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TWO PROBLEMS REGARDING MOSES

1) WHO WAS THE GOD OF THE EXODUS?

2) WHERE WAS THE HOLY MOUNTAIN?

JOHN K. HORD

The International Society for the Comparative Study of Civilizations is based on the idea that many problems can be usefully addressed from the multi-civilizational viewpoint. This paper will analyze two long-standing Biblical problems on that basis. The first involves only looking at well-known knowledge from a new, multi-civilizational perspective, and so will be presented briefly. The second is more interdisciplinary, touching obscure byways of geology, meteorology, and exploration reports.

1) WHO WAS THE GOD OF THE EXODUS?

One of the more popular Biblical mysteries of the last hundred years has involved Moses' true name. The Greek "Moses," Hebrew "Mosheh," is in Jewish tradition derived from some participial form of the Hebrew verb mā šâ, "to draw out." Most scholars now believe the origin to be the Egyptian "-mose," a particle found in many Egyptian names. The etymology probably is from mesu, "child," and the particle is generally accepted to mean "child of." It connects the person with the deity as a dependent of that deity. Examples include the pharaohs Thothmes, Djehuty-mose, "child of Thoth." Thus, there should be a first half of Moses' name. This paper suggests that when Exodus is examined in the terms current in Egypt at the time, the identification becomes obvious.

Exodus 2:10 now records:
[S]he named him Moses,  
saying, "It means: I drew him out of the water."

For which this paper suggests:

She named him Hapi-mose,  
which is, child of the flooding Nile,  
saying, "It means: I drew him out of the water."

But this is only speculation. Evidence is required, some known and accepted event that physically links Moses with the Nile god. This does exist, in the form of an unexplained event that happened twice: Exodus 32:8 and I Kings 12:28.

What's in a name? Nowadays, a rose by any other name would smell as sweet. But among the ancient Egyptians, names were magic. In our terms, they had an actual physical existence. In Egyptian legend, the sun god Re himself could be coerced by someone knowing his secret name. To the Egyptians, Moses' name was no mere label; it was a physical association with whatever identity the name carried. And Hapi was not identified solely with the Nile.

Like many Egyptian deities, Hapi had an animal form. For him it was the bull, the Apis bull well known from later times. Thus, in the eyes of people whose entire lives had been spent in Egypt, Moses' association with Hapi was not merely with the river. The god of whom he was child was in the Egyptian thought-pattern a bull god. Therefore, later, when Moses vanished on the holy mountain, Aaron was charged by the people of the Exodus to make a god to replace him. Aaron made a statue, and identified it specifically with the words, "This is your god, O Israel, who brought you from the land of Egypt" [Exodus 32:8]: and it was a "molten calf" (or "golden calf"). So likewise when later the Northern Kingdom seceded from the control of Jerusalem, the rebel Jeroboam
took counsel, and made two calves of gold. And he said to the people, “You have gone up to Jerusalem long enough. Behold your gods, O Israel, who brought you up out of the land of Egypt.” [I Kings 12:28]

Why this attraction to golden calves? Beyond general comments that the bull cult was very popular in ancient times, there has been no explanation for this peculiar ascription of the Exodus to a bovine deity. The association of Moses with Hapi provides a connection. For people who had spent their entire lives in Egypt, the god of Moses, by his own name, was a bull; and this tradition lasted for centuries, to the beginning of the Divided Monarchy. But that was enough. Henceforth, when the priests of Jerusalem looked at the historical effect of the bull connection, they saw discord and rebellion. They made an end of it, and in doing so, erased the bond of Moses to Hapi from their record.

This long association with Hapi has two further implications for Bible history. The first is that the bondage in Egypt was not, as is sometimes suggested, just a tribal fantasy invented later for purposes of nation-building. *Something* happened that had the Hebrew people under the heavy influence of a specific Egyptian myth, and this influence was so deep that it caused trouble even after two centuries had passed. This paper will not explore the possibility of other Egyptian survivals, but it may be worth investigating.

Second, the priesthood in Jerusalem seems to have handled this problem in a most conservative manner. All trace of Hapi was removed from the official record. The wording of Exodus 2:10 may have been changed to imply derivation from the Hebrew verb *mā šā*, “to draw out,” rather than from the Egyptian *mesu*, “child” or “son.” But the events themselves remained untouched. The Nile finding, the golden calves, both stayed in the chronicle, embarrassing though they had proven to be. The priesthood could simply have invented a new myth that would have reinforced their own legitimacy. They did not. This implies that
the official record was not considered a suitable victim for creative spin control.

2) WHERE WAS THE HOLY MOUNTAIN?

The question of the nature and location of the mountain of God has been mostly a Christian problem, or some members of our Society would say, a Faustian problem. Muslims are largely uninterested and Jewish tradition has made the mountain almost a mystical place that it would be nearly blasphemous to locate physically [Hobbs 1995:33, 51]. The problem was very popular early in this century, but since the 1930s it has become less fashionable. However, also since the 1930s, a great deal of scientific information has accumulated, including many new technical processes. What can these tell us about the problem of the mountain?

The early Christians began seeking monastic retreats in the Sinai peninsula not later than the third century CE. Approximately at this time, it came to be thought that the Exodus took a southern route across the peninsula. Tradition came to place the mountain of God, Sinai or Horeb, in the south among the highest peaks. The initial version placed it at Jebel Serbal, and Aharoni has noted that a tell in a large oasis near this mountain has produced pottery typical of the kingdom of Judah of the Iron Age II period (ca. 1000, 930 or 900 BCE to 586 or 539 BCE, depending on one's choice of authority). Indeed it seems to be the only site in southern Sinai inhabited more or less continuously from then until early Arab times. He further suggests that the name “Serbal” may be a corruption of the Hebrew “Sur (‘rock of’) Ba’al” (a principal Canaanite god). [Aharoni 1961:166-170] But about 360 CE a Syrian monk built a chapel on the peak Jebel Musa; by about 372 a colony of monks existed at the foot of this mountain; and about 400 a pilgrim referred to the site as “lying under the slope of the mount of God.” When in the middle 500s Justinian founded a great monastery at the foot of Jebel Musa, the matter was considered settled. There may have been a sectarian
conflict involved here, with Serbal belonging to the Copts while Musa was settled by the Syrian and Byzantine branches of the Church. [Hobbs 1995:68]

But there have been many other places suggested. One is a known religious site, the Egyptian mountain temple dedicated to the goddess Hathor at Sarabit el Khadim in the western part of the peninsula, part of the Egyptian mining complex in that area [Eckenstein 1980:67, 74]. Modern researchers have nominated Jebel Sinn Bisher near Suez, Jebel Halâl some 60 km SSE of El Arîsh, Jebel el-Yitm near Eilat, Har Karkom in the southern Negev in Israel -- even the Aegean volcano of Thera has been suggested to be part of the Exodus events, if not the holy mountain itself. But another idea has been suggested, that Mount Sinai is not on the peninsula at all, but rather somewhere east of the Gulf of Aqaba.

Since Moses' father-in-law Jethro was a priest and flock owner in Midian, the obvious place to look for this mountain is within the borders of ancient Midian. It has sometimes been thought that these included parts of the Sinai peninsula, but Har-El emphasizes repeatedly [1983:110, 112, 114, 184, 195, 373] that central and southern Sinai are so totally barren as to have been uninhabitable to migratory herdsmen before the advent of the camel, and barely habitable even afterwards. The first census of the area, in 1882, counted a total badawi population in southern Sinai of 217, in central Sinai, zero, and central Sinai continued at zero until the census of 1907 [Har-El 1983:114]. Moreover, Exodus 3:1 specifies that Moses drove flocks to the holy mountain before the events of the Exodus itself, and one must wonder whether the territory on the Sinai peninsula would even have been accessible to him at that time. The sites associated by tradition with the Midianites, and specifically with Jethro, all lie east of the Gulf of Aqaba (2). Between these sites and the Sinai peninsula lies the Arabah (Arava), a great rift valley extending from the Dead Sea to the Gulf of Aqaba.

The few MB II and LB [Middle Bronze Age,
part II (ca. 2000-1550 BCE) and Late Bronze Age (ca. 1550-1200 BCE) sites of South Sinai are clearly related to Middle Kingdom and New Kingdom exploitation of the turquoise and copper mines of southeastern Sinai near Bir Nasb and Sarrābit al-Hādim [near 29°02′N 33°25′E], with the local, apparently non-sedentary population supplying part of the labor force. The Ramesside exploitation of the mines in the southern `Araba, on the other hand, was very extensive and the existence of large amounts of local ware at the sites, and the widespread settlement of the area suggest that the mines were worked by local labor under the control of the Egyptian colonial power. [Thompson 1975:27]

Thus, to reach Sinai from Midian, Moses would have had to cross territory that was heavily controlled by the Egyptians. Exodus 4:19 specifically implies that, at least so far as Moses knew, until the end of the old pharaoh’s government a death warrant against him remained in force. This would not be a place to go.

Otherwise, the term “Midian” appears to be limited to territory east of the Gulf of Aqaba, beginning at the southern boundary of Edom (near the modern cities of Eilat and Aqaba, at a massif called the “mountains of Midian”) and stretching south indefinitely. One major objection has been raised to placing the holy mountain in ancient Midian: “The distance between Egypt and Midian is so great that it is inconceivable that the Israelites could have covered so much ground [Har-El 1983:250].” This is pure assertion, to be settled on the basis of evidence from any nominated site. And presumably the Israelites covered much more ground than this during their ensuing forty years of wandering.

In historic Arab times the cognate name “Madyan” has been assigned to a considerable though still rather indefinite stretch of the western edge of Arabia, south possibly as far as the 20th par-
allel. Various explorers have published books describing this area. Two of them, H. St. John Philby and Alois Musil, noted the existence of a granite mountain "Hurab," "Hrub," or "Hrob," possibly to be identified with Horeb, near the old Midianite capital area (see figure 1), but a local badawi told Philby that the name "al-Hrob" is attached primarily to the she'ib (small wadi) near the mountain, and the mountain itself is actually called al-Manifa ("the lofty one") [Philby 1957:222-224].

In any case, the idea that Sinai/Horeb is actually located east of the Gulf of Aqaba is based primarily on the idea that the mountain was not just a spectacular peak but an active, indeed at the time an erupting, volcano.

Exodus 19:16. On the morning of the third day there were thunders and lightnings, and a thick cloud upon the mountain, and a very loud trumpet blast, so that all the people who were in the camp trembled. 17. Then Moses brought the people out of the camp to meet God; and they took their stand at the foot of the mountain. 18. And Mt. Sinai was wrapped in smoke, because the LORD descended upon it in fire; and the smoke of it went up like the smoke of a kiln, and the whole mountain quaked greatly. 19. And as the sound of the trumpet grew louder and louder, Moses spoke, and God answered him in thunder. [Holy Bible, Revised Standard Edition 1952:56]

Exodus 24:15. When Moses had ascended the mountain, the cloud covered the mountain. 16. The Presence of the LORD abode on Mount Sinai, and the cloud hid it for six days. On the seventh day He called to Moses from the midst of the cloud. 17. Now the Presence of the LORD appeared in the sight of the Israelites as a con-
Deuteronomy 4:11. You came forward and stood at the foot of the mountain. The mountain was ablaze with flames to the very skies, dark with densest clouds. [Torah 1962:331]

Three objections have been raised to this volcano hypothesis. One is that "it makes reconstruction of the route of the Exodus impossible [Fensham 1980:1460]." This is unfortunate, but it is also irrelevant. One may hope that if the logic of the evidence requires it, then reconstruction of a volcano-oriented route of the Exodus will become possible.

The second objection is that Moses, having released his people from Egypt, escaped the attack at the Red Sea, crossed Sinai, and battled off the Amalekites, would not be so foolish as to lead his people straight into an eruption. But this is anachronistic; it assumes the Hebrews had the same appreciation of a volcano as we do, as a large, extremely dangerous, but utterly mindless heap of rock. But this mountain was the personal residence of God, of the God Who had freed them from bondage, etc. That God would invite them to His mountain only to destroy them would require exceptional perversity, and indeed Moses [Exodus 32:12] notes the reputation such an action would produce when arguing against destruction of the people after the incident of the golden calf. The mountain was dangerous -- to other people, not to them. They were protected, and to treat the mountain as mindlessly destructive would be to repudiate the entire theory behind the Exodus.

But the dangers were there. Erupting volcanoes tend to be the sites of earthquakes, pyroclastics, and flowing fire, so incidents could occur that would need explaining. One is mentioned directly associated with the events at Sinai, in Leviticus 10:1-2:

Now Aaron’s sons, Nadab and Abihu, each took
his fire pan, put fire in it, and laid incense on it; and they offered before the LORD alien fire, which He had not enjoined upon them. And fire came forth from the LORD and consumed them; thus they died at the instance of the LORD. [Torah 1962:195]

Other reports of fire and earthquake occur, though in the present text not at Sinai but after the departure, so their usefulness in the present argument is debatable. In any case their explanation was straightforward. Since the Israelites made the basic assumption that they were on God's own mountain and in His care, obviously these events had to be specific retributions exacted by God against specific people because of specific transgressions, and this is the way they are reported.

The third objection made to the volcano hypothesis is that “it reads too much into Exodus 19 [Fensham 1980:1460].” But there is much other evidence besides the local earthquakes, smoke, and fire. Another phenomenon often suggested to be volcanic in origin is the pillar of cloud and pillar of fire [e.g. Noth 1962:109, 160]. The column of smoke and ash above an erupting volcano would appear over the horizon during daytime as a pillar of cloud, at night, when lit from below by the lava in the crater, as a pillar of fire. Phythian-Adams [1934:146-147] also suggests that the otherwise unexplained “sound of the trumpet,” “very loud trumpet blast” of Exodus 19 is volcanic:

A trumpet will suggest to a modern reader some kind of musical instrument, but all that the expression was intended to convey was that there proceeded from the “thick cloud" a tremendously loud and piercing blast, and it is said that this noise was repeated and that it “waxed louder and louder.” Here again a parallel is not far to seek. Observers of the eruption of Stromboli in 1915 describe one of the vents which opened
near the center of activity as blowing off 'at intervals of from 20 to 40 minutes with a loud, startlingly sudden blast like a steam whistle from a gigantic locomotive.' The choice of similes reflects the interval of 3,000 years which separates the two accounts: in essentials they are clearly indistinguishable.

Several of the nine or ten plagues upon Egypt have also been suggested as volcanic in origin. The "red Nile," for example, is a known occurrence today, happening about once a century because of poisoning by volcanic activity in Ethiopia. The plagues of frogs and gnats would then be after-effects of the poisoning of the river. [Knight 1993:595-596] And the volcanic hypothesis would directly solve longstanding problems with two of the plagues. Consider the ninth plague:

Exodus 10:21-23. Then the LORD said to Moses, "Hold out your arm toward the sky so that there may be darkness upon the land of Egypt, a darkness that can be touched." Moses held out his arm toward the sky and thick darkness descended upon all the land of Egypt for three days. People could not see one another, and for three days no one could get up from where he was. [Torah 1962:116]

Existing scholarship holds this was an extremely severe sandstorm called a khamsin, which is known to last even longer than three days. But the khamsin is a normal event in Egypt in late winter and early spring, occurring around Cairo for an average of eleven days each year. One on 2 May 1997 is described as "the worst sandstorm in 30 years...turn[ing] the sky from gray to red to eerie white [not dark], reducing visibility to zero in many places" [Associated Press, in Northwest Florida Daily News, 3 May 1997, p. 7A]. Color regardless, even a severe khamsin
would be a familiar event, and familiar events are intrinsically too well known to carry the awe of a divine visitation.

A volcanic darkness, on the other hand, carries awe and terror even nowadays. It can be absolute, and the ash cloud passing overhead would be dropping pieces of darkness which literally could be touched (the fallout of black or grey ash dust). The following is a shipboard description from the eruption of Mt. Tambora in Indonesia in 1815, 400 km from the eruption and 90 degrees away from the main axis of the fallout:

It was now evident that an eruption had taken place from some volcano, and that the air was filled with ashes or volcanic dust, which already began to fall on the decks. By 11 the whole of the heavens was obscured except a small space near the horizon to the eastward. ... The ashes now began to fall in showers, and the appearance altogether was truly awful and alarming ... The darkness was so profound through the remainder of the day that I never saw anything equal to it in the darkest night; it was impossible to see your hand when held up close to your eye -- the ashes continued to fall without intermission through the night...by half past 9 the shore was distinguishable, the ashes falling in considerable quantities, though not so heavily as before. The appearance of the ship, when daylight returned, was most extraordinary; the masts, rigging, deck, and every part being covered with the falling matter. [Blong 1984:32]

And “during the most intense phase of the eruption, dense ash clouds caused complete darkness for three days on the island of Madura, 500 kilometers away” from the volcano along the main axis of the fallout pattern [Bullard 1976:512, my emphasis].

Consider next the sixth plague. Here the translations vary,
specifically in plague symptoms herein labeled $a$ and $b$:

Exodus 9:8-11. Then the LORD said to Moses and Aaron, 'Each of you take handfuls of soot from the kiln, and let Moses throw it toward the sky in the sight of Pharaoh. It shall become a fine dust over all the land of Egypt, and cause an inflammation $a$ breaking out in boils $b$ on man and beast throughout the land of Egypt.' So they took soot out of the kiln and appeared before Pharaoh; Moses threw it toward the sky, and it caused an inflammation breaking out in boils on man and beast. The magicians were unable to confront Moses because of the inflammation, because the inflammation afflicted the magicians as well as all the other Egyptians. Torah 1962:112-113

And the LORD said to Moses and Aaron, 'Take handfuls of ashes from the kiln, and let Moses throw them toward heaven in the sight of Pharaoh. And it shall become fine dust over all the land of Egypt, and become boils $a$ breaking out in sores $b$ throughout all the land of Egypt.' So they took ashes from the kiln, and appeared before Pharaoh, and Moses threw them toward heaven, and it became boils breaking out in sores on man and beast. And the magicians could not stand before Moses because of the boils, for the boils were upon the magicians and upon all the Egyptians. Holy Bible, Revised Standard Version 1952:48

It is apparent that there is some dispute on the exact meanings of the Hebrew words used to name the symptoms $a$ and $b$ produced by the dust. Two different words are used:
a S'hin, which appears thirteen times in the Old Testament. Nevertheless it is here variously translated as “inflammation” or “boils.”

b 'aba'bu'ot, which appears only in this context and is here translated as “boils” or “sores.” [Davis 1986:123-124]

One may therefore suggest that the actual nature of these symptoms remains problematic. What kind of affliction is known to be involved with “dust,” “soot,” and “ashes”?

Note first that this relation to “soot” and “ashes” is out of keeping with a khamsin but quite compatible with an eruption. Note further that the translations, “inflammation,” “boils,” “sores,” do not explain why the magicians were unable to confront Moses. But one volcanic phenomenon is known which would be consistent with all the data and is also quite incapacitating [Blong 1984:83, 93]:

Vesuvio, 1767: “...having rode out to take a nearer view of the volcano, I was obliged to gallop home with my eyes shut, as I could no longer open them from the pain these ashes put me to.”

Heimaey, 1973: “Wind swirled up ashes from the ground and the roofs and lashed them into one's face with great ferocity. The finest particles crept under one’s collar and seeped down to one’s shoes. Worst of all, however, was getting it in the eyes.”

Katmai-Novarupta, 1902: Babies on Kodiak Island, 160 km downwind, were affected by running noses, severe coughs, and eyes full of mucus during the week after the eruption.

numerous occasions during this period tephra [for present purposes, volcanic ash] fell on San José...about 30 km west of the volcano. Medical evidence indicates that “acute conjunctivitis was produced by ash particles in the conjunctival sac, leading to redness and burning of the eyes without any marked swelling....Throat irritation, sometimes accompanied by a dry cough, was common; also inflammation and burning of the throat without much swelling of the tissues.” Both effects cleared up very quickly after exposure ceased. Some people also suffered nasal irritation and discharge.

These would be medical effects associated with “dust”/”soot”/“ashes” and volcanoes, and with croaking throats and blinded eyes the magicians would be hard put to confront anyone.

Assuming for the moment that Sinai was an erupting volcano, the next step would be to nominate which volcano is the likely mountain. The Torah itself does not specify any coordinates or surrounding area, but if one examines the background events associated with Exodus, it becomes apparent that the proper mountain should satisfy several items of qualification:

1). Any volcano that recently active would now be classified at most as dormant. There should be evidence, geological or historical, of recent activity.

2). A considerable number of people and animals -- there is some consensus in the neighborhood of 600 families and their flocks [Bernstein 1979:45-46] -- was involved in the Exodus. One may imagine this many people clambering up and down the sides of rugged mountains, but it would seem more likely that the mountain was accessible from some established road.

3). Some 600 families of Israelites stayed with their flocks for “forty days and forty nights” [Exodus 24:18], although any figure of “forty” from this period may be suspected of meaning
only “a great many.” They would need food. They would need water. Therefore, even though it is located in the desert, the mountain itself should have enough water and pasturage for some number of people to make a prolonged stay.

4). The events described to have happened at Sinai are, at least, rather awesome, the type to be remembered in local legend as much as in Israelite history. Therefore, one may expect legends current in the area to remark some association of the proper mountain with divine power, possibly even with the Exodus itself.

5). There may also be archaeological evidence. At the very least, Exodus 24:4-8 specifies one structure that should have survived and could itself have become a focus of legend:

Early in the morning, he [Moses] set up an altar at the foot of the mountain, with twelve pillars for the twelve tribes of Israel. He delegated young men from among the Israelites, and they offered burnt offerings and sacrificed bulls [!] as offerings of well-being to the LORD. [Torah 1962:142]

6). “Around Mount Sinai visible bounds were to be set (Ex., 19:12), which the people were forbidden to cross under penalty of stoning and death. Sinai must, therefore, have been an isolated peak. [Musil 1926:298]”

Active volcanoes are well-known in the Arabian peninsula:

There are records, traditions, or indications of eruptions having taken place in historical times in the following places: the harra [volcanic wasteland] of Kheibar, the harra of Al Madina, where a volcano erupted, according to the historian Abu’l Fida, about A.D. 1256-1257; the threefold Harrat al ‘Uweiridh, extending from the latitude of Al ‘Ulā and Madā in Sālih 150
miles north-westwards to that of Tebūk (the whole of these *harras* are believed to be identical with the Harrat an-Nār -- [approximately, "desolation of fire"] of Arabic writers -- known to have been active in historical times); the volcano of Al Bedr in Jebel Thadra (roughly north-west of Harrat ar Rahā, a detached *harra* regarded as the northernmost part of Harrat al ‘Uweiridh), reported to have once vomited fire and stones, destroying many beduin and their camels and sheep, so that the beduin no longer ascend the mountain or allow their animals to graze there; Jebel Yar in ‘Asir (believed to have been active only about a century ago); the *harra* of Arhab, north of Sanā (active possibly about the third century A.D.); Jebel Tāīr and the Zubair islands in the Red Sea. Several craters in the south are in the fumarole stage of declining activity, that is, emitting vapour from fissures: such are Jebel Haidar al Lissi near Dhamār on the high plateau of the Yemen, and some craters in the Afar (Danakil) country on the African side of the Red Sea. [Western Arabia and the Red Sea, 1946:20-21]

Of all these candidates one stands out clearly: Jebel Tadra, at approximately 27°15'N 37°15'E. The Czech explorer Alois Musil traversed the area in 1910 -- insofar as this research has determined, the second and last time any Westerner has done so -- and describes it as follows [1926:214-215]:'

The valley broadens out into a basin enclosed on all sides by low, but steep, slopes, and known as al-Gaw (the watering place) because it contains many mšâše, or rain water wells. The plain is covered with a fairly deep layer of clay in which
various plants thrive luxuriantly, and it therefore forms the best winter encampment of the Beli [the local tribe]. The guide proudly pointed out to us the abundant withered pasturage through which we were passing and asked whether throughout our journey from Tebāk we had seen so many and such various plants. [Thus item 3, food and water.] ... Upon the eastern slope of the great table mountain of Tadra is situated the black volcano Hala‘-l-Bedr. ... To the southeast we perceived the hill of Slej and still farther in that direction the volcano of al-‘Āsi, in which are the Morājer ‘Abīd Mūsa, ‘the caves of the servants of Moses.’ Our guide explained that the servants of Moses sojourned in them while their master was abiding with Allāh. [Thus item 4, specific legendary association.] Another sacred spot is situated by the well of al-Hzēr. It is called al-Manhal, and upon it are twelve stones known as al-Madbah [the place of sacrifice], where the Beli still offer up sacrifices when they are encamped close by.

Tadra and the entire surrounding district is associated with various legends. The volcano of al-Bedr is said once to have vomited fire and stones, destroying many Bedouins and their camels and sheep. [Thus item 1, known activity.] Since then the Bedouins have been afraid to ascend this volcano and they drive away their animals, not allowing them to graze upon the slopes or upon the gray ridge of Tadra. Beneath the volcano of al-Bedr there was once encamped a Bedouin, ‘belonging to the men of vision, ahl as-sīr’, i.e. acquainted with that which is a secret to others. This Bedouin had intercourse
with heavenly spirits. [etc.] ...

This leaves without confirmatory evidence only items 2 and 6, road accessibility and separation of the mountain from surrounding peaks. Isolation may be confirmed by a single glance at the map (see figure 2); the parent peak, Jebel Tadra, stands out from the surrounding area. Accessibility may also be confirmed from figure 2: The Roman geographer Ptolemy noted the nearby caravan route to be "the shortest and most convenient transport route from southern Arabia to Petra, the Nabataean capital" [Philby 1957:113]. And it seems probable that this route was already in use in Moses' time. Albright [1970:200-203] notes that, with the beginning of irrigation in South Arabia ca. 1600-1400 BCE, Midian became a transit area for the caravan trade (using donkeys, not yet camels); and "the Pharaohs of the 19th and the early 20th Dynasties were very much interested in the exploitation of the mineral resources of Northwest Arabia as well as its caravan routes." It may also be of interest that Tadra itself is forbidden ground, since the recent eruption was confined to Hala'-I-Bedr, not involving the rest of Tadra. This, too, could be a remembrance of Sinai (point 6 above).

There are also collateral considerations. Tadra is some 650 km southeast of the Nile delta. Thus a prerequisite for any eruption by it to provide a major ash fall in Egypt would be a strong southeasterly wind. As it happens, the wind over Egypt generally comes from almost any direction except the east. Exodus does not specify wind direction during the sixth and ninth plagues, but it does for the eighth (locusts), in 10:13: "So Moses held out his rod over the land of Egypt, and the LORD drove an east wind over the land all that day and all night, and when morning came, the east wind had brought the locusts (4)." "A strong east wind [lasting] all that night" is also reported at the crossing of the Red Sea in Exodus 14:21, so evidently in the weather patterns of that time this was not an isolated occurrence.

Since Tadra is some 650 km away from the Nile delta, one may next wonder at the volcanic identification of the pillar of
Figure 1: Northwestern Arabia
Figure 2: Location of Jebel Tadra
cloud and pillar of fire. This is quite a distance from which to see any eruption column, however tall. But Phythian-Adams notes [1934:142] something that the Israelites may have perceived as part of the pillar of fire itself, and which has been seen very far off:

There is, however, one curious piece of evidence which makes it seem not altogether incredible that a phenomenon of this type could be visible at an enormous distance. In A.D. 1256 there was a violent eruption in the volcanic fields east of Medina, and we learn from the Arab writer al-Mukrizi that the ‘flames’ of this eruption (i.e. the reflection of the molten lava in the clouds above the crater) could be seen as far as the environs of Bozrah, 600 miles [960 km] distant, in the Hauran [modern al-Buseirah, south of the Dead Sea].

And the “pillar of cloud” as seen at a great distance would then be the daytime appearance of these same horizon clouds, identified retrospectively as part of the phenomenon when the people approached the volcano and the eruption column became distinct.

This is a hypothesis. It therefore remains to test the hypothesis. Any such tests are necessarily somewhat dependent on dating, so at this point the actual date of the Exodus becomes important. Unfortunately this is an unresolved question that has been the subject of intense and complex argument, on which see most recently Stiebing [1989:37-63, 101-148]. A minority propounds a date in the 15th century BCE; a majority holds to a date in the 13th century BCE, under the Nineteenth Dynasty of pharaohs (6). Within this majority there is more argument as to which particular pharaohs are involved. A plurality holds that the pharaoh of the Exodus was Ramesses II. He is most recently dated 1290-1224 BCE [Bunson 1991:220] or 1279 to 1213 BCE [Mazar 1990:234] or 1212 BCE [Stiebing 1989:38], but other dates have
been suggested. In this case no suggestion is made on the identity of the pharaoh of the oppression. This plurality opinion seems to be based on two data.

The datum providing the earliest possible date is that during the oppression the Hebrews were forced to build the store cities Pithom and Raamses, which are commonly assigned to Ramesses II. Therefore this pharaoh should be involved with the Exodus somehow. But the actual reference in this datum makes Ramesses the pharaoh only of the oppression, not of the Exodus itself.

Beyond this there is one thread in Exodus which seems not to have been considered heretofore. One of the dramatis personae in Exodus 1 and 2 is the unnamed “king of Egypt,” the pharaoh of the oppression. This ruler was on the throne when Moses was born, through his youth, into his exile and marriage, and “a long time after that, the king of Egypt died.” Exodus 7:7 makes Moses eighty years old (i.e., “a very great many years old”) shortly afterward. Ramesses II was on the throne for 67 years, longer if a co-regency with his father is counted. This is the only reign of the period remotely long enough to qualify.

The datum which is commonly held to set the latest possible date for the Exodus is called the stele of Merenptah, or because of our own interests, the Israel stele. Merenptah reigned from about 1224 to 1214 BCE [Bunson 1991:165] or 1213 [Mazar 1990:234] or 1212 to 1202 BCE [Stiebing 1989:38] by the latest estimates. This stele, dated to the fifth year of his reign, claims among a list of other victories that “Israel is laid waste, his seed is not.” The present consensus is that this reference, among a list of designated victims, suggests that the people Israel was already in Canaan by the fifth year of the reign of Merenptah. Since the Hebrews had presumably left Egypt “forty”/”a great many” years before, this in turn suggests that the Exodus occurred under Ramesses II, and is now regarded as the key datum on that question. But there are many problems in the interpretation of this stele (see for example Stiebing 1989:44-46, 50-52), so it is a dangerous reference.

The result of all this is a great deal of uncertainty. Exodus
1:11, 2:23, and 7:7 make a case that the oppression occurred under Ramesses II. The Merenptah stele then suggests the Exodus occurred during the first five years of that pharaoh's reign, which by the latest estimates would be 1224-1219 or 1213/1212-1208/1207 BCE. But there are so many uncertainties that the case is hardly conclusive. As previously noted, other estimates have even placed the Exodus in other centuries. Thus, the date of the Exodus must continue to be considered part of the problem rather than part of the solution.

But this may at least serve as a guideline for exploration. Archaeological technique has advanced considerably in the six decades since the volcano hypothesis was last put forward in scholarly circles. Five methods exist that may solve the problem once and for all. The first two test the volcano hypothesis itself; the other three test individual locations as candidates to be the specific mountain at issue.

1). Sediment core analysis. If any eruption in western Arabia (by Tadra or any other volcano) deposited a major ash fall in the Nile delta, then it should have deposited even more in the Red Sea and/or its arms, the gulfs of Suez and Aqaba. Subject to the chances of bioturbation, in protected parts of the sea floor these deposits should still be intact, deeply buried, and available for analysis. Volcanic deposits on deep sea floors are compressed only some 50% [Sullivan 1980:552], so any major deposit should be readily visible in drilled cores of the accumulated sediment, and could be radiocarbon-dated from organic deposits above and below the ash layer. If undisturbed sediments do exist from the general period of the Exodus and include no such ash layer, then necessarily no such deposit occurred and that part of the volcano hypothesis is disproven. There may have been enough drilling for oil off the Sinai peninsula that the required cores are already on file, needing only to be analyzed. The offshore well at Balayim lies almost on a direct line from Tadra to Cairo.

2). Weather and climate effects. The eruption of Tambora in Indonesia in 1815 injected some 100 billion m3 of ash into the atmosphere. It also produced a global fallout of some 150 million
metric tons of the sulfuric acid droplets that cause climatic cooling and brilliant sunsets [Legrand and Delmas 1987: 676]. One source lists eight twilight and three daytime visible effects of volcanic eruptions [di Cicco 1991]. These may conceivably have been recorded in the Babylonian omen texts or the Shang oracle bones, though dating would be a problem.

Much larger effects are known. In 1816, the year after the Tambora eruption, global temperatures dropped some 5° C, producing "the year without a summer," with frost and snow in June and July as far afield as Europe and New England -- fifteen times as great a change as the global warming of the 1980s [Kerr 1989]. And the proposed eruption of Jebel Tadra would, from the record, have been not only massive but prolonged, being major enough as of the first plague to poison the Nile over 500 km away, cataclysmic as of the ninth plague, providing a guiding "pillar of fire" during all the long march from the Nile to the mountain, and still continuing after the Hebrews arrived at the mountain.

Therefore, the eruption may have had more widespread effects than just those associated with the Exodus itself. During the thirteenth century BCE there had been five major realms in the eastern Mediterranean area -- Mycenae, the Hittite empire, Egypt, Assyria, Babylonia -- as well as lesser ones. About 1200 BCE all five dissolved and a period of migrations began over most or all of the area [see for example Stiebing 1989:167-192]. Two of these collapses are fairly closely datable. In Egypt after the death of Meren-ptah...the Nineteenth Dynasty seems to have died out in short reigns and dynastic intrigue, and even the order of succession of its kings is not certain. ... [The Great Harris Papyrus is able to say of this period that] [t]he land of Egypt was cast adrift, every man being a law unto himself, and they had...no leader for many years...one man killing his fellow among high and low. [Faulkner 1975:235, 240]
In Assyria, "toward the end of the reign of Tukulti-Ninurta I (c. 1244-1208 B.C.) Assyria went into rapid decline, as military campaigns ceased and revolts broke out...and [the country] was not able to recover...until the second half of the tenth century B.C." [Stiebing 1989:181]. A surviving Hittite record of about 1212 BCE indicates famine at that time [Stiebing 1989:172]. Another inscription of the fifth year of Merenptah indicates an invasion of Egypt by a coalition of nomads in search of food [Watterson 1997:117], the first of a series of inroads that went on for fifty years. Some effects are suggested even as far afield as Spain:

The El Argar culture was a worthy daughter of the brilliant Iberian Chalcolithic cultures but seems to have died out quietly, leaving no heirs. ... What happened, then, in 1200 [BCE]? One of the reasons for the wealth of El Argar had been in part her enduring trade relations with the east. The fall of Mycenae, the great human or natural upheavals which affected the eastern Mediterranean at that period, no doubt had a damaging effect even as far off as Iberia. [Briard 1979:50]

It would be unprecedented for a single eruption to be responsible for all of this, but the situation may already have been unstable. Glacial retreat and other factors indicate that Europe, Africa and Asia experienced a centuries-long "shift to a warmer (and, in the Near East, drier) climate" about 1300 BCE [Stiebing 1989:184-187]. Any volcanic effect on top of this would have been short, but if the situation was already unstable, then even a few years of severe and generalized crop failure could have been a trigger that set off a cascade of events ending in collapse.

The preferred physical methods for determining prehistoric eruptions are ice cores (mostly of the Greenland ice cap, recording sulfuric acid deposits) and frost narrowing in tree rings (in this region, primarily of ancient Irish bog oaks). On present evidence, there is no indication in either ice cores or tree rings of such an eruption later than Thera (17th century BCE). However, neither record is adequate to the present investigation. The ice core data are beside the present point; of the two sites involved,
those from Camp Century were later shown to be in error for the relevant period, and those from Dye 3 have been reported only for the period 1900-1300 BCE [Hammer et al. 1987]. And both of the studies of tree ring calibration caution as to weaknesses in the record; LaMarche and Hirschboeck [1984:126] in particular note that the incidence of frost narrowing in tree rings can be "increasingly unreliable in the earlier part of the period." Even beyond this, the proponents of each physical method raise objections to the other method [Hammer et al. 1988, Hughes 1988]. Therefore this essay will suggest that it would be far safer to judge the prospective eruption of Tadra by evidence from the site.

3). Fission track dating. Highly viscous lava subjected to sudden cooling (e.g. by being erupted) tends to vitrify rather than to crystallize, and so to produce such volcanic glasses as, particularly, obsidian. Obsidian tends to be high in uranium. As the uranium atoms decay by fission, the nuclear particles produced leave tracks in the obsidian. Uranium decay occurs at a constant rate (the half-life), so for any given concentration of uranium, the number of fission tracks produced will be proportional to the age of the obsidian according to a specific equation. Thus, any eruption that produces obsidian can be dated, and examination of obsidian flows around Tadra (if any) should tell us whether that volcano was in fact erupting toward the end of the thirteenth century BCE, or at some other time compatible with the Exodus.

Note that this research should not be confined to the present volcano. Al-Manhal is well north of Hala-l-Bedr (see figure 2); and if Thera, Tambora, and Krakatau are proper examples, this big an eruption is likely to have destroyed a large part of the precursor mountain. Thera and Krakatau vanished almost entirely and the top kilometer of Tambora was blown away. The successor mountains are much smaller, and for Thera and Krakatau, new growths. Hala-l-Bedr would be this small successor. The whole mountain Tadra is presently about the former size of the island of Krakatau and smaller than the original size of Thera; al-Manhal is on its northern slope; and Tadra's present description from ground-level observation as a "table mountain" could
reflect a caldera collapse resulting from a cataclysmic eruption.

4). Obsidian rind hydration dating. The "skin" of any obsidian exposed to open air will absorb water from that air at a rate proportional to the local humidity. Determination of the local hydration rate can thus be used to determine how long any particular obsidian flow has been exposed.

5). Archaeological surface sweeping. The site of the holy mountain evidently remained known to Israel for at least four centuries, into the period of the compilation of the Moses texts [Noth 1962:147]. In particular, Elijah (ca. 850 BCE), starting from a point in the wilderness one day's journey from the known site of Beersheba "went...forty days and forty nights to Horeb the mount of God" [I Kings 19:4-8].

This indicates that there was a live tradition about the location of the sacred mountain, and most certainly other Israelites made pilgrimages to the site to renew their relationship with God. [Beegle 1972:168]

As previously noted, Tadra lies near the caravan route to South Arabia. Solomon particularly emphasized such trade, and there are slight indications of continued contact during the eighth and seventh centuries BCE as well [Mazar 1990:513-514]. If the caravans held even part of this trade, one may expect Tadra to have been for several centuries the regular object of visits by pious pilgrims (e.g. Elijah) journeying with the traffic. It is this long-term relationship that would have burned the events of Exodus into the local memory, establishing the legends which Musil reported. This would also imply that the mountain, wherever located (7), should have accumulated considerable habitation debris of the kind that archaeologists find particularly enticing. The earliest remains may be hard to identify; Israelite material culture in the age of the Judges seems to have been highly imitative of the Canaanites, and religious remains are characterized as meager [Mazar 1990:348, 353-354]. But the bones of sac-
rifical animals should be plentiful, and these can be radiocarbon-dated. There should be pottery, and this is both diagnostic and datable by thermoluminescence. There may also be inscriptions, perhaps even earlier than the oldest known in Hebrew (tenth century BCE) [Healey 1990:222-224]. One may also hope that these Iron Age materials are still undisturbed, or nearly so, since the site has probably lain abandoned by everyone except the local tribesmen for two and a half thousand years. Al-Manhal, the caves of al-Asi, and the well al-Hzer would be the obvious places at which to begin an investigation.8

This modified volcano hypothesis may be correct; it may be wrong. But it has one great advantage: It is testable. Moreover, several different physical tests are involved, so that proof does not depend on just one method. The evidence presented in this paper has been entirely circumstantial, so it may well be that the actual physical tests will draw a blank. But if these tests do confirm continuing Israelite association with a particular volcano that was in a state of eruption at the proper time, then these data together will provide the one thing that studies of these problems have so notably been lacking: positive and unambiguous physical evidence for the date of the Exodus and the actual nature and location of the mountain of God.9

FOOTNOTES

1. All Pentateuchal references not cited to a specific source are from Torah 1962. All references from later books are from Holy Bible 1952.

2. The old Midianite capital area, on the eastern shore of the Gulf of Aqaba, is full of sites labeled the this-or-that of Jethro, and even one well of which Philby comments, “it was not difficult for the organizers of the pilgrimage [to Mecca] to pass off this Midianite well as the very one from which Moses rolled away the stone to draw water for the flocks of Jethro’s daughters.” But Jethro is an important figure in the Quran. Muslim Madyan accounted him its first ruler, and as noted this area was along the pilgrimage -- thus also, tourist -- route. [Philby 1957:211-222] Burton [1984:1, 174] suggests the older traditional loca-
tion of Moses’ well was on the coast. Thus, one must hold traditional
identifications in this still heavily-traveled area to be at least moderately
suspect. But it is noteworthy, regardless of the specifics of site assign-
ment, that this, not Sinai, is the area that inherited the traditional name
and history of Midian.

3. Considering the oft-reported tendencies of Bedouin guides in
the Sinai peninsula to tell customers what they want to hear, it is worth
noting that this is not what Musil wanted to hear. As of the time of his
exploration, Musil had no idea that Tadra could be Sinai; he reports this
information only incidentally. As of the publication of his book 15 years
later, he was against the volcano hypothesis, mentioning two of the
three objections cited in this paper. His own preference for Mt.
Horeb/Sinai was the granite peak in the ancient capital area of Midian,
mentioned above on page 6. So his report should be uncontaminated by
personal motives.

4. Philby [1957:3, 65, 106, 153, 194] traveled through Midian dur-
ing the early 1950s, and describes the area as “familiar enough
to...locust hunters,” with specific reports of passing through “a fairly
large swarm of locusts,” “quite big swarms of locusts,” “a considerable
army of locusts,” “large swarms of locusts.” One may imagine that a
preliminary ash fall, preceding the cataclysmic phase of the eruption,
may have deposited enough ash in western Arabia to encourage the
locusts to go aloft in search of better forage and thus to be carried to
Egypt by a strong east wind. But this is only “one may imagine”; there
are few data as to the effects of eruptions on such things as locust
movements. Therefore this essay will remain silent on most such possi-
bilities.

5. Using the approximation \( h = \frac{d^2}{D} \) (where \( h \) represents line of
sight height above sea level, \( d \), distance to (or from) the horizon at that
height, and \( D \), the diameter of the planet Earth), then for this Arabian
eruption to be visible at the stated distance of 960 km, \( h = \frac{d^2}{D} = 
960^2/12,742 \), would mean that the clouds reflecting the light of this
eruption were at a height of some 72 km. Clouds are quite rare, though
known, at such altitudes; and it has recently been found that “the atmos-
phere has a relatively wet layer 70 to 80 kilometers up ... [which] could
help form icy noctilucent clouds [Kerr 1997].” Moreover, even so small
an eruption as Hekla (1947) injected an eruption column to a height of
some 30 km [Blong 1984:27]. So one may suggest that these clouds
were a formation induced by condensation nuclei injected into the
stratosphere by the volcano, or were a phenomenon of the eruption col-
umn itself.

6. Other datings have been proposed, but involve radical restruc-
turings of Near Eastern chronology; see for example Courville 1971,
Anati 1986.

7. There is one possible disrupting factor. Some scholars are of the opinion that there were two separate mountains, 1) Horeb and 2) Sinai, which would explain the existence of two separate names. But since Elijah was pre-exilic and went specifically to “Horeb,” this possibility of two successive mountains should not affect the proposed tests. Archaeology will settle the problem.

8. Since the key source in this work, Musil’s *The Northern Hegáz*, was published in 1926, one must wonder why nothing has come of his description of Tadra before this paper. There was some interest during the 1930s [Montgomery 1969:47n34]. Phythian-Adams even noted that “[i]n an extraordinary number of particulars, [Tadra] fit[s] precisely the conditions of Israelite tradition [1930:206].” But nothing followed. One may only guess why: The volcano hypothesis has always been considered heterodox, so proof of it was unwanted; such attention as it received was from Bible scholars rather than from archaeologists; the 1930s were the depth of the Depression, and were followed by the even greater distraction of World War II. When Philby went near (not through) the area in 1950-1951, he seems not even to have been aware of Tadra, though he was quite aware of Musil’s work. Hobbs mentions Tadra, but only as a casual aside in a single paragraph on the volcano hypothesis in a catalogue of suggested mountains [1995:56].

9. There is a running argument about the historical usefulness of the Biblical account of events before ca. 1000 BCE. Redford for example notes that even Judges, Samuel and Kings abound in anachronisms [Redford 1992:277, 305], and the name “Pithom” and other elements indicate a redaction of the Exodus story as late as the sixth century BCE [Redford 1992:409, 451]. This essay has assumed that the Biblical account is useful at least as a research guide, i.e. that if selected elements of the Biblical account are true then the following evidence should be found. But there are scholars who reject the Biblical account completely. For example:

Nearly all peoples of which we have information have heroic epic tales concerned with miraculous migrations, fantastic battles and supernatural deeds by the protagonists of these tales. ... In all cases we can see a “historical” event with its participants in a particular setting become “ephemerized” by successive layers of additional elements, certain omissions of “unnecessary” facts and re-interpretation in a new environment. It would seem foolish to base the archaeology of Finland, Iran, Japan or Ireland on...
these tales which undoubtedly have some sort of historical core but are distorted beyond recognition. The same applies to the "Exodus" tradition and the "Conquest." ... [T]hese literary works are of the utmost importance for understanding what happened later because these works themselves made history, but they do not provide evidence for the events described. [Zohar 1988]

This argument implies that in dealing with peoples not yet up to the standards of ancient Greece and China, there is an unbridgeable gulf between "literature" and "history." The present essay may constitute something of a test for this historicity question. It proposes a specific site to be associated with a specific Biblical account of events and does so in a testable manner. Some of the tests are not quite so clear cut as may be desired; for example, the erection of specifically twelve pillars around the altar of Moses presumably occurred only after the number twelve had been settled on as the official count of Israelite tribes. But the tests of eruption date are absolute, and if some of the twelve pillars may have been erected retrospectively to suit the needs of official history, this should not affect archaeological remains from earlier Israelite occupation. And the research principle of "if...then" would also work in reverse: If the evidence is there, then this would imply that the specific events for which they are evidence actually did happen. Thus, if the proposed tests do verify Israelite association with a site so closely fitting the Biblical account, this should impact on the historicity question.

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