yield positive solutions.

If the Red Sea crossing is not sufficiently supernatural, it happened again at the Jordan River. The text itself links the two stories:

“For the Lord your God dried up the waters of Jordan from before you, until ye were passed over, as the Lord your God did to the Red sea, which he dried up from before us, until we were gone over: That all the people of the earth might know the hand of the Lord, that it is mighty: that ye might fear the Lord your God for ever.”²⁷

A secular bias is explicit in the articles; both selectively downplay or ignore God. Nof and Paldor state: “We shall not be concerned here with the question of whether a flight and crossing actually occurred in the past but rather with the issues of providing a possible scientific explanation for such a crossing.”²⁸ But if there was no crossing, then why waste time and money to derive some scientific ‘just so’ story? Drews and Han state: “The present study treats the Exodus 14 narrative as an interesting and ancient story of uncertain origin.”²⁹ This statement ignores internal textual statements, millennia-long tradition, and external evidence. Its origin is crystal clear. It is an exercise of the fallacy of ‘chronological snobbery’ that the story being ‘ancient’ and ‘of uncertain origin’ should convey a lack of confidence.

Footprint of the crossing

Biblical history, like all other history, is not a comprehensive recital of events. The Bible contains all we need for faith and practice, but that is often a brief overview and details must often be inferred. That is the case for Exodus 14 regarding any number of issues that excite human curiosity: the exact timing, the exact numbers of Israel and Egypt, the size of the sea’s opening, etc.

The difficulties in understanding these details can be seen in one of the more easily addressed issues—an inferred footprint of the people at the crossing. Limits can be placed using: (1) the duration of the crossing; (2) the maximum distance travelled; and (3) the minimum width of the opening. Based on the census (table 2) taken shortly after the crossing (Numbers 1:46), we estimate a total population to have been at least 2,500,000. The average surface area per person can be extrapolated from studies of ancient armies. Marching Roman infantry soldiers required 1 m², although the area required for baggage and animals was much greater.³⁰ We believe that 3 m² per person is a *minimal* estimate for Israel, based on the presence of women, children, animals, and baggage.

That would yield a total area of 7.5 km². Length vs width can then be constrained to certain broad limits by the distance travelled in one night³¹ by those at the rear of the procession (figure 3). For example, a footprint 250 m wide would require a length of 30 km. One 500 m wide would require a length of 15 km. Thus, those in the

Table 2. Census of Israel taken two years following the Red Sea crossing

Tribe	Men > 20, Able to fight
Reuben	46,500
Simeon	59,300
Gad	45,650
Judah	74,600
Issachar	54,400
Zebulun	57,400
Ehram	40,500
Manasseh	32,200
Benjamin	35,400
Dan	62,700
Asher	41,500
Naphtali	53,400
Levites	Not numbered
TOTAL	603,550

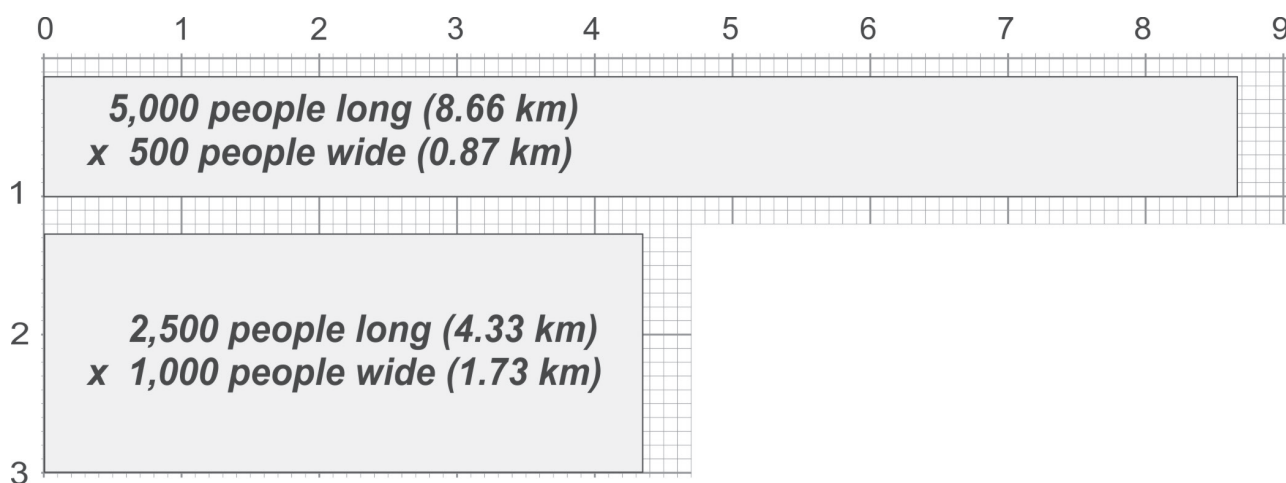


Figure 3. Potential footprints of the parted waters are constrained by the time for ~2.5 million people (and animals) to march in one night. A 1.73 x 4.33 km footprint (~1,000 x ~2,500 people) seems reasonable, although a narrower dimension 500 people wide and 5,000 people long would be possible. The relatively small area of even large numbers would allow for a variety of geographic locations, although a marching distance much greater than the ~17 km of the narrower option is probably near the upper limit for the time provided.

back would have to march 30 km in a single night. On the other hand, a width of 1.732 km would have allowed 1,000 people to march abreast, yielding a formation of 1,000 x 2,500 people, with a minimum length of 4.33 km. The resulting 8.66 km for those in the back of the formation would have been an easy night’s march, even with animals and baggage. An average day’s march for ancient armies was approximately 15 km. Thus, if Israel was 2.5 million people, the space required for them to cross was not large and could easily have been less than 1 km across. It could have been much wider; our estimates of space per person are minimal. Note too that the Jordan River was held back approximately 70 km upstream to allow a similar-sized population to cross its dry bed.³² That wider footprint allowed the Israelites to cross the river quickly, as suggested by the priests holding the ark the entire time and the time allowed for the gathering of rocks from the riverbed.³³ But the difficulties in exacting overly specific details are sufficient for caution.

What held the Red Sea in place?

Another miraculous aspect of the Red Sea crossing, commonly overlooked by naturalists, is the condition of the Red Sea water at the time of the crossing. The secular studies require a continuous, high-velocity wind setdown to prevent the parted water from closing during the crossing, but the Bible indicates that once formed, the walls of water were miraculously held in place without wind. They appeared to congeal; clearly an exercise of God’s power outside of his usual limits of mediate providence that we call ‘natural law’.³⁴ In fact, Scripture states that following the crossing, God brought the wind once again, but this time to drown

Pharaoh’s army.³⁵ Natural events cannot comprehensively explain miracles, even if God makes use of natural means for a part of the event.

Location of the crossing

Secularists share one major uncertainty with generations of biblical scholars—the actual location. Places in Exodus (e.g. Pihahiroth, Migdol, and Baalzephon) are presently unknown. Creationists understand that this is complicated by (relatively) rapid climate and sea level changes since the mid-15th century BC and the potential effects on local geography. Of course, our modern ignorance of this detail does not disprove the account. Several potential crossing sites are possible.^{36–40}

However, Exodus 13:17–20 casts severe doubt on the location proposed by Drews and Han’:

“And it came to pass, when Pharaoh had let the people go, that God led them not through the way of the land of the Philistines, although that was near; for God said, Lest peradventure the people repent when they see war, and they return to Egypt: But God led the people about, through the way of the wilderness of the Red sea: and the children of Israel went up harnessed out of the land of Egypt . . . And they took their journey from Succoth, and encamped in Etham, in the edge of the wilderness.”

While the locations of Succoth and Etham are not currently known, Bible scholars generally regard this location as south of the eastern Nile Delta region (figure 1).

Conclusion

Secularists have a new strategy. Instead of flatly rejecting the Bible, they use ‘faint praise’ by offering ‘natural’ explanations of miraculous events. An example is the escape of Israel from Egypt by the Red Sea crossing. In place of a miracle, the crossing was the result of a wind setdown or a subsea ridge, or both. However, their ‘explanation’ ignores the facts of the narrative; most importantly, they ignore the presence of God and the stated purposes of the miracle—showing the world His power, identifying Israel as His protected people, and confirming the status of Moses as His prophet. A similar attempt to explain the Flood as a relatively minor sea level rise at the Black Sea shares the same shortcomings.

Christians should be aware of a new secular strategy. Christian academics, especially, should beware of receiving the gnat of historical verisimilitude while swallowing the camel of the secular worldview and its authority to determine which parts of the Bible are true and which are not. It is simply another attempt to deny God’s power and presence in this world, and yet ... He is not far from each one of us.⁴¹

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