

On Balancing Faith in Mormonism with Traditional Biblical Stories: The Noachian Flood Story

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Describing the religion of the Latter-day Saints, John Taylor said that it “embraces every principle of truth and intelligence pertaining to us as moral, intellectual, mortal and immortal beings, pertaining to this world and the world that is to come. We are open to truth of every kind, no matter whence it comes, where it originates or who believes in it. . . . A man in search of the truth has no particular system to sustain, no particular dogma to defend or theory to uphold.”² We are glad to belong to a religion and a university that are committed to the on-going quest for truth, especially when we find ourselves confronted with finite perspectives, conflicting evidence, and divergent knowledge claims. Our difficult aim in this article, then, is to assess the competing claims regarding the historical core of the biblical story of Noah’s flood. Our primary tools of observation come from the disciplines of biogeography (the distribution of organisms) and biodiversity (the variety of organisms).

Members of the Church of Jesus Christ of Latter-day Saints often assume that their religion requires them to believe in Noah’s flood as a worldwide occurrence. Many Latter-day Saints do, in fact, hold this view of a worldwide flood. But there is more room in this ark than one might expect. It is our informal observation that a sizable group of Latter-day Saints also believe that Noah’s flood reports a local event. A third group of Latter-day Saints believes that the flood story is simply fiction, a position which members of all three groups recognize as unorthodox.

We hope to assess these historical perspectives in light of the best science that we can muster. We will argue in this article that there is overwhelming scientific evidence that the great flood described in the Bible could not have covered the whole Earth. We will conclude with observations about possible implications of this conclusion for believing Latter-day Saints.

In light of these differing beliefs, we recognize that *any* treatment of this topic is potentially divisive. Especially under such conditions, we have no desire to speak critically, uncharitably, or arrogantly. We lay no claim to authoritative doctrinal pronouncements. But we do hope that we might add constructive points to the discussion, while allowing room for competent opposing opinions in light of John Taylor's admonition to seek the truth.

While several events over the past dozen years prompted this article, a particularly telling experience occurred one day while a grandchild was sitting on White's lap. White asked what the child had learned in school that day. "Did you know, Grandpa, that there are mammals in Australia that lay eggs and they are found nowhere else but Australia?" "Yes," he said. "How did that happen?" was the response. White could not tell this child that they were dropped off there after the flood because that would not be of help in understanding the world in which that child would spend the next several decades. So he gave a brief and very watered-down version of the sequence in which animals appeared on the earth, how the continents have moved over the past eons of time, and the idea that there are regions where "relict" animals occur because of all those events.

Noah's flood is a remarkable and wonderful story of ultimate catastrophe, salvation, and new creation that most of us learned as children. The story has special significance in our time. Our understanding of this story has important implications for our stewardship over our planet, which faces its own potential ecological catastrophes, due largely to overwhelming human encroachment into ecosystems. So despite the controversial nature of the subject, we believe that a frank discussion of its historical core is worthy of consideration by Latter-day Saints.

A Brief Look at the Biblical Text

Before we examine scientific evidence regarding the flood, we will summarize a few features of the biblical worldview and the history of the text that relate to our scientific study.

The King James biblical text seems to present the flood as a historical event. Noah built an actual ark and took with him his family, seven each of every ritually clean “bird, beast, and creeping thing,” and two each of all ritually unclean birds, beasts, and creeping things (Gen. 7:2). When Noah and his company entered the ark, “all the fountains of the great deep [were] broken up, and the windows of heaven were opened,” and it rained for forty days and nights (Gen. 7:11–12).

This passage describes the ancient view of the world, according to which the earth below and the firmament above were surrounded by the cosmic waters of chaos. The Hebrews imagined that the earth floated on the waters below and was capped above by a semicircular dome, called the firmament or vault of heaven (*raqia*), with an unlimited reservoir of waters above the firmament. The firmament had openings in it to allow the waters above the firmament to fall in the form of rain. The waters below the earth were also unlimited. These waters symbolized chaos. Most texts in the Hebrew Bible assume this three-tiered world.³ In terms of the flood narrative, the waters “increased greatly upon the earth” and the “waters prevailed exceedingly upon the earth; and all the high hills, that were under the whole heaven, were covered. Fifteen cubits upward did the waters prevail; and the mountains were covered” (Gen. 7:18–20). Noah continued in the ark until at least the seventeenth day of the seventh month (Gen. 8:4), and not until the tenth month did waters return to their places and the tops of mountains become visible.

The text certainly gives the impression that the flood was universal, killing all humans, birds, and other land life over all the earth (Gen. 7:22–23). Especially in the priestly strands of the narrative, “the Flood is the reversal of Creation, in which cosmos returns to chaos,”⁴ making its impact as universal as that of the creation had been. Given the cosmological world view of the ancients discussed above, it comes as no surprise that most early Jewish and Christian sources interpreted the flood as covering the entire Earth. For example, 1 Enoch 10:2, an apocryphal work, states that “the Deluge is about to come upon all the earth; and all that is in it will be destroyed.”⁵ However, some early Jewish texts did not describe the flood as covering the entire earth.⁶

The biblical story of the flood has parallels in other literature. The flood story in Genesis 6 begins with a cryptic reference to “the sons of God” having sexual relations with “the daughters of men”; this mixture of “giants” (*nephilim*) and mortals produced “mighty men,” heroes, or “men

of renown” (Gen. 6:4). Seeing the wickedness of this situation, however, God regretted that he had created humans and decided to destroy them with a flood (Gen. 6:6–7). The references to worldwide floods⁷ and sexual relations between divine beings and humans in an age of giants are reminiscent of several ancient Mediterranean and Near Eastern myths. The flood story is “not only atypical of the Bible as a whole but also puzzling and controversial in the extreme.”⁸ In short, it appears that the transmission of the biblical flood story was profoundly influenced by Near Eastern mythology.

The LDS Church has always believed that the Bible is the word of God only insofar as it is recorded, translated, and transmitted correctly (Eighth Article of Faith). Indeed, the Joseph Smith version of Genesis 6, found in Moses 8 of the Pearl of Great Price, renders this story with significant differences from the Old Testament.⁹ The Prophet clearly believed that there were textual and transmission problems with this particular story.

There is also a wide variance with how Church authors in the twentieth century dealt with this story. In his widely used *Mormon Doctrine*, Elder Bruce R. McConkie succinctly summarizes the traditional view: “In the days of Noah the Lord sent a universal flood which completely immersed the whole earth and destroyed all flesh except that preserved in the ark.” His use of “immersed” echoes the long-standing LDS teaching that the Earth is a living creature that was baptized by immersion at the time of the flood. Elder McConkie evidently realized some of the scientific implications of his views, for he continued by dismissing the past two hundred years of geological science: “Many of the so-called geological changes in the earth’s surface, which according to geological theories took place over ages of time, in reality occurred in a matter of a few short weeks incident to the universal deluge.”¹⁰ He does not explain where his information came from or cite any source to support this view except Elder Joseph Fielding Smith.

Two decades earlier, Elder John A. Widstoe, trained as a chemist, had a much different perspective and approach to the flood. Elder Widstoe recognized that there were serious factual problems in the traditional belief regarding the flood. The title of his 1940 *Improvement Era* article and his subsequent book, *Evidences and Reconciliations*,¹¹ suggest his own approach to the subject. Widstoe took seriously factual perspectives on the flood made by then-current scientists. He recognized that the nar-

rators of the flood story were not eyewitnesses to the events and, hence, that the details of the story may not be reliable as history: "In fact, the details of the flood are not known to us," he states, and, as a result, used a suggestive and inconclusive approach and sought a tentative compromise between science and religion. Yet it seems clear that Elder Widstoe did not believe in the traditional view. He tentatively rejected the idea that water could have covered the entire earth: "It is doubtful whether the water in the sky and all the oceans would suffice to cover the earth so completely."¹² He suggested that the original writers may have relied on inaccurate traditions handed down from even earlier generations regarding the Genesis flood. "We should remember that when inspired writers deal with historical incidents they relate that which they have seen or that which may have been told them unless indeed the past is opened to them by revelation." Widstoe concluded: "The scriptures must be read intelligently."¹³

Elder Widstoe's statement is remarkable on several accounts. It is certainly not a traditional view and contradicts the claim that the highest mountains were under fifteen cubits of water. Hence, he opens the door to new ways of interpreting the flood. The denial of complete knowledge regarding the details of the facts of a flood is echoed by Morris Petersen, a former stake president, who wrote the entry on the flood for the *Encyclopedia of Mormonism*.¹⁴ "The Great Flood" appears as a subdivision under the entry "Earth." He acknowledges the lack of empirical data to support a literal, universal flood and simply cites the same sort of material as Widstoe. Under the entry on "Noah," Andrew Skinner mentions the flood only in passing: "[Noah] became second father—with Adam—of all mankind following the flood," and the remaining page or so of material discusses, as it should, Noah's importance and role as a prophet.

Elders McConkie and Widstoe agree on one area: the Earth's distinctive baptism during the flood. Since Elder Widstoe does not believe in a universal flood, he suggests that the "baptism" may have consisted of a universal rain storm that covered, however thinly, the face of the Earth with a coating of water.

Interest in the idea of a limited flood became prominent after the seventeenth century, when the size of the Earth and the nature of the water cycle became apparent to scientists.¹⁵ Accordingly, some modern commentators have suggested other ways of reading this story.¹⁶ One possibility is reading the story as a local flood consistent with the worldview of the

ancient Hebrews. For example, some recent commentators have argued that the Hebrew word *'eretz* is translated in the King James Version both as “land” and as “earth,” but twice as often as “land,” as in such phrases as “the land of Canaan” (Exod. 6:4), “the land of Egypt” (Gen. 41:33) or “the land which he promised them” (Deut. 9:28). Thus, they argue, the miraculous rainfall may have been localized to the whole face of a certain land or lands and need not necessarily refer to the entire planet.

Natural Science and the Flood

The current view of the world and the Earth’s history is quite different from the view presented in the Noachian story and in the ancient or prescientific world generally. Very naturally, therefore, one would expect to find a host of differences between our current understanding of the physical world and the story of the flood as presented in the Bible.

The traditional, universal flood story calls for a predictable series of events and patterns that follow as the waters subside. Predictability in religion is as important and compelling as it is in science and predictability is what also makes the scriptures useful in our lives and helps us build and maintain faith. Biblical stories should also have predictable events and outcomes to be useful. But the necessary results of a universal flood are not visible in the natural world. Scientific conclusions are generally tentative, by nature. Nevertheless, the geological record of the Earth yields no evidence of a worldwide flood, and biogeography does not support the idea that all current life forms had single source points some 4,300 years ago. (The flood is usually assigned a date of about 2350 B.C. based on biblical chronology.)

While much has been written about the flood over the years from the perspectives of geology and hydrology, little has been said about evidences from the life sciences, especially when couched in the framework of the flood’s proposed timing.¹⁷ Below is a simple array of evidences from plants and animals suggesting that the flood was not universal in scope. This evidence is selected from literally thousands of similar examples across a broad range of issues from biogeography and biodiversity. In these brief clips of information, we make no attempt to present more than a summary of the phenomenally complex variety of issues.

To help provide a sense of the biogeographic and biodiversity difficulties presented by a universal flood scenario, we have arranged a summary of simple selected examples under ten topics: (1) size, (2) timing, (3)

specialization, (4) islands, especially compared to continental land masses, (5) aquatic species and earthworms, (6) parasites and microorganisms, (7) endemic species, (8) plants, (9) entire ecological systems, and (10) the global distribution of life. The weight of this enormous body of scientific data is unequivocal in its testimony against a global flood.

1. Size

The ark contained insufficient space to house every bird species, let alone mammals, reptiles, insects, plants, and other life forms. Today, at least 9,672 named species are known just among birds. If Noah took seven of each of the clean and two of the unclean, then he had to fit approximately 67,704 individual birds into a space measuring 425x71x43'.¹⁸ Some were tropical hummingbirds; some were penguins from Antarctic; and others were flightless rails and now extinct moas from islands of the central south Atlantic and southern Pacific. These birds range in size from a 150-pound ostrich (or the 250-pound extinct New Zealand moa) down to a four-gram hummingbird. All available space in the ark would be used by the birds alone, if each had, on average, about 19 cubic feet (about 2.7 feet cubed), and this leaves no room for walkways, bird food for the lengthy journey, decks between floors, or anything else. If Noah could not fit in the 9,672 bird species, it is much less likely that he could find room for the other 1.5 million species so far identified on Earth.¹⁹

Perhaps fewer species existed then, or perhaps Noah did not take "species," but only higher categories of orders or families of organisms.²⁰ Either solution requires a belief in an unprecedented pace of evolution of species or a second creation after the flood for which no biblical stories, nor any scriptural, historical, or scientific evidence has ever been advanced. Any proponents of such thinking would find themselves advocates of the most extreme evolutionary theories and religious speculations, to the point of losing all scientific and religious credibility. In fact, such a view renders the original creation account irrelevant as a way of accounting for today's biodiversity; rather, only what remained after the flood should account for the enormous global biodiversity.

The biblical text states that the highest mountains were covered by fifteen cubits of water. This depth is not a problem in the Hebrew three-tiered view of the Earth with the unlimited waters above the firmament and below the Earth. But geological and earth sciences have very different perspectives about the Earth's size and its water cycle. The geologi-

cal features of the Earth have been only slightly modified in the past six thousand years. A finite amount of water is extant on the Earth. The continents, mountains ranges, and so forth are very much as they were when Noah is considered to have lived (based on interpretation of biblical chronology). Therefore, the traditional view has to explain (given what we know about the earth's water cycle) how its limited quantity of water could cover mountains that are in excess of twenty-five thousand feet.

2. *Timing*

When God first announced the flood and instructed Noah to build an ark, he said, "I am about to destroy" the human race, and "I am about to bring the waters of the flood over the earth" (Gen. 6:13–17). When the ark was finished, Noah entered in with all of the organisms he had been commanded to collect, and the flood began in seven days (Gen. 7:4). The text seems to imply a rapid sequence of events compatible only with a local set of animals. How did Noah have time to acquire animals from all land masses? No data, revealed or otherwise, suggest that the land masses did not exist as they now are (although some believe that the "division" of the Earth during the days of Peleg as stated in Genesis 10:25 implies a separation of continents), and that climates were not similar to the present during Noah's time period. Within a few days, did Noah gather, did God bring, or did the animals assemble themselves, from such distant and disparate places as South America, Australia, and the polar regions? The extent of animal life and land masses on Earth seems to make the timing of the traditional universal flood story unworkable.

3. *Specialization*

Many species of animals require highly specialized diets unavailable to Noah. The endearing koala of Australia is one of thousands of examples. (Koala fossils are found only in Australia.²¹) Few zoos are able to maintain them because of their specialized eucalyptus-leaf diets. Of more than six hundred species of eucalyptus trees²² in its native homeland of Australia, koalas eat only a few varieties.²³ Koala diets are so specialized that, if the diet is modified, they die. There are literally thousands of species so specialized that we are not yet able to maintain them in captivity.

Perhaps Noah had some mechanism of which we are unaware that allowed him to feed koalas their specialized diets. Or perhaps a very rapid

change in their physiology, morphology, and diets may have occurred. The improbability of these proposed solutions speaks for itself.

4. Islands Compared to Continental Land Masses

Continental islands are a particularly interesting case. We will use but two examples, Australia and Madagascar. Although Australia is a de facto “continent,” we treat it here as having the characteristics of an island. It possesses an accumulation of both pouched (such as the kangaroo) and egg-laying (such as the duck-billed platypus) mammals. In our understanding of the traditional view of a universal flood, the animals would have arrived in Australia from a central point where the ark alighted after the flood. Why would all marsupials (242 species currently known living) go to either Australia (most) or South America (the opossums) and not to the rest of the world as other mammals did? Did the ark stop off at various places to let such mammals out? Did Australia move to its present location after 2350 B.C. without being noticed and commented upon? Some Bible readers quickly evoke such a solution, interpreting the words “division of the earth” (Gen. 10:25) to suggest that this event referred to continental movement. But animals such as the marsupial mole would need to have been physically carried to their location by some power beyond their own because they could not dig that far. Moles in the eastern United States are apparently unable to cross the Rocky Mountains to reach the western United States. Because placental mammals outnumber pouched or egg-laying mammals worldwide by about fifteen to one, why are the former less represented in Australia, which has 159 marsupials but only 65 placental land mammals? (These figures exclude the 69 species of placental bats.)

Likewise, Australia has 765 known reptile species (snakes, lizards, and crocodiles), the largest number of reptile species of any land mass. Of these, 90 percent are endemic to Australia, meaning that they are found nowhere else. Madagascar, also a “continental” island because it was at one time connected to Africa, has three hundred reptile species so far identified, 95 percent of which are endemic.²⁴ One must wonder why reptiles would move differentially to Australia and Madagascar? Why would Australia and Madagascar collect species different from those found in New Guinea or Africa? Movement from a single point source, inherent in the understanding of a universal flood, does not explain any of these or thousands of other similar circumstances.

A second issue posed by island/continental land mass characteristics is that of island ecologies. Oceanic islands, unlike the continental islands, arise as new land from the ocean, beginning as hot lava. They are therefore not inhabited by life forms in their beginnings, yet many flightless organisms, especially birds, occupy them today. Flightless birds were there when the first humans arrived (e.g., Polynesians in Hawai'i around A.D. 500, Maoris in New Zealand around A.D. 1000). They exist in several conditions and stages of flightlessness, which in turn correlates with the island's degree of isolation and the length of time that island has existed. Of the more than two thousand presently described species of *Drosophila* (the common fruit fly so familiar during the fruit-bottling season), more than half of the species occur in Hawai'i. (This figure may be a bit misleading, however, since hundreds of species apparently exist in Southeast Asia but have not yet been described.) Some Hawai'ian flies are flightless. Mountains, such as Mount Kilimanjaro in Africa topped by its glaciers, are also essentially islands (as are a multitude of other geographical features) that are surrounded by drastically different habitats. Many flightless species occur on Mount Kilimanjaro also.²⁵ The flightless and wingless Wekiu bug (family *Lygaeidae*) developed locally only on the glacial summits of Mauna Loa and Mauna Kea on the Big Island of Hawai'i. It survives by eating wind-wafted insects that land on the glacier and has developed "antifreeze-like" fluids in its body.²⁶ Again, a universal flood does not account for these circumstances.

5. Aquatic Animals and Earthworms

One might think that, because the world was covered with water, animals living in water would not pose a problem. That is not, however, the case as two examples show.

Pupfish, specialized "minnow-like" fish, live in hot, clear, alkaline desert ponds in the Great Basin in the western United States; their ecological counterparts exist in various parts of the world. They are currently classified as endangered because simple human-caused changes in water quality and habitat are threatening them with extinction.²⁷ A universal flood would destroy the environment they need to survive. Other types of fish require either marine (salt water) or strictly fresh water for survival. Why didn't the flood destroy them?

Perhaps affected species had a different physiology before the flood? Perhaps they were created after the flood? Or perhaps the water sorted it-

self by salinity and temperature to accommodate all fish? No mechanisms for a universal flood would allow such fish to survive, especially in the specialized locations where they currently occur. No record has been found of their being carried there by humans. Certainly, the first humans to invade the Americas did not have the means to transport pupfish from where the ark landed. And why would they want to?

A second example is crayfish. About 540-plus known species of freshwater crayfish (or “crawdads”) exist worldwide. Two centers of diversity are found at two rather distant locations. The largest number exist in the southeast United States with more than three hundred species, accounting for about 61 percent of the total number of species, while the next major location is in southeast Australia with thirty-plus in Victoria and fifteen-plus on Tasmania.²⁸

Explaining such distribution is not easy, but the evidence suggests that their diversity accumulated through a series of isolation events caused by such well-recognized and well-documented phenomena as ice-age advances and retreats, acting on an organism with an ancient Gondwanaland distribution. If crayfish had spread on their own from a central location, they would have needed corridors of fresh water that connected all of the continents. This pattern exists in the southeast United States and is mirrored by other organisms in that region.

A third example is earthworms. Even from childhood, we are aware that, following a heavy rainstorm, earthworms leave their burrows and many drown on sidewalks and in gutters. Unless earthworms of a wide variety were taken onto the ark, how would they have survived the flood waters? Equally importantly, if they had one starting point, why are not the giant species (some three yards long) equally distributed rather than localized in South Africa, Sri Lanka, northern South America, and southeastern Australia?²⁹

6. *Parasites and Microorganisms*

Endoparasites, found in humans and other animals, are often restricted to their specific host or perhaps to a series of specific intermediate hosts. As examples, (1) a family of very diverse frogs that occur both in South America and in Australia share the same parasite found nowhere else among frogs; (2) the human parasites that cause Chagas’s disease in tropical America are related (same genus but different species) to the parasite that causes African sleeping sickness on the African continent, but no

comparable analog is found in Eurasia; and (3) regions in which humans are most afflicted by vector-transmitted parasites (usually some insect) are found in seemingly the greatest numbers in Africa, followed by the Far East.

One might wonder who on the ark carried the human head and pubic lice—although the answer is, Probably everyone in the ancient world. Who or which animals carried the AIDS-causing virus or the syphilis-causing spirochete organism? Were the reservoirs for the influenza, whose yearly cycles seem to always start in Asia, or the common cold virus, also on the ark?³⁰

Distributions of such life forms require host organisms. Such hosts on the ark would have needed to carry the full suite of these parasites collectively or intermediate host carriers would have had to have them. Those organisms mentioned above are not found today in the Middle East (around “Ararat,” the ark’s proposed resting place), nor is the intermediate host of African sleeping sickness, the tsetse fly. The current distribution of frog parasites can be explained scientifically by the fact that a very old family of frogs existed at the time the southern continents were connected through Antarctica, before it was largely icebound. Thus, the family shared a continuous and connected range. Human parasites have been separated so long that they have undergone speciation not consistent with a more recent single source of origin. Lastly, vectors that transmit the large array of human problems typically occur in certain environments that seem to be specific to them. In other words, even though human migration has criss-crossed the earth, human beings have not been able to carry certain diseases with them. Therefore, either the disease carrier on the ark had to maintain the life cycle of the vector/disease over several, perhaps hundreds, of generations until humans dispersed into the appropriate environment or the vector/parasite/transmission cycle has undergone radical changes. Perhaps other logical alternatives are possible.

7. *Endemic Species and/or Groups*

The New World, for example, has many unique groups of animals not found, even in a rather extensive fossil record, outside of the Americas, some confined strictly to South America. Sloths, armadillos, and hummingbirds are examples of exclusively New World animals. Three-toed sloths have limbs adapted only for hanging, usually upside down, or climbing in trees by long, hook-shaped claws. Sloths can descend to the

ground but have great difficulty standing and cannot walk, although they can drag their bodies along by their front legs for short distances. They swim more slowly over long distances than they can drag themselves.³¹ These circumstances suggest a long developmental history in place, rather than distribution from a single point after a flood.

Hummingbirds, of which some 328 species have been described, are restricted to the New World and have never during historical or prehistorical times (based on the fossil record) existed elsewhere. They range from southeast Alaska to Tierra del Fuego in South America and from sea level to at least 15,000 feet in the Andes Mountains. The greatest number are, of course, tropical with the most species in Ecuador and Columbia.³²

8. *Plants*

As most people know, most trees produce growth rings, one for each year of life. Rings may show varying thicknesses, depending on growing conditions for that specific year of growth. The bristlecone pine occurs on high mountain tops, usually above 9,000 feet, at scattered locations in Colorado, Utah, Nevada, California, and Arizona. The oldest intact record of age from growth rings for a single tree is more than five thousand years.³³ Cross-matching rings within a given tree, however, has produced a continuous age for a single tree of more than ninety-three hundred years,³⁴ thus predating the flood by about forty-three hundred years. This species of pine is not known outside the New World, even in the fossil record, nor can pines survive submersion under water beyond a few weeks.

Principal human grain foods are corn, wheat, and rice. Each is native to different parts of the world. All were certainly not carried by humans emerging from one location after the flood subsided, or they would not have had the distribution they had. Corn was seemingly known only in the New World and was “discovered” by Europeans when the conquistadors arrived. Wheat was known only from the Middle East and Europe, and rice is native to Asia. A universal flood does not account for these circumstances.

9. *Entire Ecological Systems*

Within plant and animal communities, some organisms are called “keystone” species. These species structure that particular community; around them other creatures are clustered and, in significant part, depend. When the keystone species is lost (say, through extinction), the

community frequently breaks down through a series of cascading events. A species may be a keystone in one area but not in another simply because of the structure of that particular community. An example is the prairie dog from U.S. Midwest and West. These animals modify the landscape with their burrows and grazing; they also provide necessary conditions for other species that cluster around them such as larks, mountain plovers, black-footed ferrets, etc. To remove the keystone species of an ecosystem usually spells the collapse of the entire system. In ecologically similar habitats, say, in Africa or South America, different keystone species within that community of species occur but provide the same function. So, either the different keystones with their associated species were let off together from the ark in different locations and the dependant species had to wait for appropriate habitat modifications, or they migrated together as a cohesive unit to that location from Ararat, or an elaborate co-evolution from location to location has occurred since about 2350 BCE. None of these hypotheses seems to adequately account for the data.

Deserts appear on both the eastern and western hemispheres. They generally occur on the west sides of continents in the western hemisphere; in Australia and near the Tropic of Cancer in the northern hemisphere; and near the Tropic of Capricorn in the southern hemisphere. Their distribution is explained by climate and ocean-flow patterns. Each desert has ecological and structural counterparts, often with genealogically distinct or totally unrelated animals and plants on each desert; examples are kangaroo rats in North America, jumping jerboas in Africa and Asia, and hopping mice in Australia.

We are left with the problem of how the climate and ocean current patterns that cause these deserts got established on a globe entirely covered by water in time for Noah to get the desert animals and plants to deserts after/before the appropriate land masses emerged from the flood waters. Or did they develop independently in the few short years between the flood and when they were recorded in written historical accounts from cultures living in those deserts?

10. Global Distribution of Life

If all animals started to repopulate the Earth from one focal point as in the case of Noah's flood, then we should be able to predict certain patterns. A few might be: (1) The greatest diversity should be at the focal point. (2) There should be an accumulation of slowly dispersing animals

relative to fast-moving animals at the focal point. (3) Radiation outward from that focal point should proceed along logical patterns, perhaps equally in all directions or perhaps dictated by mountains, valleys, rivers, etc. (4) As many “primitive” animals as “advanced” animals should be at the focal point.

However, the distribution of life that we actually observe around the planet does not support the idea that all life emerged or reemerged in the relatively recent geological past from a single location.³⁵

In sum, we are aware of no well-developed scientific or physical evidence that supports a universal flood. To maintain the traditional view of a universal flood, we must either appeal to a host of simultaneous, astonishing, and miraculous events (water from outer space, shrinking animal size or acceleration of the pace of evolution, massive geological change in the space of weeks, miraculous transportation, special creations after Noah, and so forth), or we must abandon the pillars of the natural sciences altogether. For those who maintain the historicity of a universal flood, the burden of proof remains upon them to explain the large body of overwhelming evidence to the contrary.

Implications for Latter-day Saints

What are the implications of this scientific evidence for faithful members of the Church of Jesus Christ of Latter-day Saints? Clearly, while tending toward traditional universal views of the flood, Latter-day Saints have a range of beliefs on the subject. These differences of opinion should indicate that we ought to allow faithful Latter-day Saints who disagree on this subject the freedom to accept whatever historical and scientific conclusions they may entertain about the flood. As authors, we choose to follow the general rule apparent in the LDS Church, which is to acknowledge respectfully the freedom of expression of, and tolerance for, those with differing conclusions regarding the flood. We consider this approach part of our joint Latter-day Saint quest to find truth. We hope that our fellow Latter-day Saints would allow us the same privilege; and, in fact, belief in a universal flood is generally not used as a litmus test of faith nor as an index of worthiness.

With this hope for tolerance, we also add our own opinion of the historicity of the flood. The very story of Noah’s ark and the flood assumes that the reader and narrator possess knowledge of a historical massive flood event that inspired the transmission of the story. But the long

textual history and the story's hidden sources make it clear to us that the details of that event are lost and that the narrative has almost surely undergone considerable alterations from the original text.

As we seriously explore the historical core of the story of Noah's ark and the flood, we are likely to encounter several possible temptations at odds with John Taylor's open quest for truth, cited in the opening of this paper. These temptations are to abandon either the text, science, or religion in our quest for truth about the story of Noah.

First, we invite readers to think about the consequences of eliminating science from the dialogue. To abandon science seems contrary to the spirit of LDS teachings on the subject. In the First Presidency's 1910 Christmas message, Joseph F. Smith said, "Our religion is not hostile to real science. That which is demonstrated we accept with joy."³⁶ Brigham Young earlier fostered a positive attitude toward scientific learning by saying, "Teach the children, give them the learning of the world and the things of God; elevate their minds, that they may not only *understand the earth* we walk upon, but the air we breath, the water we drink, and all the elements pertaining to the earth." He also said, "How gladly would we understand every principle pertaining to science and art, and become thoroughly acquainted with every *intricate operation of nature*."³⁷ Similarly, Brigham Young taught that Latter-day Saints differed from the Christian world because the other churches "advance many ideas and notions for truth which are in opposition to and contradict facts *demonstrated by science*, and which are generally understood . . . for our religion will not clash with or contradict the facts of science in any particular."³⁸

Science is an indispensable ally in our religious stewardship over the land. The Doctrine and Covenants summarizes our obligation of stewardship over the Earth: "I the Lord . . . built the earth . . . and all things therein are mine . . . and if the properties are mine, then ye are stewards" (D&C 104:14, 56). Proper stewardship of the world develops through a proper understanding of its functions, which requires an accurate view of such questions as how things came to be.³⁹ We contend that an effective stewardship is difficult to acquire without knowing what we are stewards over. This precious scientific legacy has accumulated through investigations over the last two hundred years. It has given us a relatively clear and straightforward view of life's history and its distribution on earth.

Rejecting the factual findings of science may result in very damaging treatment of the earth—the opposite of what the Noah story is teaching.

One of our greatest legacies is the biodiversity of organisms on the Earth. We live in a world that is rapidly being impoverished by the loss of diversified habitats and organisms—essentially a loss of the “creation.” In scientific parlance, the result is called biodiversity decay or ecological decay. It is humankind’s lack of knowledge that has (in large part) led to the magnitude and the geometrically increasing rate of loss in biodiversity that we have witnessed over the past several decades. Appreciation, based on an understanding of natural events, is the best way for us to protect biodiversity. For all of these reasons, we consider science an important contributor to our understanding of the Noah story and a necessary help to us in fulfilling our religious duty and moral stewardship.

Accepting the role of science in discussing the historicity of the Noah story may have the potential of rejecting the proper place of religion in the dialogue. By rejecting religion, we eliminate the language and modes of thought that are most central to the establishment of values. But religion is not just the expression of values; it is the depth element in all cultural manifestations, including science. Once values are taken out of the discussion of nature, we run the risk of completely objectifying nature, an attitude that unfortunately underpins much current economic thought. Objectification of nature is both a blessing and a curse. Objectification of nature requires the inclusion of a value system to give it proper perspective. Religion is the primary manifestation and advocate of social values. Therefore, if we are to have an impact on social norms regarding nature, we must involve religious institutions and theology. As an illustration, it seems doubtful that slavery would have been abolished in the United States without the strong religious values held by many abolitionists.⁴⁰

The dialogue proposed by John Taylor must include the religious perspective if it is to succeed. To gauge the LDS interpretive history on Noah’s flood, we have examined a large representative sample of nearly four hundred sermons from Church leaders who discuss Noah and the flood. These sermons were from the *Journal of Discourses* (which contains sermons as early as 1854) and from the *Conference Reports* from 1900 to 1970. These speeches were central public discourses that cover teachings from Brigham Young through Church leaders still living, from the nineteenth century through a majority of the twentieth century. In other words, although not exhaustive, this survey covered a large portion of LDS history. We believe that this large sample gives a reliable profile of

how LDS leaders have interpreted the story of Noah's flood in public sermons.

Though many Latter-day Saints have adopted the traditional view of a universal flood, they have a variety of views on the historical core of the story, even among the pronouncements of LDS leaders, as we have already noted. Much of the evidence from the Genesis text and from sermons of Church leaders is either silent or ambiguous on the factual issues surrounding the flood. In LDS sermons, Noah is clearly understood to be a historical character, and the flood is usually assumed to be a historical event. Other than these two implicit assumptions, rarely are historical claims about the flood expressed in LDS sermons. LDS leaders have demonstrated far more interest in the story's moral, social, and existential symbolism than in its historical details. The point of these sermons is how to exercise faith, how to live in a corrupt world about to be destroyed, how to maintain faith in the LDS Church despite the scoffing of critics, and so forth. We suspect that current Latter-day Saints will continue to use Noah's story as a religious and literary model, just as in the past.

At the end of the Noah story, God made a covenant with humanity, which included human accountability for nature (Gen. 9:1-8). God then covenanted to never totally destroy life again, not only with humans but also with "all that live on earth." This is a covenant between God and all living creatures, with humans acting as God's stewards. Living creatures are a "Thou" and are therefore intimately associated with an ethic of respect for all life. This is a story addressing immediate ethical concerns in our age. It speaks of the destruction of life and the preservation of species. Many LDS leaders have understood this story as primarily ethical. Yet in the workaday world, nature is often treated as an object, a scarce economic commodity to be discarded if the whims of the market dictate. This view of nature is foreign to the human stewardship of life articulated in the Noah story.

To enter into Noah's covenant of life is to take upon us the obligation to be accountable for the earth's preservation as articulated in this biblical passage. As we seek to survive despite the increasingly dangerous challenges that confront and surround us, we should use every tool possible for finding the truth. Each discipline that is brought to bear upon this task of finding truth contains perspectives and methodologies appropriate to its particular approach. Science concerns itself primarily with facts about the world, scriptural scholars with the meaning of texts, and reli-

gions with ethics, meaning, and values. Hence, a combined approach in which science, religion, and textual critics combine forces in the spirit of John Taylor's embrace of truth may yield new perspectives and insights into the narrative of Noah and the flood for LDS readers.

Furthermore, such a combined search will help us bring to life the sorrows and hopes of a world struggling for decency and survival. Such an open and honest search for truth, with its promise of survival, seems to be a fundamental and necessary tenet of our religion. Without facts from science, religion struggles for direction in its stewardship. Without the values that are the essence of religion, science and economics may become prisons of meaningless and heartless facts. If it is to succeed, the covenant of life articulated in the Noah story must be honest to the fundamental message of the text, guided by the light of science and inspired by the music of religion.

Notes

1. ACKNOWLEDGMENTS: This is the article mentioned at the beginning of Duane Jeffery, "Noah's Flood: Modern Scholarship and Mormon Tradition," *Sunstone*, Issue 136 (October 2004): 27–45. He describes two Brigham Young University faculty members who wrote the article and submitted it to *BYU Studies*. After some three years and about five major revisions to suit the editor, *BYU Studies* essentially accepted the article. After yet another review by another panel, the article was rejected.

Scores of people have commented on and critiqued the manuscript. They have been in and out of academia, within the field of religious instruction, especially at BYU, and outside, and from various scientific disciplines. All of those named below are active, believing Latter-day Saints. Several rejected our conclusions but nonetheless offered valuable comments. We alone are responsible for the wording and conclusions. The large majority of these contributors are faculty colleagues, former or present, and graduate students at BYU. We thank all those who have offered comments, but in particular Russell Ball, Mark C. Belk, Alvin K. Benson, Hal L. Black, David Bos, William S. Bradshaw, S. Kent Brown, Kevin Colver, David H. Ellis, Ann Ellison, Lynn J. England, Jerran T. Flinders, Wilfred C. Griggs, Parry J. Hardin, Richard W. Heninger, Ned C. Hill, Clayton S. Huber, Kent P. Jackson, Duane E. Jeffery, Jayson Lloyd, Thomas ("Ted") Lyon, Brian A. Maurer, Harold L. Miller, Markus Mika, Clark S. Monson, Spencer R. Mortenson, Donald W. Parry, George L. Peterson, W. Revell Phillips, McKay L. Platt, Elder Hugh W. Pinnock, Alan K. Parrish, Morris S. Petersen, Erland D. Peterson, Noel B.

Reynolds, Scott M. Ritter, Tom S. Smith, Phil Snelgrove, Ted Stoddard, Merle Tanner-White, Richard R. Tolman, Benjamin J. Weibell, John W. Welch, Ballard T. White, Scott Woodward, and the many students in the Honor's Colloquia classes, 241-R, "Shaping the Modern Mind"; 221R, "Environment, Society, and Culture"; and Zoology 204, "Animal Diversity." Several others offered significant suggestions and criticisms but asked not to be mentioned because they felt the topic was not their expertise or because they no longer considered themselves "believing" Mormons.

2. John Taylor, February 1, 1874, *Journal of Discourses*, 26 vols. (London and Liverpool: LDS Booksellers Depot, 1855–86), 16:369–70.

3. David Noel Freedman, ed., *Anchor Bible Dictionary*, Vol. 1 (New York: Doubleday, 1992), s.v. "Cosmology." Even assuming a three-tiered world there are other considerations. J. Ronald Galli, former dean of sciences at Weber State University, Ogden, Utah, sent us the following observation (email, February 7, 2007): "1 cubit = 20 inches so 15 cubits = 300 inches = 25 feet. If the entire atmosphere were nothing but water vapor, and if all that vapor were to condense out as water (liquid) and if all the land were at an altitude of sea level, then the water depth over the land and the increased water depth of the oceans, seas, and lakes would be less than 34 feet. This is based on the atmospheric pressure at sea level being 14.7 pounds per square inch. This means that the total quantity of air directly above every square inch of the earth's surface has a weight of only 14.7 pounds. This also means that a 1 square inch column of water 34 feet high would weigh 14.7 pounds. Since the actual amount of water vapor in the atmosphere is less than 1% of all gases, the flood depth from the condensation of all water in the atmosphere would be less than 1 foot."

4. Ed Noort, "The Stories of the Great Flood: Notes on Gen. 6:5–9:17 in Its Context of the Ancient Near East," in *Interpretations of the Flood*, edited by Forentino Garcia Martinez and Gerald P. Luttinhuizen (Leiden, Netherlands: Brill, 1999), 21.

5. Similarly, 1 Enoch 66–67, 83, 89; 2 Enoch 33:12; 3 Enoch 4; Apocalypse of Adam 3:1–7; Testament of Adam 3:5; 2 Baruch 56:15; Hellenistic Synagogal Prayers 12:58–59; Jubilees 5:20–32; Sibylline Oracles 1:230; and the Book of Adam and Eve 49:3.

6. Other early Jewish sources (the Babylonian Talmud and the Mishnah) "construe the Flood essentially as a warning to mankind," reading it "as a literary construction in which word plays and etymological puns" were more indicative of its universal moral content than of historical content. James H. Charlesworth, *The Old Testament Pseudepigrapha* (Garden City, N.Y.:

Doubleday, 1985). These sources contain debates about whether the flood could have covered certain holy places. An interesting example appears in Pseudo-Philo's *Biblical Antiquities*, written sometime around the first century B.C. In chapter 3:3 and 7 this work speaks of the flood in universal terms: "I will blot out man"; "only Noah and those who were with him in the ark survived." But in 7:4, it contains a statement by God to Abraham about the flood and the land of promise: "I will bring him out from their land and will bring him into the land upon which my eye has looked from of old, when all those inhabiting the earth sinned in my sight and I brought the water of the flood and I did not destroy it but preserved that land. For neither did the springs of my wrath burst forth on it, nor did the water of my destruction descend on it." In *ibid.*

7. For a summary of Near Eastern flood myths, see Ewa Wasilewska, *Creation Stories of the Middle East* (London: Jessica Kingsley Press, 2000), 174–84; Norman Cohn, *Noah's Flood: The Genesis Story in Western Thought* (New Haven, Conn.: Yale University Press, 1996). Many biblical scholars believe that the current flood narrative in Genesis is a composite of two earlier Hebrew narratives known as P and J. For a discussion of these two sources, see Norman C. Habel, "The Two Flood Stories in Genesis," in *The Flood Myth*, edited by Alan Dundes (Berkeley: University of California Press, 1988), 13–29; J. David Pleins, *When the Great Abyss Opened* (Oxford, Eng.: Oxford University Press, 2005), 26–30.

Despite these claims to multiple sources, general unifying features in the narrative allow us to approach the flood story as a single narrative. Many mainstream biblical scholars believe the P and J flood narratives to be derived from Mesopotamian mythologies which contain flood narratives. The earliest flood narratives were apparently first written by the Sumerians, the most famous being the myth of Gilgamesh. Alfred L. Kroeber, *Anthropology: Race, Language, Culture, Psychology, Prehistory* (New York: Harcourt, Brace, and World, 1948), gives a brief overview of the flood legends in various cultures and religions. The variety of stories and variations on them are not wholly comparable, especially in a spatial context. Additionally, most cultures also have stories of volcanic eruptions, earthquakes, fires, and other natural phenomena they did not necessarily understand and to which they attached spiritual, divine, or religious meaning. Symbolism is common throughout such stories. For example, Folki, the great Viking sailor of the ninth century, found Iceland, so the story goes, by sending up a raven from the ship to lead him there. Daniel J. Boorstin, *The Discoverers* (New York: Random House, 1983), 217. The raven was, of course, as symbolic to the Vikings as the dove and olive

tree were symbolic in biblical times; interestingly, Noah also used a raven as the first messenger released.

Some have argued from geological and geophysical data that the Black Sea resulted from a flood from the Mediterranean Sea around 5600 B.C., possibly accounting for the story in that part of the world. Don McInnis, "And the Waters Prevailed," *Earth* 7 (August 1998): 46–54, compares and relates the Genesis account and older Babylonian epic of Gilgamesh to the events surrounding the formation of the Black Sea. These events are well described by William Ryan and Walter Pitman, *Noah's Flood: The New Scientific Discoveries about the Event that Changed History* (New York: Simon and Schuster, 1998) and Pleins, *When the Great Abyss Opened*, 3–14. A recent essay with an analysis of the Black Sea hypothesis relevant to the Noah story is Jeffery, "Noah's Flood: Modern Scholarship and Mormon Tradition." See also the computer model that matches the geological data for the Black Sea phenomena in Mark Siddall, "Noah's Flood," *Nature*, August 2004, 718–19.

Cultural evidence suggests that the flood was not universally known. For example, Egypt has had a continuously written record during the time frame suggested for Noah, but does not mention the flood. Since the invention of the wheel around 3400 B.C. near the Black Sea, there has been a rather continuous historical record for that region as well, Trevor Williams, *The History of Invention* (New York: Facts on File/Equinox, 1989). These cultures do not speak of a flood that killed all living creatures. Josephus quotes an account by Nicolaus of Damascus about the large mountain in Armenia onto which many people (not just one family) fled to escape the flood. William Whiston, trans., *Josephus' Antiquities of the Jews*, 2d printing (Grand Rapids, Mich.: Kregel Publ., 1963), 27–30. Joshua 24:2, comments: "Your fathers dwelt on the other side of the flood . . . even Terah, the father of Abraham." Although interpretations vary, most biblical scholars consider "flood" in this context to mean a river. S. Kent Brown, personal verbal communication.

Early Native Americans (First Nation people) in the western United States could have included a flood story in their mythology. An estimated 12,700 years ago, the 600-cubic mile Pleistocene glacial Lake Missoula breached its dam formed across Clark Fork Valley and discharged at least 484 million cubic feet per second, scouring what is now the channeled scabland of eastern Washington. Native peoples in the Great Basin 14,000 years ago would also have witnessed Lake Bonneville overflowing the barrier at Red Rock Pass (near present-day McCammon, Idaho) and passing through the Snake River, in some places 400 feet deep at the estimated rate of 33,018,000 feet per second. Donald K. Grayson, *The Desert's Past: A Natural Prehistory of*

the Great Basin (Washington, D.C: Smithsonian Institution Press, 1993), 90–91.

8. Ephraim A. Speiser, *Anchor Bible: Genesis* (Garden City, N.Y.: Doubleday, 1964), 45.

9. In Moses 8:14, the “sons of men” took their own daughters incestuously as wives; God resolved, “If men do not repent, I will send in the floods upon them” (v. 17). There were also “giants on the earth” who sought to kill Noah (Moses 8:18). When the children of men would not repent, they came to Noah claiming “we are the sons of God”; and because they were overconfident of their powers as mortals, eating, drinking, and procreating, they refused to listen to Noah (v. 21); and for their continuous wickedness, corruption and violence, and because they sought Noah’s life (vv. 22, 26, 29–30), they were eventually destroyed.

10. Bruce R. McConkie, *Mormon Doctrine*, 2d ed. (Salt Lake City: Bookcraft, 1966), 289.

11. John A. Widtsoe, *Evidences and Reconciliation: Aids to Faith in a Modern Day*, Vol. 1 (Salt Lake City: Bookcraft, 1943), 109–12, and “Did the Waters of the Flood Cover the Highest Mountains of Earth?” *Improvement Era*, June 1940, 353. See also Widtsoe’s discussion of the importance of science and facts as a fundamental paradigm of science and how they interface with faith in the discipline of religion. As he remarks, “Science is knowledge. . . . The sum of human experience is the sum of scientific knowledge.” Widtsoe, *In Search of Truth: Comments on the Gospel and Modern Thought* (Salt Lake City: Deseret Book, 1930), 17–18; Alan K. Parrish, *John A. Widtsoe: A Biography* (Salt Lake City: Deseret Book, 2003), 366–73.

12. Widtsoe, *Evidences and Reconciliation*, 109–12.

13. *Ibid.*

14. Morris S. Petersen, “Earth,” *Encyclopedia of Mormonism* (New York: Macmillan Publishing, 1992), 2:432; Andrew C. Skinner, “Noah,” *ibid.*, 3:1016–17.

15. Interestingly, nearly twenty years before Widtsoe’s comments, Frederick J. Pack, also a scientist, a member of the general Sunday School superintendency, and a member of Apostle Anthony W. Ivins’s prayer circle, wrote *Science and Belief in God* (Salt Lake City: Deseret News Press, 1924), in which he reached the same conclusion that Widtsoe and we did (see pp. 212–15, 220–21), although Pack did not use the sorts of data we did.

16. Rienk Vermij, “The Flood and the Scientific Revolution: Thomas Burnet’s System, of Natural Providence,” in *Interpretations of the Flood*, edited by Martinez and Luttikhuisen, 150–66. For further interpretations of the

flood, see Charlesworth, *The Old Testament Pseudepigrapha*; Cohn, *Noah's Flood*; Jack P. Lewis, *A Study of the Interpretations of Noah and the Flood in Jewish and Christian Literature* (Leiden, Netherlands: Brill, 1986); and Pleins, *When the Great Abyss Opened*. There were questions about the accuracy of the flood story as early as 1660 and into the early eighteenth century, a period known as the Age of Enlightenment. Alfred Newton, Robert Boyle, Edmund Halley, and William Dampier, for example, were scientists of the time. Readers wrote to the *Athenian Gazette* with such questions as what became of the water after the flood. John Lindsay, *The Monster City: Defoe's London, 1688–1730* (London: Granada, 1978), 87–89; and Diana and Michael Preston, *A Pirate of Exquisite Mind: Explorer, Naturalist, and Buccaneer—The Life of William Dampier* (New York: Walker and Company, 2004), 232–33.

17. Pleins, *When the Great Abyss Opened*, 55–94, engages geology, paleontology, mathematics, and other hard sciences and disciplines, but does not mention biogeography or biodiversity. Timing becomes especially important to the Latter-day Saints because the standard scriptures have simply adopted traditional dating systems. “For the earliest parts of the O.T. history we rely entirely on the scripture itself; but . . . many dates cannot be fixed with certainty,” according to the “Chronology” in the “LDS Bible Dictionary,” LDS edition (1979, 1987 printing) of the King James Bible, 635–36. The standard view is that this event occurred roughly 2350 B.C. However, that date and the flood’s timing was based on traditions coming from the 1650s. The calculations are by Archbishop James Ussher of the Church of Ireland, and some of his dates “have been shown to be incorrect.” “LDS Bible Dictionary.”

18. This figure assumes that 0.009 percent of all the birds were “not clean.”

19. Estimates of Earth’s species range as high as 10 million (100 million, by some liberal estimates), of which a vast number are aquatic and certainly microscopic. We have estimated a rather conservative 1.5 million (about the number presently named or “known”) as those necessary for Noah to save in the ark.

20. James R. Christianson, *Noah, the Ark, the Flood: A Pondered Perspective* (Salt Lake City: Randall Book, 1986), 47–48.

21. Pat V. Rich and E. M. Thompson, *The Fossil Vertebrate Record of Australia* (Victoria, Australia: Monash University Offset, 1988).

22. Harry Reicher, D. Lunney, and I. Dunn, *The Natural Legacy Ecology of Australia* (New York: Pergamon, 1979), 147.

23. Ronald Straham, ed. *The Australian Museum Complete Book of Australian Mammals* (Sydney: Angus and Robertson, 1983), 112–13.

24. Tim F. Flannery, *The Future Eaters: An Ecological History of the Australian Lands and People* (Chatswood, New South Wales: Reed Books, 1996), 108–16; and Peter Tyson, *The Eighth Continent: Life, Death and Discovery in the Lost World of Madagascar* (Scranton, Penn.: HarperCollins, 2001), xv–xx.

25. Sherwin Carlquist, *Island Life: A Natural History of the Islands of the World* (New York: American Museum of Natural History, 1965); James Farmer, personal verbal communication.

26. Francis G. Howarth and William P. Mull, *Hawaiian Insects and Their Kin* (Honolulu: University of Hawaii Press, 1992), 28–29, 47; Philip Bruner, professor of biology, BYU-Hawai'i, personal verbal communication.

27. James E. Deacon and Cindy D. Williams, "Ash Meadows and the Legacy of the Devil's Hole Pupfish," in *Battle against Extinction: Native Fish Management in the American West*, edited by William L. Minkley and James E. Deacon (Tucson: University of Arizona Press, 1991), 69–87.

28. Horton H. Hobbs, "Crayfish Distribution, Adaptive Radiation and Evolution," in *Freshwater Crayfish: Biology, Management and Exploitation*, edited by David M. Holdich and Roger S. Lowery (London: Croom Helm, 1988), 57–82.

29. Stephen C. Ayala, Calvin Johnson, Beth Morris, Brian Rooney, Anna Stuart, and Barry Woodhull, "A Colony of Giant Andean Earthworms," *Bioscience* 22 (May 1972): 299–301.

30. Jared Diamond, *Guns, Germs, and Steel: The Fate of Human Societies* (New York: W. W. Norton, 1997); Gary Taubes, "The Cold Warriors," *Discover* 20, no. 2 (February 1999): 40–50.

31. Ronald M. Nowak, *Walker's Mammals of the World*, 5th ed., 2 vols. (Baltimore: Johns Hopkins University Press, 1991), 1:515–21.

32. J. Del Hoyo, A. Elliott, and J. Sargatal, eds., *The Handbook of the Birds of the World*, 11 vols. to date (Barcelona: Lynx Ediciones, 1999), 5:468–680.

33. D. R. Curry, "An Ancient Bristlecone Pine Stand in Eastern Nevada," *Ecology* 46, no. 4 (July 1965): 564–66.

34. Blaine Furness, Department of Botany, Brigham Young University, personal verbal communications.

35. We approach the Noah flood story in terms of the distribution of animals that are now (though not necessarily recently) extinct, an approach elaborated by Janet Browne, *The Secular Ark: Studies in the History of Biogeography* (New Haven, Conn.: Yale University Press, 1983). Many other paradigms should be expected. Events such as the volcanic explosion of Mount St. Helens, Krakatoa, or Tambora help us understand how fast "new"

land may be occupied when life already exists nearby but reveal little more about the pattern. We cannot predict how human movement over the Earth's surface might proceed nor how the artificial transport of animals might be reflected. It is clear, however, that certain sorts of organisms either would or would not be transported by humans. The discipline of biogeography provides literally thousands of examples, if not millions depending on how finely we divide the examples, relative to the distribution of organisms such as those given in the text. Such examples are so extensive that a simple list would fill a very large book indeed. David Quammen, *The Song of the Dodo* (New York: Scribner, 1996), only briefly touched on the topic, yet reported a seventeen-pound pile of reprints on his desk with another forty to fifty pounds of related literature in his files. We have used only a few statements to indicate a diversity of patterns. Most of this information can be found in any college biology or ecology text and therefore needs no supporting references. We have avoided using examples that rely on radiocarbon or other dating methods. Such methods produce an entirely different data set that would require a good deal of background knowledge, and some people who might read this article are not entirely comfortable with the methodology anyway.

36. First Presidency, "Christmas Message," *Desert Evening News*, December 17, 1910, Pt. 1, p. 3. Smith's counselors were then Anthon H. Lund and John Henry Smith.

37. John A. Widtsoe, comp. and ed., *Discourses of Brigham Young* (Salt Lake City: Deseret Book, 1925), 251, 258; emphasis ours.

38. Brigham Young, May 14, 1871, *Journal of Discourses*, 26 vols. (London and Liverpool: LDS Booksellers Depot, 1855–86), 14:115–16; emphasis ours.

39. We think it important to understand Noah's role as a prophet of God. But at the same time, we hope readers will equally understand that the patterns and locations of the distribution of life on Earth are just as important to accurately understand as, say, why medicines work on diseases, why disease micro-organisms mutate into resistant strains so rapidly under the selection pressures of chemical medicines, why genes affect the development of embryos, why the moon has a full, waning, new, and waxing cycle, why the water we drink or air we breathe is made available through cycles, why global climates are all interrelated, and so forth. An understanding of these processes, however, is not a part of our scriptural heritage.

40. Fergus M. Bordewich, *Bound for Canaan: The Underground Railroad and the War for the Soul of America* (New York: HarperCollins, 2005), argues that the entire fight for abolition was fueled by religious values.