

## Astro-statistics in Dating and Locating the Exodus

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### Abstract

**A new piece of evidence is provided in determining the as yet unknown dating and location of the Exodus. The evidence is derived from the statistical use of Graeco-Roman precessional astrology and the philosophical historian's observations that a new world religion begins in a police state. The religions of Judaism and Christianity also start at the beginning of a new astrological age. The new world religion here, presumably started in the near East with a new set of "rules", may build on tradition and finally extend both Judaism and Christianity as the Leo/Aquarius age unfolds. To harmonize the dating of the Exodus and its location and to find tangible evidence, logical deduction and the details of the Hebrew texts are suggested to be used to develop a list of possible sites for the Exodus. Excavation begins with the most probable site on the top of the list. Systematic searching should be undertaken and, necessary or not, documentation should be provided for future researchers.**

**I would like to express my thanks to Dr. William Shea and Rabbi Nahum Schnitzer for their very useful advice and for their encouragement.**

Consider a contradiction. The church vehemently opposes astrology—and therefore there was no star of Bethlehem as factually told in Matthew. Consider a confusion. Isaiah himself disparages astrology. Or, was it really the commerce of astrology and religion—materialism mixed up with pride (1Kings 10:14)? Consider now a Lie. The unmistakable psychological evidence and motives in St. John's conscience suggests that the spear of Longinus was never thrown. (John 19:35) The Lie about the spear had been slipped in here by the one who loved Christ the most and did not want to see the Idea die. If nothing else, the Lie adds comedy to the giant contradiction between law, free will, and economics, determinism, as in the presidential swearing-in oath.

On the other hand, the Chaldeans based their religion on logical deduction. They had no need of contradictions, anomalies, or a lie. Astrology is valid since the stars represent one part of Creation and therefore deserve study in their

own right. Abraham himself probably painted his imagination upon the ceiling of heaven. Perhaps there really were lucky stars shining divinely in the celestial city of the ancients. If nothing else, awe and wonder suggested an eternal beauty expressed in a mythological dimension to the universe. Even the catwalk around the modern observatory proclaims it today.

The novelty of this paper is to show through precessional astrology a statistical piece of evidence that fits the “conservative” model for the Exodus c. 1450 BC. “Conservatives” stand by tradition, while the “liberals” do not. Precessional astrology means that with the beginning of each new astrological age there are two new important religious figures with one as the innovator. The two new figures have signs opposite to each other. Their signs match up with the age. The age has a point estimate of 2150.5 years, given the popular technique of equi-partitioning the zodiac into 12 equal parts. For example, Abraham was a Libra born at the beginning of the Libra age if Isaac was an Aries.<sup>1</sup> It is well

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Mr. Scott Lee, a calendar conversion expert, writes the following:

“The Hebrew calendar has been in use for several thousand years, but in the early days there was no formula to determine the start of a month. A new month was started when the new moon was first observed. It is not clear when the current rule based calendar replaced the observation based calendar. The patriarch Hillel II published these rules in 358 AD. But Hillel II may have only published the 19 year rule for determining the occurrence of leap years. For this reason, conversion for dates such as 1446 BC are only estimates. And due to the uncertainty of leap year placement (where a 13<sup>th</sup> month is added) the estimated conversion could easily be off by more than a month.”

We simulate Isaac’s birthday of Nisan 15. The time interval examined ran from January 1, 1585 AD to January 1, 2000 AD yielding 415 data points. We used February 19 to March 22 (12 were March 22) as the Pisces with March 23 to April 20 as the Aries. The null hypothesis: Isaac is not an Aries, born between and including March 23 and April 20. We use Mr. Lee’s calendar conversion software. First, astrological tropicalism gives an Aries proportion of 396/415 from an interval running from January 1, 1585, the inception year of the Gregorian calendar, to January 1, 2000. The Julian calendar yields a proportion of 278/415 with 118/415 for the difference in population parameters. A further yearly comparison from 360 AD to 1580 AD was made between the Julian and hypothetical Gregorian calendars. With replacement was used here, while the finite population correction factor of .91 was deemed inconsequential to the results. In a simple random sample of 200 years the difference in proportions yielded expected significance results with a z-value of c. 3.42. The short of it all, the simulation data strongly suggest that Isaac must have been born an Aries.

known that with at least 83% certainty Mary was a Virgo, while Christ was a Pisces. We predict that the next innovator was/is a Leo (a Jewish expectation), while his father was/is an Aquarius.<sup>2</sup> Aquarius is not calendar-wise important for the Jews, but Leo is. Hence, the switch. The assumption is that the Leo may have no children. The pair must appear at the dawn of the Aquarian age. Ironically, but divinely played, despite all the disparagement of astrology from theology and the Bible itself, it is astrology that comes to the rescue.

### **The Dating**

Egyptologists unanimously agree that the Exodus could only have happened under one of two possible pharaohs—Amenhotep II, a cruel and narcissistic muscle man, and Merenptah who, we can infer, was a relatively sensitive leader given the era. Merenptah was a man who at least kept his word. The official dates of Amenhotep II's reign do not fit conclusively with history. The 1450 BC date of the "conservatives" is only one of three possible dates. Two of them other than 1450 BC do not fit the theory. And, since the Egyptians never mentioned the Exodus, as far as we know as of now, circumstantial evidence can only be used. What is the evidence?:

- (1) The usual Biblical dating of c. 1446 BC using the Julian calendar.
- (2) William Shea, the well known Old Testament scholar, has suggested that the 1446 BC date emerges from two sets of problematic texts. Dr. Shea concluded that there were two pharaohs with the first one dying in the Exodus and the second one, an impostor that assumed the names of the first.

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Possible relevant historical sequence: ->1967->Jewish capture of Jerusalem->"Hair" opens in October! -> the "common heritage of mankind" declared through an Aquarian in November, 1967-> the United Nations(UN) members sign onto the Third UN conference on the Law of the Sea-> using the legal/stewardship principle of the common heritage, Jerusalem becomes a cultural, educational, athletic, religio-philosophical and tourist center with the "remnant" of Mecca and Rome with a piece of the action? -> a triumph of cooperation and necessity->and the new Jerusalem; tap your temple?

The general public (not the military) need never know, since the pharaoh need never show himself to it. All we would have is rumor.

At this point, further research could be directed first to more accurate identification of the royal mummies, second, to the use of technology and anatomic knowledge (such as minerals of the sea under the finger nails) to ascertain whether Amenhotep II or Merenptah drowned, and, third, to any discernible change in Egyptian domestic and foreign policies.

(3) Biblical chronology, when taken literally, places Abraham's birth in the absolutely minimum theoretical date of 2168 BC. Much more likely it was 2167 BC or 2166 BC or 2165 BC. The astrological precessional hypothesis fits this data. The comparison of Biblical and astrological chronology yields an absolute maximum difference of eleven years—c. 1/215 chance in a uniform probability distribution. The astrological age's confidence interval estimate is 2157.7 BC +/- 200 years.<sup>3</sup> 2157.7 years would correspond to 2168.7 BC for an estimate of Abraham's year of birth. We use as the anchor March 7 BC, the most probable and accepted date of Christ's birth, since we don't have the exact year of birth of Abraham or the Leo.

Precessional astrology now side steps two important issues that have concerned scholars.

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A sampling frame of certified Level IV professional astrologers (National Council of Geocosmic Research) as of February, 2005 was used. The unpaid email census yielded a response rate of 9 out of 56 (74 had no address for a total of 130). Unfortunately then, we had to use the t-test—and, on great faith, the assumptions of normality in the population. With a Gregorian point estimate of 2013 AD we are left with a 95% confidence interval of 95.4—1966 as the low and 2061 as the high. This does not conflict with a range of 211.5 years and outliers of 2142 and 1931. If an astrologer gave two endpoints, we used the usual technique of halving the interval of the two endpoints. It is clear that the +/- 200 years for locating the beginning of an astrological age, or at least the Aquarian age, prove much too large here. Further experimentation and good response rates are needed. Interestingly, the results are premillennian.

(1) Places have changed names. Avaris is the classic one. In modern times the crest of a country may even be changed. Dom Mintoff, former prime minister of Malta, liked the picture of the sun over the water for the national emblem as opposed to the earlier one where the red and white are guarded by two dolphins. The crest has now been changed again, the result of a political compromise. All this in Malta took place within the span of 15 years.

(2) Outside conclusive historical evidence is also non-existent as far as I know. For example, we cannot use any volcanic evidence at this stage in our knowledge since the US Geological Survey for one does not show any extraordinary events like spectacular volcanic eruptions c. 1450 BC in the Mediterranean. Only Vesuvius had a volcanic explosivity index equal to 4 or more, but statistically a Vesuvius eruption is highly unlikely at the date of the Exodus. Clearly, the magnitude of the Exodus is also exaggerated. Presumably, the writer(s) wanted to emphasize an important religious not historical event. The initial 70 “souls” by the rule of 72 could not have produced more than c. 6,000 “souls” even with a generous net birth rate (takes into account all deaths at birth) of 1% in “a high pressure” population regime. The 6,000 could also include the “mixed multitude”. The 600 chariots or more of the pharaoh indicate the possible validity of this argument. (Incidentally, the Biblical passage reveals something else. It hints at the pharaoh’s preoccupation and knowledge of horses and chariots. Fancying himself a clever military commander, the pharaoh had estimated the necessary number to win.) The event in relation to the Egyptian population of c. 2 million at the time would also have probably been the largest civil rights movement in ancient history. It is no wonder that Amenhotep II or Merenptah was astonished by Moses’ courage and his example—a man who could govern himself, not someone who had to be governed. Could the pharaoh

now risk the fact that the Exodus might encourage other groups with the intent to break out?

If the Biblical reported numbers in the story seem ludicrous, without judgment we might have to throw out all of the numbers, such as Moses' census. All we can say then is that the Exodus must have taken place since the Jewish people and their traditions are still here.

Let us try now recomputing the age of Abraham, Isaac, and Jacob, arbitrarily shaving off 50 years for Abraham, 30 years for Isaac, and, say, 50 years for Jacob making a total of 130 years. The ages of the patriarchs would seem much more plausible from our point of view, despite being arbitrary. These numbers still are not enough to set the date of the Exodus in the reign of Merenptah almost certainly beginning in 1212/1211 BC. We would still have to shave off another 70 years at least even if Thutmose III died in 1426 BC, a claim made by some scholars. We could even use 1423 BC as the date of Thutmose III's death, if necessary. Only astrological precession theory could work here; the Biblical and Dr. Shea's claim could not. Below 1423 BC astrological precession theory itself would at some point have to be abandoned.

With precessional astrology one can see where the relay race is going. For one thing, with a Dioscuri the theology of Judaism and Christianity disintegrates. (If there are to be any new rules, the second one must include a challenge to understand, an ongoing study of the universe, creation itself, not the Creator. Logically, there is a "moral" component to foresight). So, beyond the miracles, there must be a deeper meaning and truth in Christ's behavior than is presently understood and taught.<sup>4</sup> For another thing, we predict that a new innovator in

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If Joseph of Arimathea were Christ's biological father, he was forgiven when discovered. A clearer and more understandable picture of the New Testament story emerges—and the secret of the resurrection.

Leo, born on the 9<sup>th</sup> of Ab, the Jewish expectation, will appear whose father is an Aquarius. The size of the astrological age is probably 2150.5 years +/- 200 years. Therefore, Leo's birth would take place c. 2144 AD +/- 200 years.

We have now turned the topic into a scientific and statistical one. Isaac fits the data. A well known argument with circumstantial evidence can, in fact, has been advanced in identifying Virgo/Pisces with at least 83% certainty. We have also made a prediction for a Leo/Aquarius combination. Unfortunately, with the data as of now, we will not be able to test with virtual certainty the Leo/Aquarius combination for at least another 200 years unless a new set of "rules" are given and believed prematurely.

There is suspicion that the "liberals" have been outwitted. There are numerous events that could illustrate the validity of the Old Testament with the caveat that we could have limited and insufficient information. (In other words, we must not fall into the fallacy of Cartesian elimination.) For example, the Old Testament fits with Joseph's corn arbitrage and advice to Sesostris II and then Sesostris III in the subsequent centralization of Egyptian administration. Second, the Old Testament fits with Amenhotep I, the pharaoh who "knew not Joseph". Thirdly, the Old Testament fits with the hackneyed truism that the Hebrews had remained loyal to the Egyptians during the Hyksos period. And this explains why the local Egyptians provided all the necessary supplies for the Hebrew journey. Obviously, Amenhotep I was not taking any chances; the Hebrews might turn on him. Fourth, the Old Testament fits with Thutmose III's hatred for Hatshepsut. Hatshepsut, like her mother, princess Ahmose, may have wanted Moses to be the pharaoh. After all, as far as we know, princess Ahmose is the most likely candidate to have raised Moses. This explains perhaps why Thutmose III wanted Moses dead at any excuse—only for Moses to discover a

new paradigm totally different from anything before or during the reign of all pharaohs. Finally, in our examples, the Old Testament fits with the longevity in the ages of the patriarchs. Gerald Schroeder, an orthodox rabbi, has shown that this phenomenon can be explained with science!

What seems to me amazing are the abilities of the writer(s) to conceal intentionally or not when and what happened in the Exodus. With uncanny predictability we must rely on circumstantial evidence, statistics, and thus faith. Also, there is always a possibility, millenia later, we have overlooked important details or have need of further archaeological excavation. Naturally then, we are left sometimes with unsettling scenarios. For example, historical and archaeological findings suggest that horses were introduced into Egypt in the early stages of the Hyksos. But the Old Testament chronology suggests that horses were known during the time of Joseph. Were the writers ignorant of the facts, incompetent, or innumerate? I doubt it.

We have the probable year now, can we logically deduce the exact date using Biblical chronology? In the rest of this paper, we have ruled out all possibilities except one. Why? On closer inspection these excluded possibilities, as far as I know, have all ended up with a flawed alibi. For example, geologists argue that the Red Sea was connected to the Bitter Lakes "relatively recently", but the 12<sup>th</sup> dynasty of Egypt had already written that the Bitter Lakes were undrinkable lakes. Further, no one so far can conclusively explain the body of water on each side of the crossing itself.

Now we know a few facts:

(a) It was spring time (b) Isaac was an Aries born on Nisan 15. (c ) the Hebrews left in a hurry on Nisan 15. (d) a forced march very seldom covered more than 20 miles/day. We can now infer that, even though the Hebrews were

walking day and night and with the fire and smoke to guide and keep them together, there was no hope of reaching the Red Sea from the general location of Goshen in less than four days. Why the Red Sea? There was no hope of escaping detection given high population densities and high immigration/emigration and the line-of-sight fortresses and/or canals dotting between the Mediterranean and the Red Sea, the great Green (the color of the Red Sea is greenish at noon and crystal blue at sundown.) This explains why the Hebrews stopped at Etham, at the edge of the wilderness, **perfectly positioned to pick up sweet water for the journey**, since there was none at Suez. This means that even in Thutmose III's and Amenhotep II's time, a canal must have been functioning to the left and above the Bitter Lakes at least in part of every year. A combination of events such as the winds and the sirocco would have been ascertained to provide a rough idea when maintenance should be undertaken by the Egyptians. Maintenance was a perennial problem.

The water from the Nile then entered these lakes and finally the Red Sea as non-potable water. We can infer then that the Hebrews' water supply lasted c. two to three days (confirmed by Exodus 15: 22). After Suez it was replenished with the brackish, but, according to Napoleon, drinkable water of the Wells of Moses. One day and only one day must have been spent resting and light walking—probably just below and to the left of these lakes. The logic suggests that the probable date was Nisan 18 when the Hebrews got to Migdol near the mouth of the canal in the late afternoon. The Hebrews could not waste any time. The tides were checked, and the easterly wind was approaching a Beauford 7. The sand was hardening and soon the sea or perhaps a body of water (but not a lake) heaped—and the Hebrews could now be off on the crossing on early Nisan 19.

Now for the time itself. The Hebrews, or at least some of them, knew that they had to catch the tail end of the spring tide at the Red Sea (lunar implication). The effect of the new moon on the tides usually takes here c. 2 days. Since Suez has a semi-diurnal tide, the high tide and the low tide last c. 6.2 hours each. Since the Egyptians spotted the Hebrews between dawn and a few minutes before sunrise, at c. 6 a.m., the low tide must have begun around midnight.

**The argument in this paper: the Exodus occurred in 1446BC Nisan 19 c. midnight to a few minutes before sunrise (c. 6 am)**

### **The Location**

Location must harmonize with the dating. Archaeology tells us that logical deduction is the last technique one would use in order to find tangible proof. This method, we think, has to be used here in order to narrow down and explain possible sites. The situation demands the method because we don't know where exactly one would have to dig, and, how deep in the sand and soil one would have to excavate with the use of ground penetrating radar. Perhaps at this stage in history the effort may be too daunting; the money needed too much. Should we just give up here and concentrate on searching for evidence at, say, the Sinai mines where some of the Hebrews might have worked? Logic tells us that the mines are highly unlikely since the Sinai miners returned from the mines in late April or early summer. Therefore, the Hebrew miners would not have participated in the Exodus. For any evidence the mines must be close to the bottom of any list of possible sites.

Now the Egyptians manning the line-of-sight fortresses would easily have spotted the Hebrew columns by day or by the bonfire at night. Using the sun, the Egyptians could also signal each other which could explain why the pharaoh could track the Hebrews so readily. Therefore, with the existence of the fortresses a northerly or central exit route, particularly in a densely populated

area with heavy real and attempted immigration/emigration, would be out of the question. The Red Sea Exodus would probably be the best choice—and **it fits our dating, ceteris paribus.**

The fortresses would probably be undermanned, fewer, and/or small since fresh water has to be brought into Suez. Moses, a native guide or at least one of the Hebrews would have to have known about the approximate times of the tides and an escape route. Finally, to consider, the correlation of the phases of the moon with the times of the tides probably lay beyond the Egyptians' military knowledge. They knew about Ra Amun, but they probably did not know about the moon goddess. In fact, the Egyptians may not have known about any paths across the Red Sea and/or any facts behind tides.

Before, we used precessional astrology with the known facts—which brings into focus a much deeper, more logical and more subtle world view than currently taught by academics. Armed with the date, we now use logic and the known facts to cut down on the number of places where the Red Sea Exodus could have occurred. The approach here argues for a complete and systematic search, taking into account the modern Suez canal.

A list of possible sites should be constructed with the most likely area searched first. Without groupthink or brainstorming, I think there are at present five sets of issues which the archaeologist must resolve to undertake a systematic, "carpet" search. Feasible, satisfactory solutions to **all** these issues would have to be met in order to qualify for inclusion on the list of possible sites to be examined. The approach, I believe, could probably make finding the true location a manageable and feasible task both in money and in effort. If the site is not found, future efforts could at least have ruled out certain areas. Now, the issues with the main topic of each in bold:

**(a) What has changed in the geography and geology of the Southern route?**

Remarks:

First and foremost, the US and/or Egyptian-Israeli geological survey should perform a detailed simulation as of 1450 BC without resorting to an across-the-board annual 2mm recession of the Red Sea.

1. To make the situation simple without compromising the relevant details, I assume that hydrological knowledge did not exist in 1450 BC. The archaeologist should first estimate the volume/second of water exiting from the canal, leaving the Gulf of Suez an estuary. Near fresh water from the canal would push back onto the sides of the mouth of the channel. Pliny notes that the height of the canal was c. 40 feet—suggesting that a wall could have been erected at the same time to keep people in or out and to minimize maintenance against sand and wind. The high tide depth of the estuary must have been at least the height of the high tide above the path surface. For safety a boat's draught could not be larger than this height. Salt tolerant common reeds may then have grown around the banks of the estuary at least part of the year. Common reeds can withstand periodic tidal action with a salinity of 3.5%-4.0% (very close to the average salinity of the Red Sea). Common reeds are drought resistant, can withstand flooding and a moderate change in salinity. With near fresh water seepage probably from the water table, salinity is not a problem since the common reed reproduces using roots one to two meters deep. The salt tolerant reed can grow at c. 4% salinity. The real problem in this case is germination, not proliferation. A maximum amount of c.

2% salinity is required. There is no guarantee that the canal water from the Bitter Lakes to the Red Sea can meet this criteria. On the surface it looks quite plausible. Future research simulations should be conducted here. If common reeds did not grow in the time of Moses, we would have to use our final defense—unfortunately, unreliable linguistic evidence. We know that *Yam suph* has generally been interpreted as a sea of reeds, and the argument for a Red Sea crossing should be discounted. It seems unlikely that there was a play on words. “Reed” is to “weed”? The common reed, *Phragmites Australis*, is also considered a weed by botanists. The sea of reeds might reflect the puzzlement of the Egyptians (and later the biblical writers) over why reeds did grow on the banks around Suez.. The Egyptians may not have known the conditions necessary for the germination of the common reed. Finally, there is always the unsatisfactory answer that the whole area up to the Mediterranean constituted “a sea of reeds”. In that scenario, we must abandon an air tight argument attempted in this paper.

The mathematics suggest that with the existence of the canal salt tolerant common reeds could grow on the embankments of the Suez. First, we compute the canal’s discharge to discover the numeric relationship with the volume surrounding Suez.

$$.1V_1 + .4V_2 = .2(V_1 + V_2) \text{ with solution } 2 V_2 = V_1 \text{ in the static model.}$$

Where  $V_1$  = the cubic meters of the canal’s discharge and  $V_2$  = the cubic meters of the surrounding area. Notice that the .1 means that the waters from the Bitter Lakes are still undrinkable. The .4 represents the salt density of the Suez waters; the .2 represents the

salt density for common reed germination. If seeds here germinate in the spring time and if the density of the Suez waters is lower than the Red Sea proper, the probable south east surface wind would move the canal water to the Suez embankments.

With Manning's equation we have  $\min.V_1 = [k/n][(dw)^{5/3}/(2d + w)^{2/3}]S^{1/2}$ . A rectangular cross-section of the canal is permissible.

K= 1, since we are using meters for simplicity  
 N=.0145, the Manning's constant (the average of .015, brickwork, and .014, clay)  
 d=the average depth of the canal's water, the variable  
 w= width of the canal, a constant of 35 meters (difficult to change), given the famous Hapshesut's barge and her boast.  
 S= the gradient, a height of 10 meters/ the distance of 32 kilometers calculated from the current lower end of the Bitter Lakes plus the 8 kilometers to compensate for the Red Sea's recession..

Notice that we cannot use normal probability (which is in any event debatable here) by multiplying  $V_1$  by the Gaussian density function and then using definite integration,(i.e from constants a to b). The integration is beyond the current state of analytical mathematics. Therefore, table 1 shows what we feel is the absolute minimum discharge for a given average depth of water in the canal. An archaeologist could check these numbers against those of the ruins of the canal.

**Table 1  
 Minimum  
 Discharge  
 of the Red  
 Sea Canal**

average depth	cubic meters/sec	discharge/hour	discharge/day
1	41	148,029	3,552,705
2	126	453,756	10,890,148

			20,703,30
3	240	862,638	8
			32,395,24
4	375	1,349,802	7
			45,586,40
5	528	1,899,434	5
			60,008,66
6	695	2,500,361	1

Notice that the canal issues c. 20 million cubic meters/day regularly at an average depth of 3 meters. For comparison, the Nile issues c. 300 million cubic meters/day to 700 million cubic meters/day in September, at least 15 times larger in volume than this canal.. For all practical purposes the average water depth of the canal would not exceed 3 meters, given the draft of, say, Khufu's ship or Hatshepsut's barge with its possible keel. Theoretically, the surrounding area, inclusive of the canal, yields c. 30 million cubic meters/day with 2% salinity. The 10 million cubic meters, equivalent to an area of 2 square kilometers with an average depth of 5 meters, would give a Suez salinity below 4%. With a part of the canal's water forced backward onto the Suez embankments and with a regularity of the canal's discharge over a period of 10 to 25 days at most, germination would occur at Suez in its temperature of late March to early April. The outcome would be little different with a gradient ten times less, given the spring floods between the beginning of March and the ending in May. The canal would issue c. 6 ½ million cubic meters/day. Now, germination would depend, if at all, on the interaction of the surface wind with the **speed and volume of circulation and the water depth**—a nice simulation project for an oceanographic researcher.

(b) **Was Migdol at Clysma?**

Remarks:



Baalzephon could be true north of Migdol and Pihahiroth and still on the eastside of the canal.

2. The path was (a) at least 10 feet wide to accommodate cattle and chariots in single file. The path was flat across. (b) with a maximum length determined by (1) how far 20/20 vision would allow a man in spring time to make out figures of people a few minutes before sunrise. (The Egyptians did not station a man on top of the Attaka mountains because feedback would take too long in the semi-darkness. Such a man would invariably have seen the smoke screen and the fire brands of the Hebrews.) (2) whether the Hebrews could all get across in c. 6 hours or less in a Beauford 7 near gale that “heaps up the sea” in this case, on the west or northwest side of the path. With 6,000 Hebrews traveling single file at a maximum  $\frac{1}{2}$  mph, the maximum distance of the path could not be more than 3 miles. With 6 feet of space between and in front of each Hebrew, the crossing would have taken 14 hours. Given three Hebrews across, a feasible width of the path would have been at a minimum of 18 feet. (c ) The maximum length would require that all the Egyptian horses and horsemen with some moving room and probably in single file could fit on the path at the same time (The pharaoh’s chariot leading the front blocked all the Egyptians) (d) Other factors to consider: (1) The high tide and the current yielded a depth able to drown men, landlubber or not, and possibly horses. A quick change to high tide would also mean that the length of the path would be shorter than it otherwise need to be. (2) The entrance, exit and environs of the path were flat and/or gently sloping with a thin covering of sand and/or

gravel. These characteristics would explain why the chariots and horses could be ridden in the first place. (Don't forget the cattle!) Deep layers of sand would have slowed down the Egyptians significantly. (3) The path itself consisted of c. 1  $\frac{3}{4}$  feet deep of surface sand, about the radius of an Egyptian chariot wheel of the time. Realistically, the path could dry up with a strong wind in much less than 6 hours providing enough time to start the crossing.

With the low tide and intermittent reductions in the wind's speed, a parting of the Red Sea would be conceivable even if we rule out exaggerations about an easterly wind that may not have been necessary for the drama. Understandably then, the Hebrew top brass "had light" by knowing the time of the tides that the Egyptian military had not foreseen.

**(e) Why was the pharaoh and his men defeated?**

Remarks:

The answer seems quite clear. The Hebrews' stopping at the north of the Bitter Lakes was not for military but health reasons. The pharaoh had misinterpreted the movement. Therefore, he had not anticipated that he would fall into a trap—he would have to wait until the next low tide. Suppose he had waited for the next low tide and crossed the Red sea, the Hebrews at 2 mph would have arrived at the Wells of Moses at least two hours earlier than the Egyptians. The pharaoh could also have sent half of his horse around the canal—but he did not. This indicates again that the pharaoh knew a lot about the capabilities of horses and chariots and about the canal itself. Amenhotep II is well known as the greatest horseman in ancient Egyptian history.

The questions then become: how long would it take before locating a break in the canal so that the horses and horsemen could cross? Would they arrive at the Wells of Moses before the Hebrews? The Wells of Moses were situated 8 miles away from Suez. . A day constituted 8 hours. Endurance riding horses today can travel at a maximum speed of 7 miles per hour for two consecutive days over a maximum distance of 50 miles for each day. Given the heat, the sun, and any sand the speed would be much slower here. If the Hebrews averaged 2 mph, the Hebrews and these horsemen would arrive at the Wells of Moses at the same time. We are assuming that the detour was 28 miles. Ultimately, the pharaoh lost because of an unforeseen miscalculation in time and distance. His troops and his horses had no choice but to gamble on the tide. If they did not, they would not be able to catch the Hebrews disappearing into the singing sands of the desert where chariots would be difficult to operate. Even if the Egyptians were well stocked with water, and they knew the times of the tide, they would not have been able to catch the Hebrews without a native guide. There is sand and coral.

### **Conclusion**

In Exodus we are dealing with a “fish” story for the emphasis of a religious point as much as we are with the tale of of a stuttering “serpent” of Egypt and his people. The only certainty in the relevant texts is its exaggeration—but a kernel of truth need not be dismissed. This kernel of truth suggested in this paper can be verified with statistical certainty.

Overall, the passages reveal an almost morbid fascination in the superior knowledge (and hygiene) of the Hebrews, from animal husbandry to astronomy and the tides. We encounter this same superciliousness in dealing with Philistia. For example, the Essenes labeled the Romans in secret contempt as

the pejorative “kittim” (or “chittim” from Crete). Israel was the first born, the “chosen”, not Egypt. Indeed, physically, the first born of the pharaoh, an unknown dauphin perhaps, may have died, the future embodiment of Egypt herself.

The Exodus account given here, the scientific bedrock of which lies in the prediction of a Leo innovator for the Leo/Aquarius age, yields an interesting implication for modern political economy. Philosophical historians have long been puzzled by why a new world religion and a new historical innovator always appear in or just before the police state stage of a “civilization” or universal state. The philosophical historian also notes that the proletarians and lumpen-proletarians are the first to transmit and act upon the Idea. The seeming mystery deepens in that only Judaism and Christianity have been ushered in with a new astrological age from the Western zodiac.

Frankly, I think the reasons for these patterns are obvious. Regardless of its truth and its paradigm, a world religion in its purest sense is a psychological liberation from human perception and reality. Naturally in the beginning, only the suffering poor in a now bureaucratic caste society would follow—and hope. In fact, a world religion in its early years supersedes science and politics. It sets the tone and character for the next civilization; it captures the imagination without necessarily being entirely accurate historically. In the end, a world religion demands an emotional and intellectual maturity, particularly if democracy is preferred.. It has no need of the “conceit of scholars and the conceit of nations”. It has abandoned the notion of the pleasure/pain calculus that is taught so unthinkingly by the economist in every school and in every university in the world. “Virtue is its own reward” but Man considers it

irrational—and history therefore must repeat itself with the “cunning of reason”, with the prisoner’s dilemma, with another new religion.

Even if we were to find the probable Exodus location with the date at hand, we may be so unlucky as not to recover any relevant artifacts. Without a smoking gun we would be faced with a statistical proposition once again. Probability reigns over history. Ultimately we must ask: is any part of the Exodus story true? With mounting evidence from multiple independent and “reasonably” reliable outside sources contradicting the declared veracity of the Old Testament, the conservative would be backed into a corner. He escapes by questioning the credibility of all those sources. Finally, ironically, could everyone have failed to understand the text itself? Science has become faith—and the fighting goes on....

### **Bibliography**

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