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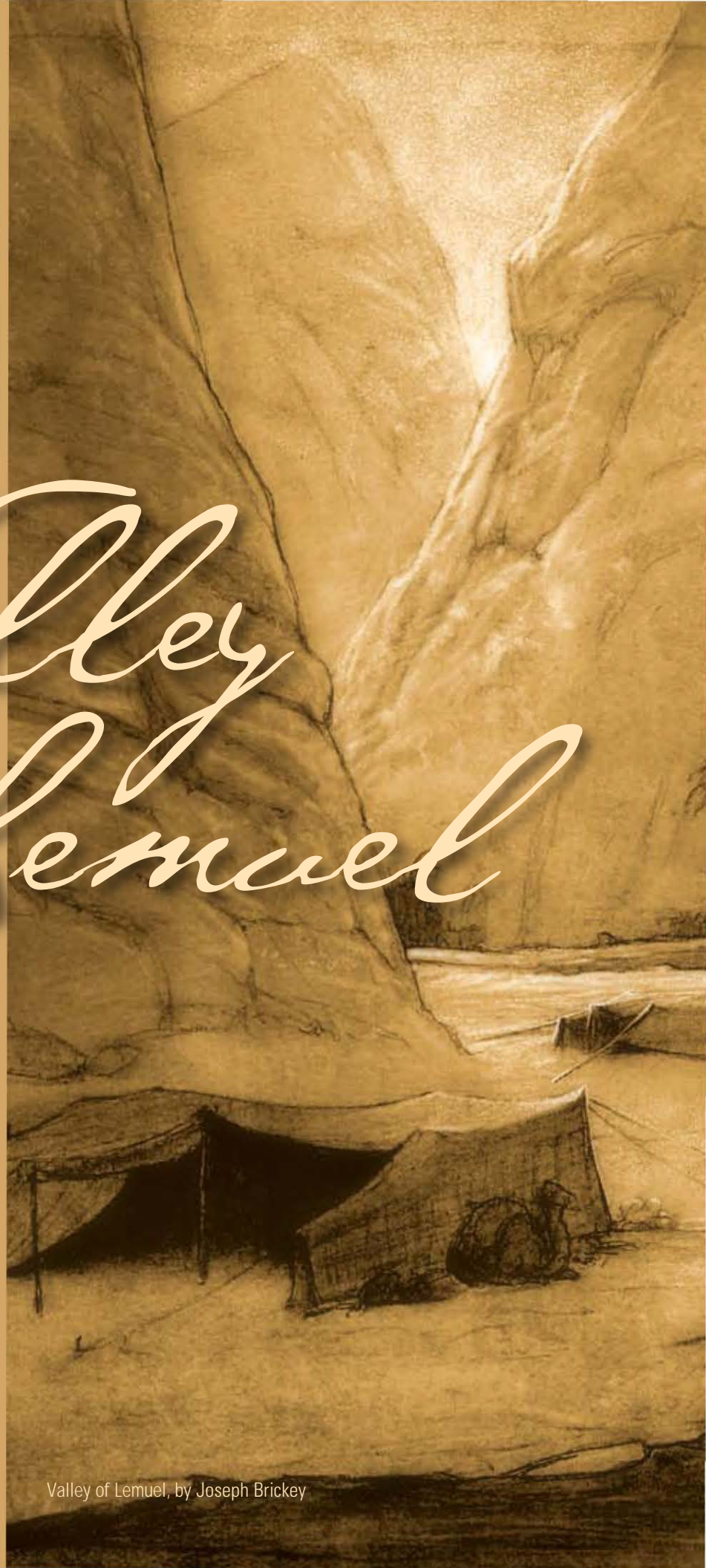
Abstract Book of Mormon prophet Lehi and his family left Jerusalem shortly before Nebuchadnezzar destroyed it. As they traveled across the desert, they undoubtedly faced extreme weather conditions. This article examines the climate of the Middle East, particularly of the areas where Lehi probably passed through, and comments on how the family was able to endure such conditions. This analysis takes into account historical climate change, suggesting that the environment in which Lehi found himself may have been slightly more tolerable than the environment of the modern Middle East.

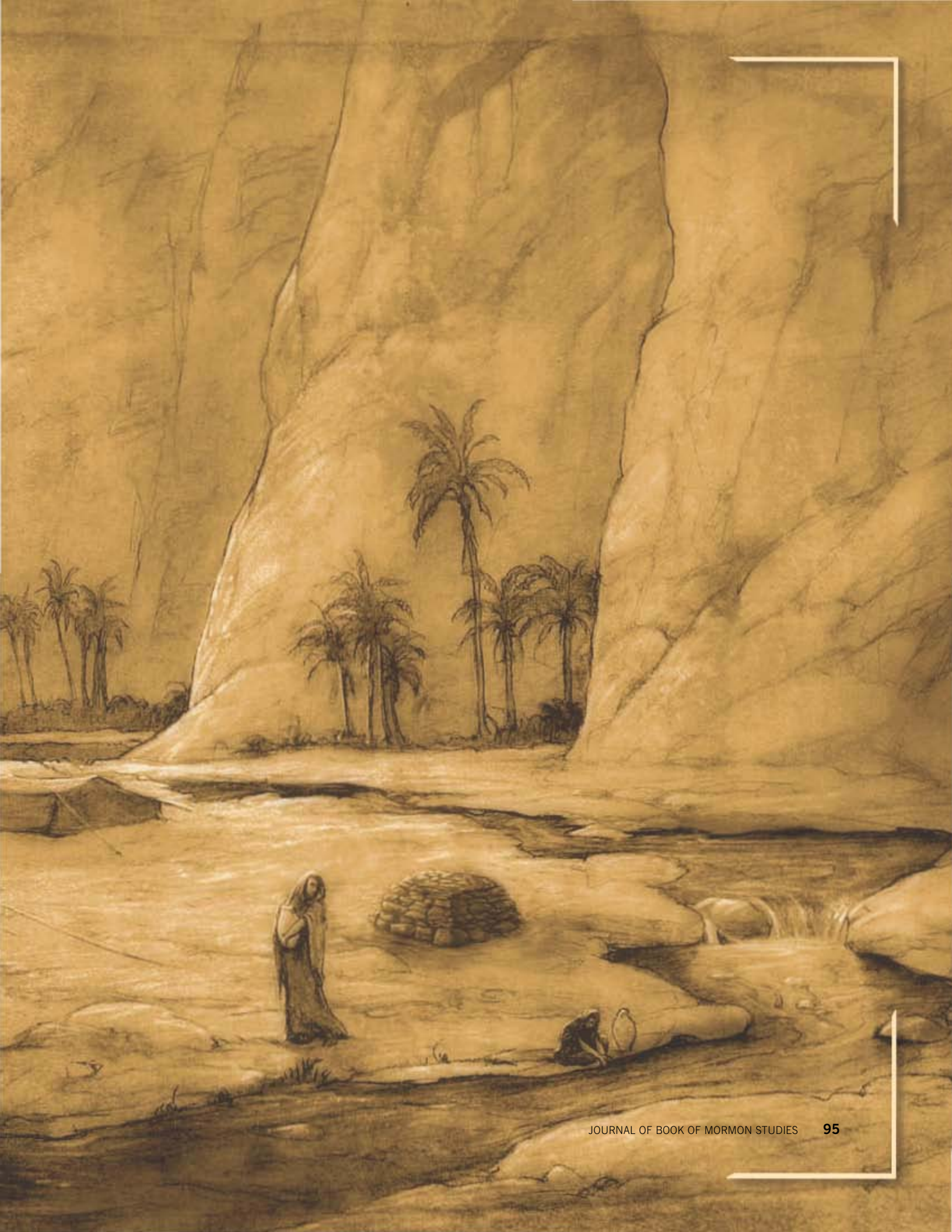
WEATHER REPORT

from the

*Valley
of
Lemuel*

Wm. Revell Phillips





THE “PROMISED LAND” for the children of Israel lay between a powerful empire to the north in the valley of the Tigris-Euphrates—Babylon—and a powerful empire to the south in the valley of the Nile—Egypt. Each empire pressured and manipulated the kingdom of Judah for its own interest. In 598 BC, Nebuchadnezzar, as crown prince of Babylon, defeated Judah and installed Zedekiah as king. Many Jews who had favored Egypt fled to the Nile valley before the final wrath of Nebuchadnezzar fell upon Jerusalem in 586 BC. One Israelite who had Egyptian connections (see 1 Nephi 1:2) and fled before the destruction was the prophet Lehi. He was a member of an expatriate Israelite community in Jerusalem¹ whose fathers may have fled the doomed northern kingdom more than a century before. Lehi was neither of the tribe of Judah nor a Levite priest, and his inspired warning of Jerusalem’s impending destruction fell upon deaf ears. He did not follow the exodus to Egypt but, with his wife, family, and a small group of expatriates, embarked upon a remarkable journey of faith through Arabia destined for yet another land of promise.

His eight-year, 2,000-mile journey took him the length of a subcontinent, often on or parallel to well-worn trails of trade caravans that could cover the same distance in a few months. Arabia is well known as a land of drifting sand, scorching heat, and few water sources, and those who chose to live there endured a marginal subsistence, subject to drought, famine, and forced migration. They were nomads by necessity. But was it always so? Did Lehi face the same harsh environment and the seemingly impossible task that such a journey would present today?

The Arabian Peninsula and the Sahara of Africa lie in the zone of tropical deserts, defined by the horse latitudes (about 30 degrees north latitude) on the north and the equatorial jungle on the south, where prevailing trade winds blow toward the equator, allowing felucca boats to sail upstream against the current of the Nile. Moving south, the trade winds become warmer, their ability to hold moisture increases, and they surrender very little rain to the deserts below. Near the equator, trade winds coming from the north meet corresponding trade winds coming from the south and rise into the upper atmosphere where the air cools and

gives up its moisture as torrential rains along the equatorial jungle belt. North of the horse latitudes, the prevailing westerlies blow north, cooling as they go and yielding a more or less uniform blanket of rainfall over the zone of temperate climate and the croplands of the world. These climate zones explain the existence of a jungle belt through central Africa, a desert zone from the jungle to the southern margin of the Mediterranean, and a temperate zone through all of Europe and Asia Minor. Ancient climates have been extensively studied in Arabia and the Near East because these climate patterns are apparent there and because extensive historical and archaeological records are available.

This simple picture is complicated by local topography and by superimposed monsoonal wind patterns. The rainfall in southwestern Arabia depends largely on monsoonal winds that deposit rain in the late summer on the incense-growing coastal highlands, leaving the interior regions dry. In northern Arabia, rains come mostly in the winter, and in central Arabia, the wind patterns may overlap. In prehistory the monsoonal rains extended much farther north.²

Climate Changes of Prehistory

In the late Pleistocene (about 15,000 years ago), the world climate was generally colder and dryer than it is now. Precipitation was considerably less, and much of it was in the form of snow. Evaporation was minimal, however, so what fell endured, much like the polar zones of today. The oceans were 328 to 410 feet below present levels, and the Red Sea was a freshwater marsh isolated from the Indian Ocean.³ As the glaciers melted after 10,000 BC, the sea level rose rapidly and northern Arabia and the Sahara became open grassy steppe land with numerous lakes. Grasslands attracted game animals and birds, followed by hunter-gatherer populations. Human occupation in northern Arabia was extensive, reaching a maximum population shortly after 4000 BC.⁴ Maximum moisture appeared about 5000–4000 BC, lakes were abundant, and agricultural settlements and population density were concentrated in the subhumid, lightly wooded areas of the Fertile Crescent.

Climate Changes of the Historical Period

About 3000 BC, rainfall declined over the entire Near East, and Arabia became warm and dry from about 2400 to 800 BC (except for a wetter spell about 1200 BC).⁵ During this early period, the Dead Sea dropped almost 328 feet and withdrew from the Jordan Valley. Nomads abandoned settlements in the Negev (southern Israel), and both men and animals were concentrated in oases around shrinking lakes and drying springs. Populations were forced to migrate to the fringes of the deserts or to the valleys of the Tigris-Euphrates or the Nile, where water sources were dependable. Arad, in the northern Negev, was deserted about 2600 BC and Subir, in the Tigris-Euphrates valley, about 2200 BC.⁶ Collapse of the large Mesopotamian civilizations about 2000 BC has been attributed to Semitic invaders and poor irrigation procedures, resulting in salination of agricultural soil. Records show increased barley

production in preference to wheat, which is less salt tolerant. But surely the drying climate was also a factor in the demise of those civilizations.

The Middle Bronze Age (1500 BC) began as a warm, dry period, with high sea levels in the Mediterranean and Red seas and low lake levels in the Dead Sea.⁷ But about 1400 BC, not long before the Israelites fled from Egypt, there was a trend toward increased precipitation that continued almost to 1000 BC. The Dead Sea rose, and settlements of seminomadic tribes appeared along the desert margins of the Negev. The Tigris-Euphrates reached its peak flow between 1350 and 1250 BC.⁸

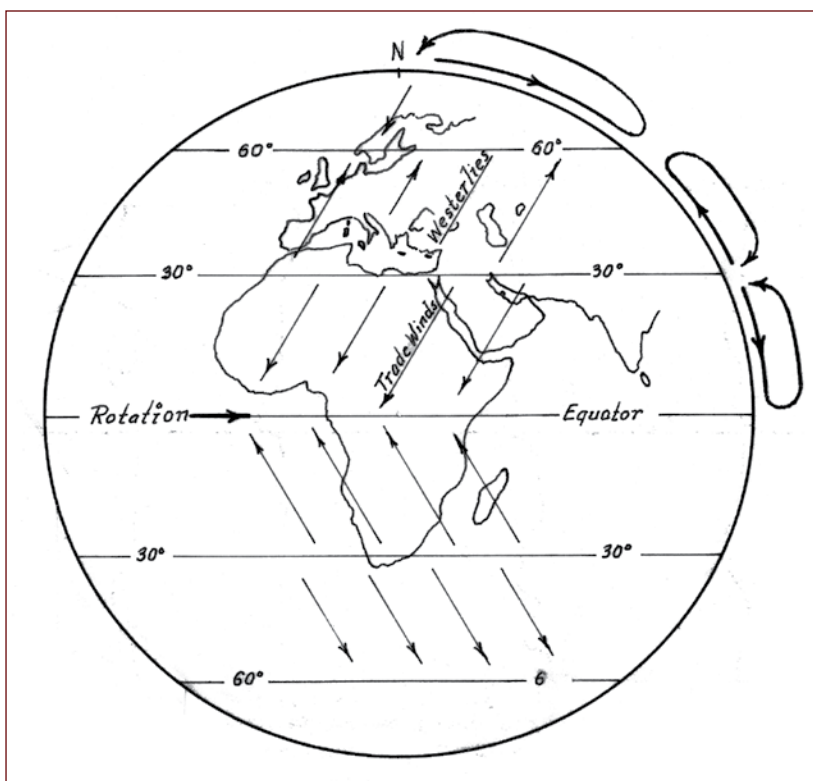


Fig. 1. World climate zones. The Northern and Southern Hemispheres display three distinct climate zones: (1) the tropic zone, at 0°–30° latitude, where trade winds blow toward the equator from north and south, heavy rainfall produces a jungle climate near the equator as trade winds rise into the upper atmosphere, and little rainfall and desert conditions prevail between the horse latitudes (30°) and the jungle belt; (2) the temperate zone, at 30°–60° latitude, where the prevailing westerlies, which blow away from the horse latitudes toward the poles and away from the equator, cool as the air moves toward the poles and drops rain more or less uniformly over the world's agricultural lands; and (3) the polar zone, at 60°–90° latitude, where the polar easterlies blow away from the poles and drop little moisture above 60°, creating a frozen desert.

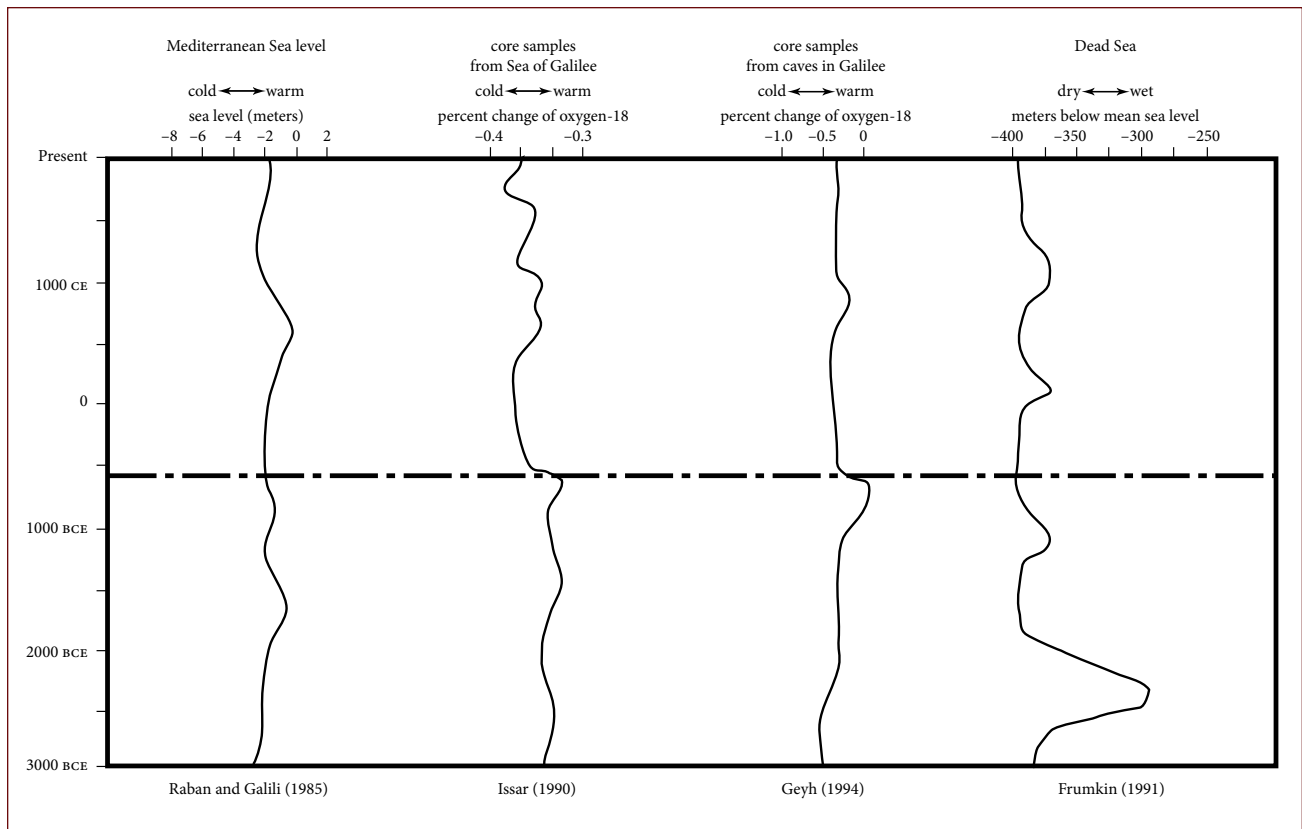


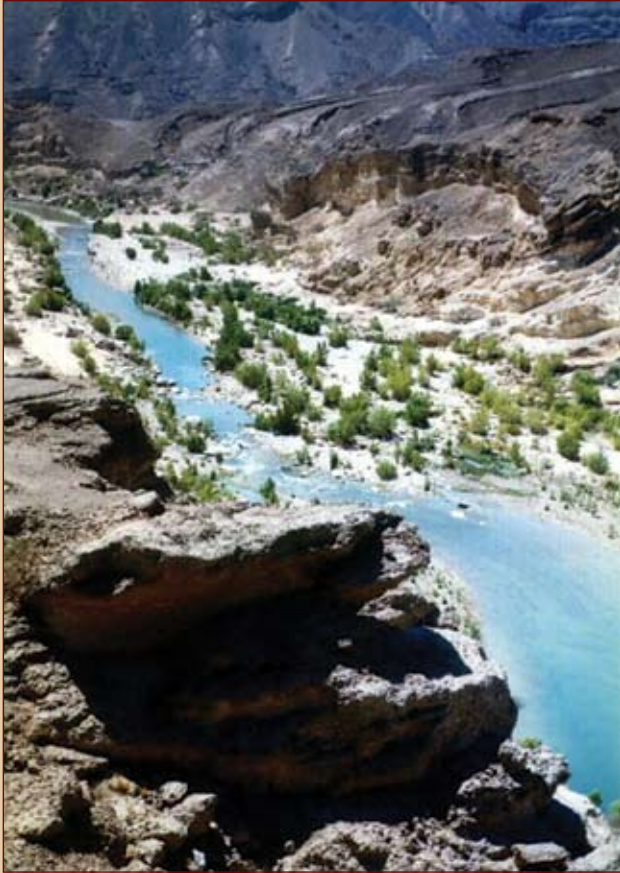
Fig. 2. Climate changes in the eastern Mediterranean over the past 5,000 years are shown in graphic form by several investigators (redrawn after Issar 1995). Temperatures are inferred from isotopic ratios (O_{18}/O_{16}) found in marine organisms, and rainfall is inferred from water levels in the Dead Sea. The dashed horizontal line is at 600 BC, where a sharp decline in temperature is indicated.

The brief wet period about 1200 BC was followed by increasing dryness⁹ coincident with a period of great turmoil in the Mediterranean region. The indeterminate “Peoples of the Sea” and the Hebrews were new to Palestine. Hebrew tribes settled along the desert margins where the Canaanite population was sparse, especially in the mountainous areas near springs. Lybians and the Peoples of the Sea invaded Egypt but were repelled, the Hittite kingdom collapsed and disappeared, and big city-states along the Syrian coast (Ugarit and Alalach) were suddenly destroyed and never reoccupied. Cyprus was ravaged, and important cities in Canaan like Hazor, Lachish, Beth Shean, Megiddo, and others were destroyed. Trade routes were disrupted. Tin, which alloyed with copper to make bronze, ceased to reach the eastern Mediterranean, and the Middle East was forced into the Iron Age. A more favorable climate accompanied the transition from the Late Bronze to the Iron Age.¹⁰

A return to aridity at the end of the 13th century may have prompted the Canaanites to introduce the concept of cisterns, which allowed small independent settlements to survive in the desert regions and in the mountains of the Negev and Sinai. For the first time, settlements could be established far from springs and watercourses.¹¹ Desert settlements of the Early Iron Age were unwalled farms, but they had become a complex of walled fortifications and agricultural lands by the time of the Israelite kings. David and Solomon built fortresses in the Negev to control commercial routes to Aqaba-Eilat and as a defense system in the southern part of the Israelite kingdom. The Old Testament speaks of a drought during the reign of King Ahab (869–850 BC) that was brought to an end by the prophet Elijah (see 1 Kings 18:41–45).

Arabia Felix

The name *Arabia Felix* (“Fortunate Arabia”) suggests a favorable land, and ancient writers displayed



One of the few rivers that run all year in Yemen. Photo courtesy Kim Clark.

their ignorance by describing in glowing terms a land they had never seen. Theophrastus wrote of frankincense growing in mountains that were “lofty, forest-covered and subject to snow, and rivers from them flow down into the plain.”¹² Eratosthenes spoke of a fertile land with rivers leading to lakes and an abundance of domestic animals, and Photius (quoting Agatharchides) described the Arabian Red Sea coast as “an extensive and exceedingly well watered shore.”¹³ Pliny’s frankincense-producing district, called Sariba, was said to have hills with “natural forests on them running right down to the level ground.”¹⁴ These classical writers undoubtedly relied on the faulty reports conceived and exchanged among themselves as they described a land foreign to what Lehi and Sariah would experience.

The Climate of Lehi’s Journey

Studies in recent decades shed light on general climatic conditions in the Mediterranean and in

Arabia around the time of Lehi. For example, Nigel Groom reports a wetter period in Arabia from 700 to 250 BC, and J. Neumann notes a cool, wet climate in Italy after 800 BC. Temperature curves of Mebus Geyh and Arie Issar show a minor temperature decline about 600 BC or slightly later (see figure 2).¹⁵

Thus in their wilderness travels upon fleeing Jerusalem, Lehi and Sariah may have enjoyed slightly cooler temperatures, greater-than-average rainfall, and elevated sea levels resulting from the earlier warm periods that lasted for several hundred years. Hugh Nibley concluded, however, “Though some observers think the area enjoyed a little more rainfall in antiquity than it does today, all are agreed that the change of climate has not been considerable since prehistoric times—it was at best almost as bad then as it is now.”¹⁶ There is scarce evidence, indeed, to believe that Lehi and Sariah faced a climate or an environment greatly different from what we see in western Arabia today.

The River of Laman and the Valley of Lemuel

Nephi records that Lehi “came down by the borders near the shore of the Red Sea; and he traveled in the wilderness in the borders which are nearer the Red Sea; and . . . when he had traveled three days in the wilderness, he pitched his tent in a valley by the side of a river of water” (1 Nephi 2:5, 6). Nephi describes that “river of water” as “continually running,” flowing through a valley that is “firm and steadfast, and immovable,” and emptying “into the fountain of the Red Sea” (2:9, 10).



Smooth rocks and a flat gravel floor witness that a sizable stream once flowed through Wadi Tayyib al-Isim’s lower canyon. Photo courtesy George Potter.

In recent years, George D. Potter and Richard Wellington located and described what appears to be the only perennial watercourse flowing from the Arabian Peninsula into the Red Sea, making Wadi Tayyib al-Ism and its tiny stream the leading candidates for the Valley of Lemuel and the River of Laman.¹⁷ In the Near East, words for “river” could mean a large river, as we understand the word, a

small stream, or even a dry wadi that may contain water only after a rainstorm.¹⁸ The River of Laman was certainly not a large river; if it were, it would have been well known and named, and a settlement would have arisen near its banks. In Arabia no water source goes unnoticed, and every water source is claimed by someone.¹⁹ Lehi must have obtained permission from some local tribal chief

to camp on his land and use water from his “river,” and he may well have paid for the privilege. Nephi’s use of the term *wilderness* in connection with his three-day journey from where he reached the “Red Sea” (Aqaba?) to the “river of Laman” implies that the group had little contact with other people. Indeed, the proposed Valley of Lemuel is without settlement today although it is certainly not without visitors, lost and forgotten. Several ancient encampments can be recognized in the upper valley 3½ miles from the coast, and one or more appear to be Iron Age sites possibly related to Nephi’s account.

Potter and Wellington describe the upper valley (above the springs that give rise to the “river”) as an oasis of about one square mile with 12 wells and several hundred palm trees lying at the low end of a 12-mile-long wadi. Potter quotes geologist Wes Gardner, who estimates a watershed drainage basin of over 100 square miles, providing water for the wells



Reaching much higher than seen here, the towering walls of Wadi Tayyib al-Ism’s lower canyon dwarf the vehicle on the canyon floor. Photo courtesy George Potter.



Calcite deposits on river rocks further attest to a deeper streambed in earlier times. Photo courtesy George Potter.


and the “river.” At Qurayya, about 78 miles east of Wadi Tayyib al-Ism, are a good sandstone aquifer (underlain by a layer of kaolin clay) and a complex network of irrigation channels that brought abundant water from a large natural spring to the surrounding cultivated fields.²⁰ If the same geological conditions exist in the upper valley of Wadi Tayyib al-Ism, or if the granite body exposed in the canyon underlies the drainage basin, the upper valley may have a perched water table²¹ with a collection basin of 100 square miles. This seems likely because Potter reports that the springs at the source of the “river” break out 600 feet down the narrow canyon below the upper valley floor, presumably at the impermeable interface.²² Today rainfall does not completely recharge the groundwater basin, and gasoline-driven pumps further lower the water table.²³ Lehi may have enjoyed somewhat greater rainfall and a fully charged water table.

After establishing an extensive camp in a desirable location and forging favorable relations with local bedouin leaders, Lehi may well have remained at the oasis for a long time, perhaps several years.²⁴ He was far enough from Jerusalem to be beyond the reach of those who perhaps wished him harm, and he was well off the main north–south trade route, the well-used spice and incense trail that led east through the Midian mountains.

Lehi’s oasis had arable land and water for irrigation, and a reconnaissance survey of the northwestern province of Saudi Arabia²⁵ would seem to open

endless possibilities for ancient agriculture. In addition to irrigation channels at Qurayya, “possible evidence of ancient irrigation in the Al-Bad’ area suggests that agricultural methods similar to those at Qurayya may have been used at this time [Iron Age].”²⁶ Lehi may have paused in several places along the way to cultivate land and harvest crops. He had brought from Jerusalem “all manner of seeds of every kind” (1 Nephi 8:1) intended for the fertile soil of the “promised land” (see 18:24).

Potter and Wellington identify the canyon of Wadi Tayyib al-Ism as the probable Valley of Lemuel.²⁷ It is only one of several wadis along the northern Aqaba coast that were cut through the granitic basement rock of the coastal highlands by streams flowing several million years ago in the Pliocene epoch, which was the last major humid period in the Hijaz. The modern topography is largely the result of this period of erosion.²⁸ The valley is a deep, narrow canyon with granite sidewalls rising to 2,000 feet in places and is unique by virtue of the tiny stream that flows south from the oasis and veers west through the canyon into the Red Sea. At the mouth of the wadi is a beautiful cove with palm trees, and here the surface water disappears into the gravel of a narrow beach, flowing through the gravel into the open sea.²⁹

In light of all the above, what might Lehi and Sariah have encountered in the Valley of Lemuel on their remarkable journey of faith? Surely the shape and character of Wadi Tayyib al-Ism and the general topography of the Red Sea coast have changed little, and studies of earlier climates allow for only a little more rainfall and slightly cooler temperatures. Historically, however, slight changes in climate in Arabia have brought about mass migrations of indigenous peoples to and from the desert regions and have spelled the difference between cultivated green fields and desert sand, between life and death. Even a little more rain meant more water for the River of Laman and for Lehi’s crops and more vegetation for pack animals and game animals. Perhaps Arabia was a little kinder to Lehi and his party than to those who wander the trails of Arabia today. It would not be the first or the last time that God smoothed the way for those in his service. 

a Black Vulture, it would be unclear.

11. The kite, as well as the falcon, is a type of hawk.
12. This is the European Red Kite, *Milvus milvus*, which does not occur in the Middle East. Therefore, the term *buzzard*, as rendered in the Hebrew, although being more generic, is more accurate.
13. Buzzards are a large, soaring type of hawk.
14. The raven, after its kind, includes crows, magpies, and jays, all of which are scavengers.
15. There is a notable difference between the eight-foot-tall ostrich and even the largest owl. The present-day range of the wild ostrich is essentially confined to the savannah areas of central and east Africa, reaching as far north as the southern edge of Egypt. In millennia past, the range extended farther up into Egypt, the Sinai Peninsula, and even southern Palestine. Interestingly, in light of the Bible's prohibition of eating ostrich, there are at least two ostrich farms in Israel, one in the south a few miles north of Eilat, the other near the Sea of Galilee.
16. This word apparently does not refer to the Cuckoo. Most modern biblical scholars consider it to be either the Seagull, as do the Tanakh translators, or the Petrel. Petrels are a seagoing family of gull-sized or smaller birds that feed off the surface of the water, thereby picking up anything that might be edible. They are scavengers of the high seas, similar to gulls, except that they do not come to the land except to breed and raise their young. They even sleep at night resting atop the rolling waves of the sea.
17. Practically all gulls are known to be scavengers, either on the open sea or along beaches.
18. While most hawks prefer to capture their prey fresh, if extremely hungry they might be forced to eat carrion.
19. Even now there is a species named Little Owl, *Athene noctua*, in the Middle East and North Africa.
20. There are several large owls in the Middle East similar to North America's Great Horned Owl.
21. This is an obvious mistranslation, as the swan belongs to the larger goose-duck-swan family, which was and is currently used for food.
22. The only essentially all-white owl in the Middle East is the ubiquitous Barn Owl, *Tyto alba*.
23. The gier eagle is a type of vulture, probably the Egyptian Vulture, *Neophron percnopterus*.
24. The bustard is a large terrestrial bird, several species of which are native to the Middle East and are not related to the hawk-eagle family.
25. Included in the heron family are bitterns and egrets, all marsh waders, which besides catching and eating fish also consume many kinds of amphibians and reptiles, some of which may be poisonous to humans.
26. Why this mistranslation occurred is unclear. The Lapwing, *Vanellus vanellus* (a type of plover), and the Hoopoe, *Upupa epops*, occur both in continental Europe as well as in Turkey. However, only the Lapwing is common in Great Britain, where the King James translators lived, while the Hoopoe is found in the Middle East, including southern Palestine near where the Mosaic law was given and in other parts of the Arabian Peninsula.

Weather Report from the Valley of Lemuel

Wm. Revell Phillips

1. Lehi was of the northern tribe of Manasseh (see Alma 10:3) but was living in the southern tribal lands of Judah.
2. See Karl W. Butzer, "Environmental Change in the Near East and Human Impact on the Land," in *Civilizations of the Ancient Near East*, ed. Jack M. Sasson (New York: Scribner's Sons, 1995), 1:123–51.
3. See Butzer, "Environmental Change in the Near East."
4. See Butzer, "Environmental Change in the Near East."
5. See Nigel Groom, *Frankincense and Myrrh: A Study of the Arabian Incense Trade* (London: Longman Group Ltd, 1981), 217–18.
6. See Arie S. Issar, *Climate Changes during the Holocene and Their Impact on Hydrological Systems* (Cambridge: Cambridge University Press, 2003), 227.

7. See Issar, *Climate Changes during the Holocene*, 227.
8. See Paul A. Kay and Douglas L. Johnson, "Estimation of Tigris-Euphrates Stream-flow from Regional Paleoenvironmental Proxy Data," in *Climatic Change* 3 (1981): 258.
9. See Groom, *Frankincense and Myrrh*, 217–19; J. Neumann and S. Parpola, "Climatic Change and the Eleventh-Tenth Century Eclipse of Assyria and Babylonia," *Journal of Near Eastern Studies* 46/3 (1987): 161–82.
10. See Issar, *Climate Changes during the Holocene*, 227.
11. See Yohanan Aharoni, *The Archaeology of the Land of Israel* (Jerusalem: Shikmona Publishing, 1978), 83–103.
12. Groom, *Frankincense and Myrrh*, 96.
13. Groom, *Frankincense and Myrrh*, 69.
14. Groom, *Frankincense and Myrrh*, 111.
15. See Groom, *Frankincense and Myrrh*, 218; J. Neumann, "Climate Change as a Topic in the Classical Greek and Roman Literature," *Climatic Change* 7/4 (1985): 441; Mebus A. Geyh, "The Paleohydrology of the Eastern Mediterranean," in Ofer Bar-Yosef and Renee S. Kra, eds., *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean* (Tucson: Department of Geosciences, University of Arizona, 1994), 131–45; and Arie S. Issar, *Water Shall Flow from the Rock: Hydrogeology and Climate in the Lands of the Bible* (Berlin: Springer-Verlag, 1990), 11.
16. Hugh Nibley, *Lehi in the Desert; The World of the Jaredites; There Were Jaredites* (Salt Lake City: Deseret Book and FARMS, 1988), 50.
17. See George D. Potter and Richard Wellington, *Lehi in the Wilderness: 81 New, Documented Evidences That the Book of Mormon Is a True History* (Springville, UT: Cedar Fort, 2003), 55.
18. See Potter and Wellington, *Lehi in the Wilderness*, 5.
19. See S. Kent Brown, "A Case for Lehi's Bondage in Arabia," *JBMS* 6/2 (1997): 206–8.
20. See Michael Lloyd Ingraham et al., "Saudi Arabian Comprehensive Survey Program: Preliminary Report on a Reconnaissance Survey of the

Northwestern Province (With a Note on a Brief Survey of the Northern Province)," *ATLAL: The Journal of Saudi Arabian Archaeology* 5 (1981): 73.

21. A perched water table is formed where an impervious bed of limited horizontal extent (e.g., clay or granite) is overlain by permeable rock material (e.g., sandstone or alluvium). Rainwater accumulates in the permeable and porous upper rock material but cannot penetrate downward into the impervious rock. Thus water builds up on the impermeable surface and flows out where that surface is exposed by erosion, as in the floor of a canyon. A perched water table in the desert lies much nearer the surface than the regional water table, which may lie at very great depth.
22. See George D. Potter, "A New Candidate in Arabia for the 'Valley of Lemuel,'" *JBMS* 8/1 (1999): 61.
23. See Ingraham et al., "Saudi Arabian Comprehensive Survey Program," 62.
24. It is noted here that no report of children being born appears in the record before the party left Nahom (see 1 Nephi 17:1). This in no way precludes the earlier birth of children, and to assume from this that Lehi departed Nahom nine months after Ishmael's daughters arrived at Lehi's camp would be an unfounded assumption. Lehi's complete journey took eight years (see 17:4) and over 2,000 miles. If he left Nahom after one year on the trail, the remaining seven years and 700 miles are summed up in three scriptural verses (see 17:1–3).
25. See Ingraham et al., "Saudi Arabian Comprehensive Survey Program," 59.
26. Ingraham et al., "Saudi Arabian Comprehensive Survey Program," 75.
27. See Potter and Wellington, *Lehi in the Wilderness*, 57.
28. See Ingraham et al., "Saudi Arabian Comprehensive Survey Program," 62.
29. See Potter and Wellington, *Lehi in the Wilderness*, 9.

[With Real Intent]

Out of Judaism

Nancy Goldberg Hilton

1. I give more details about my conversion in my autobiog-