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Abstract Review of *Losing a Lost Tribe: Native Americans, DNA, and the Mormon Church*, by Simon G. Southerton.

Missing the Boat to Ancient America . . . Just Plain Missing the Boat

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> "Is there any conflict between science and religion?" There is no conflict in the mind of God, but often there is conflict in the minds of men.
>
> Henry Eyring[1]

According to a widely circulated media piece, "Plant geneticist Simon Southerton was a Mormon bishop in Brisbane, Australia, when he woke up the morning of Aug. 3, 1998, to the shattering conclusion that his knowledge of science made it impossible for him to believe any longer in the Book of Mormon."[2] He now claims that the Book of Mormon is strictly a fictitious invention composed and orchestrated by Joseph Smith—with no inspiration, no angels, no revelation (he remains silent about Joseph's motives). However, Southerton strives to explain the scientific rationale supporting his feelings (although,

1. Henry Eyring, *Reflections of a Scientist* (Salt Lake City: Deseret Book, 1983, 1998 pagination), 2.

2. Patty Henetz, "LDS Scholarship Revising Doctrine in Light of DNA Research," *Salt Lake Tribune*, 24 July 2004.

Review of Simon G. Southerton. *Losing a Lost Tribe: Native Americans, DNA, and the Mormon Church*. Salt Lake City: Signature Books, 2005. xvi + 207 pp., with index and appendix. $24.95.

incidentally, individuals belonging to the Church of Jesus Christ of Latter-day Saints are criticized for using their feelings as a criteria of belief; pp. 44–45). He draws heavily on current population genetics data of Native Americans and Polynesians, specifically mitochondrial DNA (mtDNA) and Y chromosome information, which he insists indicates an Asian, as opposed to an ancient Near Eastern origin for these groups. In addition, he proposes that Latter-day Saint scholars, particularly those associated with the Foundation for Ancient Research and Mormon Studies (FARMS), are attempting to alter what he considers official church views that Native Americans and Polynesians are exclusively descendants of those groups described in the Book of Mormon. He argues that the Latter-day Saint view of Native American ancestry is being changed not by revelation but by contemporary research.

Background behind the Claim

The biological blueprints of life are archived in the nucleus of every human cell. This information is written in the simple four-letter genetic alphabet: G, A, T, and C. The mere presence of these instructions indicates a passage through numerous generations for a very long time. It is the divinely sculptured biological inheritance of the human family. Most of the arguments made by Southerton involve two unique archives of information, the Y chromosome, which is inherited exclusively through the father (paternal inheritance), and mtDNA, which is transferred solely through the mother's ovum (maternal inheritance) (fig. 1).

By analogy, the nuclear archive holds the approximate information content of about fifty sets of encyclopedias, while mtDNA holds as little as ten pages of instructions (fig. 2). Literally spelled out with the four genetic letters is a "biochemical" paternal name in the Y chromosome and a "biochemical" maternal name in mtDNA. These names have the potential to persist through many generations because they are not shuffled or altered like nuclear DNA. This shuffling of nuclear information accounts for the endless variety of individuals seen everywhere. In fact, a maternal mtDNA name may retain the same spelling for as many

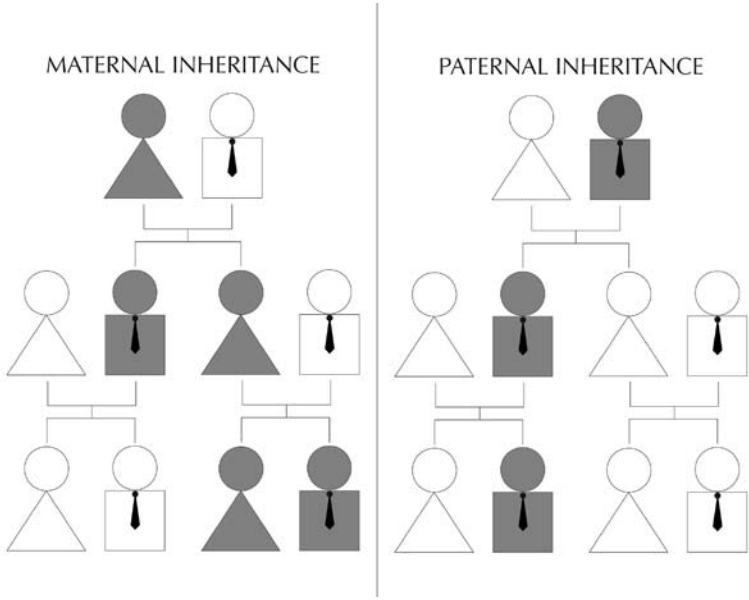

Figure 1. The gray shading follows the maternal inheritance patterns of mtDNA and the paternal inheritance pattern of the Y chromosome. Both a son and daughter receive their mtDNA from their mother, but only the daughter can pass it to the next generation. Y chromosome inheritance follows a father-to-son only pattern.

as 33 generations or 825 years;[3] however, it is also important to realize that this spelling can change through mutation within as little as one generation. In general, the Y chromosome will accrue one difference, at any given marker, every 1,450 generations, or 36,250 years.[4] The term *haplogroup* refers to a cluster of related names with subtle differences in spelling. There are generally five Native American mtDNA haplogroups,

3. Thomas J. Parsons et al., "A High Observed Substitution Rate in the Human Mitochondrial DNA Control Region," *Nature Genetics* 4/15 (1997): 364.

4. Lev A. Zhivotovsky et al., "The Effective Mutation Rate at Y Chromosome Short Tandem Repeats, with Application to Human Population-Divergence Time," *American Journal of Human Genetics* 74 (2004): 54–55. The mutation rate at a Y chromosome "DNA finer print" locus, or the specific address on a chromosome, is estimated at 6.9×10^{-4} mutation events every generation (or every 25 years). This means it takes 1,450 generations or 36,250 years for a change to occur; however, a Y chromosome has many different fingerprint addresses. This means if we look at 10 different fingerprints we would expect to see a change at one of these every 3,625 years.

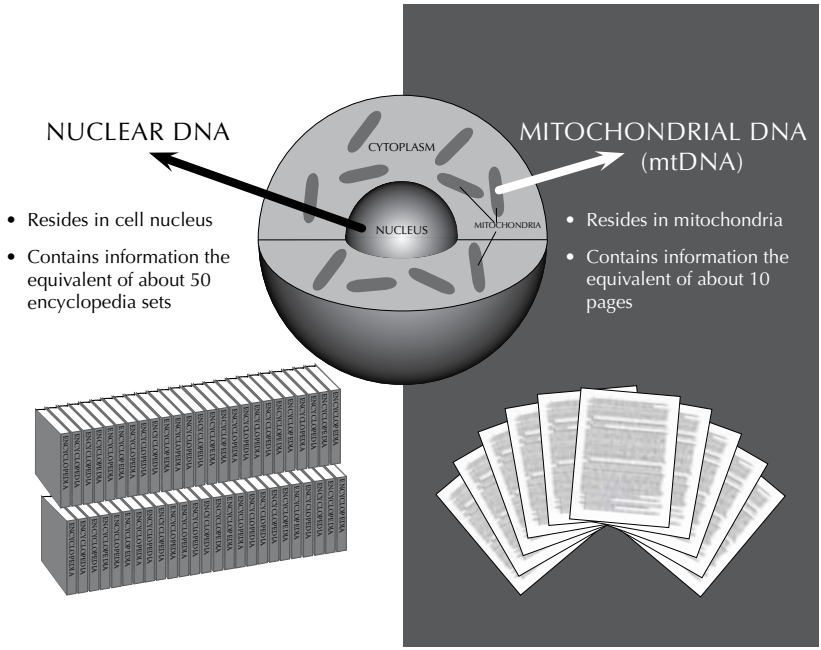

Figure 2. The information content between nuclear and mtDNA is vastly different. Mitochondrial DNA has 0.0005% that of the nucleus.

or biochemical maternal names: A, B, C, D, and X. Importantly, there are limitations to the persistence of these names. Ordinarily, each name must be selected by a random biological lottery from generation to generation. Statistically, this is known as "coalescence."[5] For example, mothers pass their mtDNA name, or haplotype, on to their sons and daughters; however, only daughters hold the potential to further perpetuate this name by having their own daughters. The same is true of the Y chromosome, which persists through generations by father-to-son transmission. Yet this biological process can be final—if there is a generation or family with a minimal number of children (what is known as a genetic bottleneck), then these names may quickly be erased by nature. If no children are born, for example, then these names are extin-

5. John C. Avise and R. C. Vrijenhoek, "Mode of Inheritance and Variation of Mitochondrial DNA in Hybrido-genetic Fishes of the Genus *Poeciliopsis*," *Molecular Biology and Evolution* 4 (1987): 514–25.

guished. Indeed, over time, the fate of most Y and mtDNA lineages is extinction through coalescence (fig. 3).[6]

Southerton contends that since Native Americans do not have Y chromosome and mtDNA names indicative of ancient Near Eastern ancestry, the Book of Mormon cannot possibly be true.

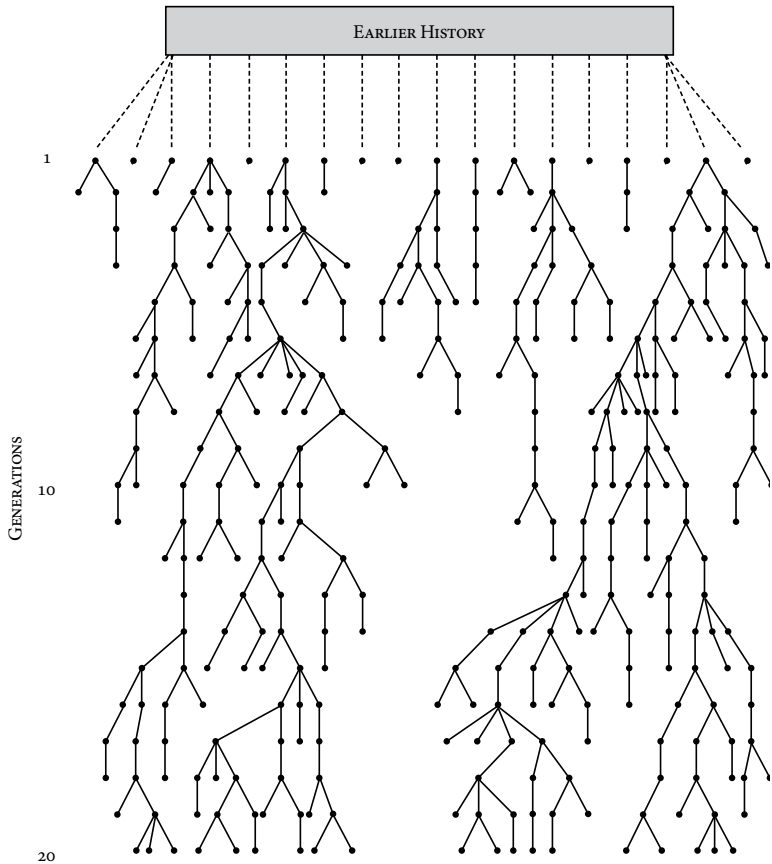

Figure 3. In general, if eighteen unique mtDNA, or Y chromosome "names" are followed through time, by the twentieth generation, only two names will have survived. John C. Avise, Molecular Markers, Natural History, and Evolution, *2nd ed. (Sunderland, MA: Sinauer, 2004), 144 fig. 4.9.*

6. John C. Avise, *Molecular Markers, Natural History, and Evolution*, 2nd ed. (Sunderland, MA: Sinauer, 2004), 144–45.

Limitations of the Science

Southerton has done a reasonable job of summarizing the current data set describing Native American haplotype/haplogroup frequencies of mtDNA and Y chromosomes; however, the obvious difficulty is the clear and persistent insistence that these data are an accurate archive of all past population histories in the Americas. This is an unrealistic and vast simplification of population dynamics. Specifically, the difficulty and reliability of genetically characterizing past populations in detail has been noted: "There are, however, many complex possible histories of subdivision, population growth, and bottlenecks, and we can hope to understand the consequences of different histories only in the most general way."[7] Others have expressed similar views: "Biologists must necessarily view with caution estimates of prehistorical population sizes estimated from data drawn only from genetic diversity studies of modern populations, since the same result can be theoretically explained by multiple evolutionary scenarios."[8] The specifics of population dynamics are frequently obscured through time. For example, genetic characterization of Native American populations currently suggests one migration or wave of individuals from Asia into the New World.[9] Genes move with their hosts; however, based on chance (coalescence) and selection, which has recently been documented for mitochondrial haplotypes, this genetic heritage changes in frequency in different populations. One needs only to survey the data in appendix B of Southerton's book (pp. 211–22) to understand this process. Many distinct histories are seen here. The absence of one or more haplogroups within these groups or tribes is not unusual. Some populations are essentially fixed or are characterized by one haplogroup, while others have varying frequencies of all five mtDNA groups. Absence of a haplogroup in any of these populations cannot

7. H. C. Harpending, S. T. Sherry, and A. R. Rogers, "The Genetic Structure of Ancient Human Populations," *Current Anthropology* 34 (1993): 494.

8. Rebecca L. Cann and J. Koji Lum, "Dispersal Ghosts in Oceania," *American Journal of Human Biology* 16 (2004): 447.

9. Ripan S. Malhi et al., "The Structure of Diversity within New World Mitochondrial DNA Haplogroups: Implications for the Prehistory of North America," *American Journal of Human Genetics* 70 (2002): 905.

be taken as evidence that it was not present at some time in the past. Past events responsible for these current genetic frequencies are not always possible to understand. The very processes that could obscure genetic signatures from the ancient Near East are readily operative in the data used by Southerton to refute the Book of Mormon. And this applies to the Y chromosome as well. Recent work attempting to reconstruct the migration and movements of men in Africa is also a complex process that cannot be fully understood except in the generalities suggested by modern Y chromosome frequencies.[10]

It is not difficult to imagine a multiple millennial stroll across the Bering land bridge, mostly because this idea is part of the "contemporary wisdom" that anthropologists have professed and to which they have adhered for some time; however, the associated archaeological clues do not offer the requisite breadth and detail to reconstruct more than broad generalities of this ancient process. The same is true of the genetic data. Although current Native American populations have Y chromosome and mtDNA paternal and maternal names that are Asian, there is no record of those maternal and paternal haplotypes lost in antiquity. Selection and haplotype extinction are ancient and ongoing processes; ancient and modern frequencies may be quite distinct.[11] In a historical sense, migratory groups, such as those crossing Beringia, are small and likely kin-associated.[12] In the absence of gene flow from other small populations, fixation could occur rapidly. Indeed, haplotype extinction is extremely likely. It is probable that through this process some haplotypes were lost, some persisted, and yet perhaps some unique haplotypes arose. Statements such as "The question of whether or not Jews or members of the Ten Lost Tribes anciently found their way to the New World is susceptible to examination using DNA technology" (p. 118) indicate an ignorance of the

10. For example, see Fulvio Cruciani et al., "A Back Migration from Asia to Sub-Saharan Africa Is Supported by High-Resolution Analysis of Human Y-Chromosome Haplotypes," *American Journal of Human Genetics* 70 (2002): 1197–214.

11. Ryan Parr, "Molecular Genetic Analysis of the Great Salt Lake Wetlands Fremont" (PhD diss., University of Utah, 1998), 18–35.

12. W. Y. Adams, D. P. VanGerven, and R. S. Levy, "The Retreat from Migration," *Annual Review of Anthropology* 7 (1978): 488.

complexities of population dynamics. Such an effort, at its best, requires the comparison of archaeologically well-defined ancient populations in an archaeological context representative of the groups intended for comparison. In instances in which comparative ancient and contemporary data exist, specific and detailed conclusions are often difficult to construct. For example, much work has been done in the American Southwest toward a general reconstruction of ancient haplogroup frequencies, using both modern and ancient data. These studies demonstrate continuity in pre-Columbian haplogroup patterns in North America as far back as the time of Christ; however, patterns before this date are uncertain.[13] In addition, attempts to address archaeological issues with comparative DNA work have had some success. Movements of Numic speakers, beginning around the time of Christ, from what is now known as Death Valley, California, into the Great Basin and areas northward, explain the distribution of ancient and contemporary haplogroup frequencies in this area; still, these efforts are justifiably tempered with terms such as *probable, suggestive,* and *consistent with*.[14] This caution is understandable since specific, representative population data is difficult to obtain in these circumstances. Such movements occur over relatively long periods of time, over large areas within which subtle stochastic forces are operational. Moreover, in the instance of the Numic migration, some have questioned the reality of the temporal, spatial "pottery trail" and the pottery forms used to define this movement from an archaeological perspective.[15]

13. Malhi et al., "Structure of Diversity," 906, and references therein.

14. Frederika Kaestle and David G. Smith, "Ancient Mitochondrial DNA Evidence for Prehistoric Population Movement: The Numic Expansion," *American Journal of Physical Anthropology* 115 (2001): 8, and references in the article.

15. See S. R. Simms, "Unpacking the Numic Spread," in *Across the West: Human Population Movement and the Expansion of the Numa,* ed. David B. Madsen and David Rhode (Salt Lake City: University of Utah Press, 1994), 76–83; D. K. Grayson, "Chronology, Glottochronology, and Numic Expansion," in *Across the West,* 20–23; S. R. Simms, "Farmers, Foragers, and Adaptive Diversity: The Great Salt Lake Wetlands Project," in *Prehistoric Lifeways in the Great Basin Wetlands: Biological Reconstruction and Interpretation,* ed. Brian E. Hemphill and Clark S. Larsen (Salt Lake City: University of Utah Press, 1999), 21–54.

Distribution, burial patterns, time intervals, preservation, and the cultural context of ancient human remains are not always clear. In addition, the ideal of obtaining samples from a continuous biological breeding population is rarely, if ever, met; however, consistent provenance, reliable dating methods, and proper archaeological context indicate that the sample set is representative of the intended population. Once this information is ensured, an arduous and lengthy task remains to extract accurate and meaningful information from ancient human remains. Only those experienced with ancient DNA analyses appreciate these challenges.[16]

From the Ancient Near East to Mesoamerica

Members of the Church of Jesus Christ do not read the Book of Mormon for nuances and echoes of population demographics and population genetics. To do so would be like reading the Sermon on the Mount with a concern for the exact date and location of the event and the ethnic composition of the audience but without any regard for its wisdom for society. The Book of Mormon is read, studied, prayed about, and taught for its instructions and insights on the journey to a Christlike life, centered in service and concern for others. Like the Old and New Testaments, the purpose of the Book of Mormon is to serve as a witness for Christ. For the most part, the Book of Mormon follows the ecclesiastical and secular history of Lehi and his family, who left Jerusalem prior to the Babylonian conquest of Judea in 587 BC.[17] Living one thousand years after the arrival of Lehi's party, Mormon, as final editor of the records, was not primarily interested in the population dynamics during that entire period. Gregor Mendel is nearly fifteen hundred years in the future, as are James Watson and Francis Crick. Anyone who has read the Book of Mormon account can readily understand Mormon's concern and preoccupation with other issues. What we consider important, here and now, was unknown to the ancients.

16. Frederika A. Kaestle and K. Ann Horsburgh, "Ancient DNA in Anthropology," *Yearbook of Physical Anthropology* 45 (2002): 92–130.

17. John Bright, *A History of Israel,* 3rd ed. (Philadelphia: Westminster, 1981), 330.

Lehi's group was relatively small and perhaps closely kin-associated. It is possible, based on some attested Old Testament associations, that Ishmael was related in some way to either Lehi or his wife Sariah.[18] In addition, there was limited genetic diversity within this association, with a maximum of four mitochondrial lineages if the families were maternally unrelated (Sariah, Ishmael's wife, and the wives of two of Ishmael's sons). Moreover, Zoram, Ishmael, and Lehi represent at least three Y chromosome types within this small gene pool, assuming that Lehi and Ishmael were paternally unrelated (1 Nephi 5:14; 6:1–2; 2 Nephi 3:4; Alma 10:3). When this small group of immigrants disembarked in approximately 589 BC in what is believed by many Book of Mormon scholars to be Mesoamerica, the geographical and genetic circumstances were dramatically different from those of the ancient Near East. An immediate limitation may well have been the imported mitochondrial genetics of the ancient Near East. Mitochondria are vital cellular components because they generate the fuel that fires metabolism. Moreover, mitochondria work in concert with a subset of the major archive of genetic information in the nucleus to accomplish this task. It is likely that biological selection operates for or against specific types of mitochondria, based on the specific haplotype. Recently, mitochondrial haplotype selection based on climate has been demonstrated.[19] This natural elimination of "foreign" mtDNA haplotypes would accelerate mtDNA coalescence. In addition, this would increase the loss of Y haplotypes in males with mtDNA at a selective disadvantage. Once a specific haplotype is lost, it leaves no record of ever having existed. This presents yet another difficulty for those expecting Native Americans to appear, from a genetic sense, as ancient Near Eastern populations since the genetic characteristics of these ancient Near Eastern populations remain unknown. Moreover, small kin-associated groups, without outside genetic contribution, digress to extinction because recessive, disease-associated genes become prevalent in the population. An

18. For example, Abraham insisted that his son, Isaac, marry a relative. Isaac married his paternal cousin, Rebekah (Genesis 24). Likewise, Isaac's son Jacob married two cousins, Rachel and Leah (Genesis 29).

19. Eduardo Ruinz-Pesini, Dan Mishnar, Martin Brandon, Vincent Procaccio, and Douglas C. Wallace, "Effects of Purifying and Adaptive Selection on Regional Variation in Human Mitochondrial DNA," *Science* 303 (2004): 225.

additional challenge is the extensive peopling of Mesoamerica, attesting to large populations that ancient Near Eastern genetics would have to displace to reach a detectable frequency. These estimates top off at 25 million in Central America at the beginning of the fifteenth century (p. 84).[20] Numerous serial migrations from the ancient Near East may be necessary to enforce a genetic presence.[21] Interestingly, Southerton quotes the following: "religions spread more by conversion than by the sword" (p. 118). This philosophy parallels very closely many details from the Book of Mormon. There are many instances of attempts to reclaim dissenters or to convert Lamanites and Nephites throughout the account. These efforts are widespread. Some attempts are very successful (for example, Alma 23:8–13), while others fail (for example, Jacob 7:24). It is not difficult to see how Lehi's posterity could become numerous and prosper, based not on genetic association but rather on religious affiliation.

There are other practical limitations as well. For example, in the mortuary population of Kellis, a Romano-Byzantine-Coptic Christian site in the Dakhleh Oasis of southwest Egypt, insight into the mortality rate of ancient populations is well illustrated. The inhabitants of ancient Kellis buried all human remains, even fetuses. The cemetery associated with Kellis may hold as many as three thousand burials. The paleodemography of 378 of them indicates a prereproductive mortality of 63 percent.[22] A group's arrival in a foreign land in relatively small numbers and perhaps at a selective disadvantage reduces the probability that its ancient Near Eastern mitochondrial and Y chromosome types will ever be recognized in large indigenous populations twenty-six hundred years later. Moreover, the practice of polygamy is precluded early in the Book of Mormon record (Jacob 2:27). Y chromosomes do not have a polygamy-driven advantage leading to the concentrated paternal genealogies recorded in some Old Testament records (e.g., 1 Chronicles 1–9).

20. Michael H. Crawford, *The Origins of Native Americans: Evidence from Anthropological Genetics* (New York: Cambridge University Press, 1998).

21. Cann and Lum, "Dispersal Ghosts in Oceania," 441.

22. J. Eldon Molto, "Bio-archaeological Research of Kellis 2: An Overview," in *Dakhleh Oasis Project: Preliminary Reports on the 1994–1995 to 1998–1999 Field Seasons,* ed. Colin A. Hope and Gillian E. Brown (Oxford: Oxbow Books, 2002), 238–55.

The fate of most individuals and events is lost through time. For example, the presence of the children of Israel in Egypt is not found in Egyptian records. Indeed, an event such as the exodus and the national repercussions for Egypt, as described in the book of Exodus, would surely have been noted. However, there is little evidence from archaeology other than a boundary stela erected by Merenptah, the elderly son of Ramses II (Ramses II is considered by many to be the pharaoh of the exodus of the children of Israel from Egypt, as recorded in the book of Exodus), which mentions Israel only as a political entity.[23] Genetic evidence of Israel's four hundred years in Egypt remains to be uncovered.

Limitations of "Genetic Genealogy" in General

The three great patriarchs of the Old Testament—Abraham, Isaac, and Jacob—were promised extensive posterity and that "in thy seed shall all the nations of the earth be blessed" (see Genesis 22:17–19; 26:4; 28:14). Perhaps this refers to an ideological/theological belief. The Abrahamic covenant is not driven by genetics—that would simply not be possible. Specific nuclear DNA finding its way through time from any one of these progenitors to any descendent of today is extremely unlikely from a biological perspective. The "Law of Increasingly Irrelevant Remote Ancestors" provides an explanation:

> All of the long-settled families of the Alsace region of France invariably include heroic Charlemagne of eighth century in their genealogical trees. Charlemagne, who was king of the Franks, later became emperor of all the Romans. Similarly, all the Japanese families of the Genji lineage include emperor Seiwa of [the] ninth century as the most illustrious ancestor in their genealogies, whereas another emperor, Kanmu of eighth century, plays the same role in the genealogical trees of those belonging to the Heike lineage. Such a genealogical claim has traditionally been dismissed outright as an absurd fantasy

23. Gaalyah Cornfeld, *Archaeology of the Bible: Book by Book* (Peabody, MA: Hendrickson, 1989), 35.

> borne of a wishful delusion. Quite to the contrary, this study reveals that unlike the N_e [those individuals contributing genes to the following generation] of population genetics, the number of ancestors at the AN SA generation [generation in the past at which all adults become ancestral] was very large, probably numbering in the millions, and the ancestors of the AN SA and all generations previous to the AN SA included all progeny-produced adults of the entire ancestral population. It follows that among them had to be all the local kings of the times. Not to be forgotten, however, are other ancestors of the times, for also included in the ancestry were murderers, thieves, embezzlers, prostitutes, and all other social misfits of the times.
>
> The expression of "diluted blood" is frequently used to lament the ineptness of a descendant in comparison with his or her illustrious, but remote, ancestor. Indeed, as one's ancestors fade into the remote past, there is an ever-increasing chance that they have become totally irrelevant in the genetic sense in that they left no trace in the genome of their descendants of today.[24]

Increasing ancestral time depth means increasingly remote chances of having any trace of specific ancestral genetics. Recent Y chromosome characterization of male Cohen Jews (those responsible for traditional priestly duties), of both Ashkenazic and Sephardic descent, indicate that 50 percent share specific Y chromosome markers, indicating paternal clustering of half the males in these groups; however, the remaining 50 percent do not have these markers.[25] Does this imply that these individuals are not Cohen Jews and should therefore be precluded from their traditional duties? Of course not! Yet the data remains—some of the children of Abraham are characterized as genetic outliers if specific

24. Susumu Ohno, "The Malthusian Parameter of Ascents: What Prevents the Exponential Increase of One's Ancestors?" *Proceedings of the National Academy of Sciences* 93 (1996): 15278.

25. Mark G. Thomas et al., "A Genetic Date for the Origin of Old Testament Priests," *Nature* 394 (1998): 138–40.

molecular definitions are enforced. This is where the Israelite-like-DNA reasoning becomes absurd. To complete the ideal direct-descent Hebrew lineage for those demanding strict religious and genetic associations, these individuals should also retain the correct mitochondrial DNA haplotype, as well as definitive nuclear DNA "fingerprints," a process demanding strict inbreeding and resulting in "genetic suicide" through the concentration of recessive alleles.

The biological process of descent indicates that the presence of genetic markers is not particularly indicative of the history of the children of Abraham. For example, "Jewish populations have clearly been through significant bottlenecks in their history. However, their strong genetic ties to European populations are readily apparent" (p. 124).[26] Genetic bottlenecks result in the extinction of genetic markers and the loss of genetic distinctiveness. Curiously, critics like Southerton deny this well-attested process of lost genetic diversity to small groups of immigrants from ancient Israel to Mesoamerica.

One group of Jewish migrants who seem to be currently winning the genetic lottery is the African Lemba.[27] Southerton cites this example as his expected outcome for Lehi and others. However, the process of genetic drift and Y chromosome coalescence is underway; 30 percent of Lemba males are African in paternity, indistinguishable from encompassing Bantu populations. Moreover, the Lemba are African in appearance. Given greater time depth, genetic integration may be complete and all traces of Israelite paternity lost. Yet again, this process is denied Lehi's "descendants" by Southerton.

The ability to genetically identify these groups, such as the Lemba, may be indicative of many movements of small populations or kin-

26. Mark G. Thomas et al., "Founding Mothers of Jewish Communities: Geographically Separated Jewish Groups Were Independently Founded by Very Few Female Ancestors," *American Journal of Human Genetics* 70 (2002): 1411–20; M. Richards et al., "Tracing European Founder Lineages in the Near Eastern mtDNA Pool," *American Journal of Human Genetics* 67 (2000): 1251–76; M. F. Hammer et al., "Jewish and Middle Eastern Non-Jewish Populations Share a Common Pool of Y-Chromosome Biallelic Haplotypes," *Proceedings of the National Academy of Sciences of the USA* 97 (2000): 6769–74.

27. Mark G. Thomas et al., "Y Chromosomes Traveling South: The Cohen Modal Haplotype and the Origins of the Lemba—the 'Black Jews of Southern Africa,'" *American Journal of Human Genetics* 66 (2000): 674–86.

associated groups out of ancient Israel; however, many may well lose their genetic identity, becoming invisible from a genetic perspective, indistinguishable from surrounding populations. These examples suggest the possibility of many such movements, some still genetically visible and some now genetically invisible.

Plant Genetics

A curiosity of this book is Southerton's lack of success in systematically addressing the literature that suggests widespread human movement across the South Pacific attested by the distribution of cultigens, or crops. This logical scientific approach should appeal to Southerton since he is a plant geneticist. Indeed, he admits to potential contact between Polynesia and the Americas as one avenue of cultigen introduction (p. 114). The plant data casts serious doubt on the claim of "no-contact" between the Americas, South Pacific, and Asia. Table 1 lists enough potential work to employ a molecular plant geneticist for several careers (pp. 105–6).

Interestingly, Amerindian Y haplotypes have been found in eastern Polynesia on the island of Rapa (two potentially transported cultigens to East Polynesia are attested in table 1); however, this is credited to the presence of three men from Chile and Mexico who were integrated into the island population in 1863–64. All were from the *Cora,* an illegal Peruvian slave ship. Slaves infected with dysentery and smallpox began an epidemic on the island; twenty males are thought to have survived, inclusive of these Native Americans (p. 112). But there are limitations to this assumption. Were these men part of the effective population (those who reproduced)? If so, how many sons did they father? Again coalescence, or the allelic sorting process, indicates that in general 72 percent of the Y chromosomes held individually by these twenty men have "drifted" out of the population, given that four generations have since elapsed (assuming a generous thirty years per generation).[28] Clearly, the *Cora* incident is not the only explanation.

28. At the conclusion of the fourth generation, 13 of 18 Y-haplotypes would have coalesced, or become extinct. See Avise, *Molecular Markers, Natural History, and Evolution*, 144.

If men were sailing this area in the 1800s, why would people not be traversing these waters much earlier? Some have suggested a seagoing, migratory wave for Native American haplogroup B thousands of years ago.[29] Additionally, seafaring is well attested in the ancient Near East, long before Lehi and others began their journey. Indeed, a settlement on the coast of the Persian Gulf at Umm an-Nar indicates a long acquaintance with sea travel. This village dates from around the period of Gilgamesh (2800 BC), the epic king of the Sumerian city of Uruk.[30]

Additionally, what we would call folklore (for example, stories such as Paul Bunyan) appears to make its way across the waves as well. For example, the mythical story of the posthole murder motif may well have been exchanged between Micronesia and Mesoamerica in pre-Columbian times.[31] The direction of transfer is not known; however, this suggests cultural contact without regard to what the current genetic records portray.

Belief and Science

Southerton warns of a change in Latter-day Saint views toward the origins of Native Americans, driven by research as opposed to revelation; however, varying notions on the subject of Native Americans, Asian origins, and the Book of Mormon are not unfamiliar topics. Southerton seems surprisingly unaware of church doctrine and policy established well over 150 years ago: "seek ye diligently and teach one another words of wisdom; yea, seek ye out of the best books words of wisdom; seek learning, even by study and also by faith" (D&C 88:118). This admonition drives a strong belief in secular education.

29. A. Torroni et al., "MtDNA Variation of Aboriginal Siberians Reveals Distinct Genetic Affinities with Native Americans," *American Journal of Human Genetics* 53 (1993): 603–4.

30. Geoffrey Bibby, *Looking for Dilmun* (New York: Knopf, 1969), 338.

31. J. D. Stewart, "A Consideration of the Posthole Murder Motif," in *Diffusion and Migration: Their Roles in Cultural Development,* ed. P. G. Duke, J. Ebert, G. Langemann, and A. P. Buchner (Calgary: The Archaeological Association of the University of Calgary, 1978), 226–35; Joe D. Stewart, "Ethnohistorical Implications of a Mythological Theme in Micronesia and Mesoamerica," *Canadian Journal of Anthropology* 4/1 (1984): 23–37.

Included in this philosophy is this traditional wisdom: "In this church you don't have to believe anything that isn't true."[32] This same advice holds for secular knowledge as well. If what Southerton suggests is true, that secular knowledge has no place in an understanding of the Book of Mormon, then it is a curious fact that within the First Presidency and Quorum of the Twelve Apostles are many highly educated men who hold advanced degrees in areas such as medicine, law, and education. Operative in all aspects of the church is this ancient observation welding together the concepts of faith and knowledge: "precept upon precept; line upon line . . . here a little and there a little" (Isaiah 28:10). Knowledge and understanding is a product of patience, time, and work. As a result, Latter-day Saint scholars are encouraged to participate in all areas of research, including analyses of the Book of Mormon. To represent the church as an uneducated, backward organization indicates a fundamentalist-type mind-set. Indeed much research has been done in this area, although Southerton's distrust of these efforts is understandable—to some extent. As a plant geneticist, he lacks the necessary in-depth expertise in what continues to be a multidisciplinary approach to the Book of Mormon in areas such as linguistics, languages (e.g., Hebrew, Demotic, Middle Kingdom Egyptian hieroglyphics), text analysis involving statistics, ancient Near Eastern history, and an understanding of the cultural nuances of these ancient groups.[33] If the "evidence" isn't strictly archaeological or genetic, Southerton becomes very narrow, an unusual trait for a scientist.

The introduction to the 1981 edition of the Book of Mormon states, in part, that the Lamanites "are the principal ancestors of the American Indians." Critics have been particularly noisy over this line; however, haste usually takes precedence over diligence. For example, this statement was neither included in the original 1830 edition of the Book of Mormon nor in subsequent editions previous to 1981. This seems to

32. Eyring, *Reflections of a Scientist,* 1.

33. See Daniel C. Peterson, "News From Antiquity," *Ensign,* January 1994, 16–21; Daniel C. Peterson, "Mounting Evidence for the Book of Mormon," *Ensign,* January 2000, 19–24.

indicate a variance in opinion and belief concerning this issue, yet these elements seem to escape critics. People of faith are naively believed incapable of holding differing views on certain issues.[34] In other words, this statement is not a central aspect of belief; nevertheless, it appears insurmountable to critics or to those searching for reasons to disbelieve. The issue is one of genetics—and it is on this basis that the Book of Mormon is being criticized. Moreover, it is the misconceptions about genetics that drives the criticisms. From a genetic perspective we have *yet* to demonstrate the Native American-ancient Near East genetic connection, but should we expect such a connection? The critics certainly think so, but critics generally propose many desperate scenarios that are clearly wrong—as is this one. Given the implied population genetics, why should we expect a chapter and verse genetic definition? Our faith must lift us above the sophistry of our critics.

Typically, this particular line would rarely be noticed; the preface is consistently bypassed in favor of the actual scriptural account. Their determined focus on one noncanonical phrase suggests a desperate search for negative material on the part of critics. Moreover, other statements in the preface are far more powerful and merit investigation—for example: "The crowning event recorded in the Book of Mormon is the personal ministry of the Lord Jesus Christ among the Nephites soon after his resurrection. It puts forth the doctrines of the gospel, outlines the plan of salvation, and tells men what they must do to gain peace in this life and eternal salvation in the life to come" (preface to the Book of Mormon).

Southerton states that "one feature of the emerging map of human genes is that people usually share the most genetic similarity with their closest neighbors" (pp. 121–22).[35] We should not be surprised, then, when the small founder groups described by the Book of Mormon, after twenty-six hundred years and more, appear genetically like their

34. For a discussion of a variety of Latter-day Saint views involving Native Americans and Book of Mormon peoples, see Matthew Roper, "Nephi's Neighbors: Book of Mormon Peoples and Pre-Columbian Populations," *Journal of Book of Mormon Studies* 15/2 (2003): 91–128.

35. See Luigi Luca Cavalli-Sforza, Paolo Menozzi, and Alberto Piazza, *The History and Geography of Human Genes* (Princeton, NJ: Princeton University Press, 1994).

closest neighbors, the Native Americans, having assimilated with varying frequencies of Native American mtDNA and Y chromosome haplotypes/haplogroups. Conversion of indigenous populations may well have hastened this genetic incorporation. In addition, communication of ideology could be distant, much like the movement of cultigens in the general South Pacific and maternal and paternal genes from Asia now found in the Americas. It is important to understand that early after arriving in the New World, the labels of *Lamanite* and *Nephite* lose implications of descent or genetic relationship; they are typically used to identify nonbelievers and believers (Jacob 1:13–14), a notion reinforced later in the text (4 Nephi 1:17, 20). Reasonably, the migratory groups described in the Book of Mormon are genetically lost through integration, selection, migration, coalescence, and the effects of time. From a genetic perspective, a subset of ancient Native Americans are the Book of Mormon peoples. A Mesoamerican setting for Book of Mormon events with widespread cultural elements transferred in a give-and-take fashion appears likely; however, if the Mesoamerican setting is incorrect, then there is an incredibly large area in which to locate a Book of Mormon setting.[36]

Although Lehi may be an increasingly irrelevant ancestor from a genetic perspective, the importance of his bringing the covenant of Abraham to the New World persists. This ideology is not written in the language of inheritance and once established remains a perpetual promise: "in thy seed shall *all the nations of the earth* be blessed" (emphasis added; see Genesis 22:17–19; 26:4; 28:14).[37] In the October 2004 priesthood session of general conference, President James E. Faust explained: "Anyone who is righteous and desires to possess greater knowledge and to become 'a greater follower of righteousness' can, under the authority

36. Dallin H. Oaks, "The Historicity of the Book of Mormon," in *Historicity and the Latter-day Saint Scriptures,* ed. Paul Y. Hoskisson (Provo, UT: BYU Religious Studies Center, 2001), 238–39.

37. See D. Jeffrey Meldrum and Trent D. Stephens, "Who Are the Children of Lehi?" *Journal of Book of Mormon Studies* 12/1 (2003): 38.

of the priesthood, obtain a greater knowledge of God. . . . 'They become the sons of Moses and of Aaron and the seed of Abraham.'"[38]

Some Observations on the Text

Southerton's separation from the church appears to be motivated by a rigid, unrelenting perspective that the Book of Mormon must meet his private interpretations and expectations, or it cannot be true. This attitude, of necessity, includes Latter-day Saint church leaders who are also expected to agree with his views of what the Book of Mormon does and does not mean and who are held to a narrow interpretation of what they have and have not said about the Book of Mormon. This inflexible insistence, that his view is true, generates criticisms resulting in a constant reintroduction of old issues that distract from the major theme of his book. For example, he is critical of the Church Educational System, including Brigham Young University and its programs of "indoctrination." This particular chapter ("The Lord's University") has a "home-cooked" feel about it. The criticisms appear "Salt-Lake-centric" and play out the party line of detractors from this particular region. But Southerton was born in Australia, joined the church, served a mission, and received his education in Australia. It is doubtful he would have the "cultural exposure" that would support these specific criticisms. Other subjects in this particular book, which are often cited by critics, have been debated at length elsewhere (for example, racism and origins of the Book of Abraham)[39] and, with the foregoing, seem to act as page filler here, clogging the main flow of the narrative.

As a scientist, Southerton twists some material from Henry Erying's *Reflections of a Scientist* for his own purposes (pp. 144–45), and yet critical and inspired advice from the same book is ignored: "I

38. James E. Faust, "The Key of the Knowledge of God," *Ensign,* November 2004, 52, 53 (quoting D&C 84:34).

39. See John A. Tvedtnes, "The Charge of 'Racism' in the Book of Mormon," *FARMS Review* 15/2 (2003): 183–97. Creating misunderstanding of the Book of Abraham is a well-worn tactic; for example, see Mark Ashurst-McGee, "A One-Sided View of Mormon Origins," *FARMS Review* 15/2 (2003): 316–19, for his discussion on the origins of the Book of Mormon.

have trouble understanding why people drift away from the Church. . . . There are all kinds of contradictions that I don't understand, but I find the same kind of contradictions in science, and I haven't decided to apostatize from science."[40]

Such practical wisdom eludes Southerton and confounds any ability to reason, think, and ponder through what he sees as inconsistencies. This drives a misunderstanding of the nature and character of the Book of Mormon and yields an unwillingness to acknowledge the limitations of the science upon which he relies so heavily. In addition, Southerton seems unfamiliar with the Book of Mormon. The second sentence of his preface proclaims that the principal groups and populations of the Book of Mormon "were practicing Christians centuries before the birth of Christ" (p. vii).

These myopias are astonishing for one claiming special insider knowledge not only as a former long-time member of the Church of Jesus Christ, but also as a scientist. One is left with the impression that this effort is really a "vent" of chronic frustration pressured by a personal inability to reconcile long-held religious beliefs with current scientific understanding, entangled with every criticism possible of anything Latter-day Saint. Southerton certainly is not the first LDS person to take note of some of the genetic data he describes; however, he demands that scientific proof must precede his faith—the unrealized irony forgotten here is that, in science, faith precedes the light of understanding. Two tragedies are woven between the lines of this book—Southerton's bitter estrangement from a religion that he cannot leave alone and the fact that many will believe what he has written as accurate background information on the Church of Jesus Christ but are unwittingly "studying the Church only through the eyes of its defectors—like interviewing Judas to understand Jesus."[41]

40. Eyring, *Reflections of a Scientist*, 47.

41. Cory H. Maxwell, ed., *The Neal A. Maxwell Quote Book* (Salt Lake City: Bookcraft, 1997), 71.

Conclusion

Nothing within the Book of Mormon precludes an Asian ancestry for Native Americans, nor is there any reason to believe that these same people, given geographic constraints, were not part of the events described therein. There are no "chapter-and-verse" genetic requirements for any of these groups, nor should we expect any. This does not mean that genetic markers of an ancient Near Eastern origin will never be found in the genetic record of Native Americans; however, there are compelling reasons to accept their absence. There will always be those who must have every detail before them prior to any acceptance of truth. This view always generates a cascade of doubt that ends in an appeal to the secular judge of science; however, in this particular instance, the insistence that the presence of small groups from the ancient Near East must absolutely be present in the current genetic record of Native Americans, as a means of testing the authenticity of the Book of Mormon, is an unrealistic expectation.

Table 1. Plants for which there is decisive evidence of transoceanic movement.[42]

Species	Common Name	Origin	Moved To
Amaranthus caudatus	love-lies-bleeding	Americas	Asia
Amaranthus cruentus	amaranth	Americas	Asia
Amaranthus hypochondriacus	amaranth	Americas	Asia
Amaranthus spinosus	spiked amaranth	Americas	South Asia
Ananas comosus	pineapple	Americas	India, Polynesia
Aristida subspicata		Americas	Polynesia
Aster divaricates		Americas	Hawaii
Bixa orellana	achiote, annatto	Americas	Oceania, Asia
Capsicum annuum	chili pepper	Americas	India, Polynesia
Carica papaya	papaya	Americas	Polynesia
Ceiba pentandra	kapok, silk cotton tree	Americas	Asia
Cucurbita ficifolia	chilacayote	Americas	Asia
Cyperus vegetus	edible sedge	Americas	India, Easter Island
Gossypium barbadense	a cotton	Americas	Marquesas Islands
Gossypium hirsutum	a cotton	Mexico	Africa, Polynesia
Gossypium tomentosum	a cotton	Americas	Hawaii
Heliconia bihai	balisier	Americas	Oceania, Asia

42. John L. Sorenson and Carl L. Johannessen, "Scientific Evidence for Pre-Columbian Transoceanic Voyages to and from the Americas," Sino-Platonic Papers 133, CD-ROM (Philadelphia: University of Pennsylvania, 2004). This data comes from an expanded version of a presentation given at a conference, "Contact and Exchange in the Ancient World," held at the University of Pennsylvania, Philadelphia, 5 May 2001, 4–6.

Species	Common Name	Origin	Moved To
Hibiscus tiliaceus	linden hibiscus	Americas	Polynesia
Ipomoea batatas	sweet potato	Americas	Polynesia, China
Lagenaria siceraria	bottle gourd	Americas	Asia, East Polynesia
Lycium carolinianum		Americas	Easter Island
Manihot sp.	manioc	Americas	Easter Island
Maranta arundinacea	arrowroot	Americas	Easter Island, India
Mucuna pruriens	cowhage	Americas	India, Hawaii
Nicotiana tabacum	tobacco	Americas	South Asia
Osteomeles anthyllidifolia		Americas	China, Oceania
Pachyrhizus erosus	jicama	Americas	Asia
Pachyrhizus tuberosus	jicama, yam bean	Americas	India, China, Oceania
Physalis peruviana	husk tomato	Americas	East Polynesia
Polygonum acuminatum	a knotweed	Americas	Easter Island
Psidium guajava	guava	Americas	China, Polynesia
Sapindus saponaria	soapberry	Americas	India, East Polynesia
Schoenoplectus californicus	bulrush, totora reed	Americas	Easter Island
Sisyrhynchium acre	a “grass”	Americas	Hawaii
Solanum candidum / *S. lasiocarpum*	naranjillo	Americas	Oceania, Southeast Asia
Solanum repandum / *S. sessiflorum*		Americas	Oceania
Solanum tuberosum	potato	Americas	Easter Island
Sophora toromiro	toromiro tree	Americas	Easter Island